SCRITTI LETTERARI
DI
LEONARDO DA VINCI

cavati dagli Autografi e pubblicati

da
J. P. RICHTER

IN DUE PARTI. — PARTE II.

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OF
LEONARDO DA VINCI
compiled and edited from the Original Manuscripts
by
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KNIGHT OF THE BAVARIAN ORDER OF ST. MICHAEL, &C.
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TO

HER MOST GRACIOUS MAJESTY

THE QUEEN
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ERRATA.

Italian text: page 19 l. 12 for rope read rompe.—p. 20 l. 4 from the end for sciuma read schiuma.—p. 132 l. 16 for scorse read scorre.—p. 164 l. 32 for trova read trova,—p. 170 l. 28 for più vicini read più vicini.—p. 260 l. 9 for varano read varano.—p. 293 l. 12 for oro read loro.—p. 309 l. 9 for arismetici read aritmetici; l. 11 for sie stende read si estende.—p. 328 l. 22 for modi read modo.—p. 329 l. 4 for regoli read regole.—p. 358 l. 5 from the end for belloni read bolleni.—p. 365 l. 3 from the end for abbraccierai read abbraccieran—.

English text: page 46 l. 12 for No. 14 read No. 4.—p. 49 l. 19 for Pl. CXXXIV read Pl. LXXXIV.—p. 53 first Note, for Pl. IX read Pl. XI, III.—p. 60 l. 8 for Pl. CXIX read Pl. XCIX.—p. 102 l. 1 from the end for XCVI read XCIV.—p. 103 l. 8 for Pl. XL read Pl. XC; l. 9 for Pl. XL read Pl. XC.—p. 155 l. 11 for weight read weighty.—p. 199 l. 23 for it there read there.—p. 324 l. 4 from the end for to much read so much.—p. 358 l. 24 for Flamme read Flame; l. 29 for to blows read blows.
XI.

The notes on Sculpture.

Compared with the mass of manuscript treating of Painting, a very small number of passages bearing on the practice and methods of Sculpture are to be found scattered through the note books; these are here given at the beginning of this section (Nos. 706—709). There is less cause for surprise at finding that the equestrian statue of Francesco Sforza is only incidentally spoken of; for, although Leonardo must have worked at it for a long succession of years, it is not in the nature of the case that it could have given rise to much writing. We may therefore regard it as particularly fortunate that no fewer than thirteen notes in the master's handwriting can be brought together, which seem to throw light on the mysterious history of this famous work. Until now writers on Leonardo were acquainted only with the passages numbered 712, 719, 720, 722 and 723.

In arranging these notes on sculpture I have given the precedence to those which treat of the casting of the monument, not merely because they are the fullest, but more especially with a view to reconstructing the monument, an achievement which really almost lies within our reach by combining and comparing the whole of the materials now brought to light, alike in notes and in sketches.

A good deal of the first two passages, Nos. 710 and 711, which refer to this subject seems obscure and incomprehensible; still, they supplement each other and one contributes in no small degree to the comprehension of the other. A very interesting and instructive commentary on these passages may be found in the fourth chapter of Vasari's...
Introduzione della Scultura under the title „Come si fanno i modelli per fare di bronzo le figure grandi e piccole, e come le forme per buttarle; come si arrmino di ferri, e come si gettino di metallo," &c. Among the drawings of models of the moulds for casting we find only one which seems to represent the horse in the act of galloping—No. 713. All the other designs show the horse as pacing quietly; and as these studies of the horse are accompanied by copious notes as to the method of casting, the question as to the position of the horse in the model finally selected, seems to be decided by preponderating evidence. "Il cavallo dello Sforza”—C. Boito remarks very appositely in the Saggio on page 26, "doveva sembrare fratello al cavallo del Colleoni. E si direbbe che questo fosse figlio del cavallo del Gattamelata, il quale pare figlio di uno dei quattro cavalli che stavano forse sull'Arco di Nerone in Roma" (now at Venice). The publication of the Saggio also contains the reproduction of a drawing in red chalk, representing a horse walking to the left and supported by a scaffolding, given here on Pl. LXXVI, No. 1. It must remain uncertain whether this represents the model as it stood during the preparations for casting it, or whether—as seems to me highly improbable—this sketch shows the model as it was exhibited in 1493 on the Piazza del Castello in Milan under a triumphal arch, on the occasion of the marriage of the Emperor Maximilian to Bianca Maria Sforza. The only important point here is to prove that strong evidence seems to show that, of the numerous studies for the equestrian statue, only those which represent the horse pacing agree with the schemes of the final plans.

The second group of preparatory sketches, representing the horse as galloping, must therefore be considered separately, a distinction which, in recapitulating the history of the origin of the monument seems justified by the note given under No. 720.

Galeazzo Maria Sforza was assassinated in 1476 before his scheme for erecting a monument to his father Francesco Sforza could be carried into effect. In the following year Lodovico il Moro the young aspirant to the throne was exiled to Pisa, and only returned to Milan in 1479 when he was Lord (Governatore) of the State of Milan, in 1480 after the minister Cecco Simonetta had been murdered. It may have been soon after this that Lodovico il Moro announced a competition for an equestrian statue, and it is tolerably certain that Antonio del Pollajuolo took part in it, from this passage in Vasari's Life of this artist: "E si trovò, dopo la morte sua, il disegno e modello che a Lodovico Sforza egli aveva fatto per la statua a cavallo di Francesco Sforza, duca di Milano; il quale disegno è nel nostro Libro, in due modi: in uno egli ha sotto Verona; nell'altro, egli tutto armato, e sopra un basamento pieno di battaglie, fa saltare il cavallo addosso a un armato; ma la cagione perchè non mettesse questi disegni in opera, non ho già potuto sapere." One of Pollajuolo's drawings, as here described, has lately been discovered by Senatore Giovanni Morelli in the Munich Pinacothek. Here the profile of the horseman is a portrait of Francesco Duke of Milan, and under the horse, who is galloping to the left, we see a warrior thrown and lying on the ground; precisely the same idea as we find
in some of Leonardo's designs for the monument, as on Pl. LXVI, LXVII, LXVIII, LXIX and LXXII No. 1; and, as it is impossible to explain this remarkable coincidence by supposing that either artist borrowed it from the other, we can only conclude that in the terms of the competition the subject proposed was the Duke on a horse in full gallop, with a fallen foe under its hoofs.

Leonardo may have been in the competition there and then, but the means for executing the monument do not seem to have been at once forthcoming. It was not perhaps until some years later that Leonardo in a letter to the Duke (No. 719) reminded him of the project for the monument. Then, after he had obeyed a summons to Milan, the plan seems to have been so far modified, perhaps in consequence of a remonstrance on the part of the artist, that a pacing horse was substituted for one galloping, and it may have been at the same time that the colossal dimensions of the statue were first decided on. The designs given on Pl. LXX, LXVI, LXXII, 2 and 3, LXXIII and LIV and on pp. 4 and 24, as well as three sketches on Pl. LXIX may be studied with reference to the project in its new form, though it is hardly possible to believe that in either of these we see the design as it was actually carried out. It is probable that in Milan Leonardo worked less on drawings, than in making small models of wax and clay as preparatory to his larger model. Among the drawings enumerated above, one in black chalk, Pl. LXXIII—the upper sketch on the right hand side, reminds us strongly of the antique statue of Marcus Aurelius. If, as it would seem, Leonardo had not until then visited Rome, he might easily have known this statue from drawings by his former master and friend Verrocchio, for Verrocchio had been in Rome for a long time between 1470 and 1480. In 1473 Pope Sixtus IV had this antique equestrian statue restored and placed on a new pedestal in front of the church of San Giovanni in Laterano. Leonardo, although he was painting independently as early as in 1472 is still spoken of as working in Verrocchio's studio in 1477. Two years later the Venetian senate decided on erecting an equestrian statue to Colleoni; and as Verrocchio, to whom the work was entrusted, did not at once move from Florence to Venice—where he died in 1488 before the casting was completed—but on the contrary remained in Florence for some years, perhaps even till 1485, Leonardo probably had the opportunity of seeing all his designs for the equestrian statue at Venice and the red chalk drawing on Pl. LXXIV may be a reminiscence of it.

The pen and ink drawing on Pl. LXXII, No. 3, reminds us of Donatello's statue of Gattamelata at Padua. However it does not appear that Leonardo was ever at Padua before 1499, but we may conclude that he took a special interest in this early bronze statue and the reports he could procure of it, form an incidental remark which is to be found in C. A. 145\textsuperscript{a}; 432\textsuperscript{a}, and which will be given in Vol. II under Ricordi or Memoranda.
Among the studies—in the widest sense of the word—made in preparation for this statue we may include the Anatomy of the Horse which Lomazzo and Vasari both mention; the most important parts of this work still exist in the Queen’s Library at Windsor. It was beyond a doubt compiled by Leonardo when at Milan; only a few interesting records to be found among these designs are reproduced in Nos. 716 and 717; but it must be pointed out that out of 40 sheets of studies of the movements of the horse belonging to that treatise, a horse in full gallop occurs but once.
If we may trust the account given by Paulus Fovius—about 1527—Leonardo's horse was represented as "vehementer incitatus et anhelatus". Fovius had probably seen the model exhibited at Milan; but, need we, in fact, infer from this description that the horse was galloping? Compare Vasari's description of the Gattamelata monument at Padua: "Egli [Donatello] vi andò ben volentieri, e fece il cavallo di bronzo, che è in sulla piazza di Sant Antonio, nel quale si dimostra lo sbuffamento ed il fremito del cavallo, ed il grande animo e la fierezza vivacissimamente espressa dall'arte nella figura che lo cavalca".

These descriptions, it seems to me, would only serve to mark the difference between the work of the middle-ages and that of the renaissance.

We learn from a statement of Sabbà da Castiglione that, when Milan was taken by the French in 1499, the model sustained some injury; and this informant, who, however, is not invariably trustworthy, adds that Leonardo had devoted fully sixteen years to this work (la forma del cavallo, intorno a cui Leonardo avea sedici anni consumati). This often-quoted passage has given ground for an assumption, which has no other evidence to support it, that Leonardo had lived in Milan ever since 1483. But I believe it is nearer the truth to suppose that this author's statement alludes to the fact that about sixteen years must have passed since the competition in which Leonardo had taken part.

I must in these remarks confine myself strictly to the task in hand and give no more of the history of the Sforza monument than is needed to explain the texts and drawings I have been able to reproduce. In the first place, with regard to the drawings, I may observe that they are all, with the following two exceptions, in the Queen's Library at Windsor Castle; the red chalk drawing on Pl. LXXVI No. 1 is in the MS. C. A. (see No. 712) and the fragmentary pen and ink drawing on page 4 is in the Ambrosian Library. The drawings from Windsor on Pl. LXVI have undergone a trifling reduction from the size of the originals.

There can no longer be the slightest doubt that the well-known engraving of several horsemen (Passavant, Le Peintre-Graveur, Vol. V, p. 181, No. 3) is only a copy after original drawings by Leonardo, executed by some unknown engraver; we have only to compare the engraving with the facsimiles of drawings on Pl. LXV, No. 2, Pl. LXVII, LXVIII and LXIX which, it is quite evident, have served as models for the engraver.

On Pl. LXV No. 1, in the larger sketch to the right hand, only the base is distinctly visible, the figure of the horseman is effaced. Leonardo evidently found it unsatisfactory and therefore rubbed it out.

The base of the monument—the pedestal for the equestrian statue—is repeatedly sketched on a magnificent plan. In the sketch just mentioned it has the character of a shrine or aedicula to contain a sarcophagus. Captives in chains are here represented on the entablature with their backs turned to that portion of the monument which more
strictly constitutes the pedestal of the horse. The lower portion of the aedicula is surrounded by columns. In the pen and ink drawing Pl. LXVI—the lower drawing on the right hand side—the sarcophagus is shown between the columns, and above the entablature is a plinth on which the horse stands. But this arrangement perhaps seemed to Leonardo to lack solidity, and in the little sketch on the left hand, below, the sarcophagus is shown as lying under an arched canopy. In this the trophies and the captive warriors are detached from the angles. In the first of these two sketches the place for the trophies is merely indicated by a few strokes; in the third sketch on the left the base is altogether broader, butresses and pinnacles having been added so as to form three niches. The black chalk drawing on Pl. LXVIII shows a base in which the angles are formed by niches with pilasters. In the little sketch to the extreme left on Pl. LXV, No. 1, the equestrian statue serves to crown a circular temple somewhat resembling Bramante’s tempietto of San Pietro in Montorio at Rome, while the sketch above to the right displays an arrangement faintly reminding us of the tomb of the Scaligers in Verona. The base is thus constructed of two platforms or slabs, the upper one considerably smaller than the lower one which is supported on flying buttresses with pinnacles.

On looking over the numerous studies in which the horse is not galloping but merely walking forward, we find only one drawing for the pedestal, and this, to accord with the altered character of the statue, is quieter and simpler in style (Pl. LXXIV). It rises almost vertically from the ground and is exactly as long as the pacing horse. The whole base is here arranged either as an independent baldaquin or else as a projecting canopy over a recess in which the figure of the deceased Duke is seen lying on his sarcophagus; in the latter case it was probably intended as a tomb inside a church. Here, too, it was intended to fill the angles with trophies or captive warriors. Probably only No. 724 in the text refers to the work for the base of the monument.

If we compare the last mentioned sketch with the description of a plan for an equestrian monument to Gian Giacomo Trivulzio (No. 725) it seems by no means impossible that this drawing is a preparatory study for the very monument concerning which the manuscript gives us detailed information. We have no historical record regarding this sketch nor do the archives in the Trivulzio Palace give us any information. The simple monument to the great general in San Nazaro Maggiore in Milan consists merely of a sarcophagus placed in recess high on the wall of an octagonal chapel. The figure of the warrior is lying on the sarcophagus, on which his name is inscribed; a piece of sculpture which is certainly not Leonardo’s work. Gian Giacomo Trivulzio died at Chartres in 1518, only five months before Leonardo, and it seems to me highly improbable that this should have been the date of this sketch; under these circumstances it would have been done under the auspices of Francis I, but the Italian general was certainly not in favour with the French monarch at the time. Gian Giacomo Trivulzio was a sworn foe to Ludovico il Moro, whom he strove for years to overthrow. On the 6th September 1499 he marched victorious into Milan at the head
of a French army. In a short time, however, he was forced to quit Milan again when Ludovico il Moro bore down upon the city with a force of Swiss troops. On the 15th of April following, after defeating Ludovico at Novara, Trivulzio once more entered Milan as a Conqueror, but his hopes of becoming Governatore of the place were soon wrecked by intrigue. This victory and triumph, historians tell us, were signalised by acts of vengeance against the dethroned Sforza, and it might have been particularly flattering to him that the casting and construction of the Sforza monument were suspended for the time.

It must have been at this moment—as it seems to me—that he commissioned the artist to prepare designs for his own monument, which he probably intended should find a place in the Cathedral or in some other church. He, the husband of Margherita di Nicolino Colleoni, would have thought that he had a claim to the same distinction and public homage as his less illustrious connection had received at the hands of the Venetian republic. It was at this very time that Trivulzio had a medal struck with a bust portrait of himself and the following remarkable inscription on the reverse:

**DEO FAVENTE • 1499 • DICTVS • IO • IA • EXPYLIT • LVDOVICÝ • SF • (Sforzian) DVC • (ducem) MLI (Mediolani) • NOÍE (nomine) • REGIS • FRANCORVM • EODEM • ANN • (anno) RED'T (edit) • LVS (Ludovicus) • SVPERATVS ET CAPTVS • EST • AB • EO.**

In the Library of the Palazzo Trivulzio there is a MS. of Callimachus Siculus written at the end of the XVth or beginning of the XVIth century. At the beginning of this MS. there is an exquisite illuminated miniature of an equestrian statue with the name of the general on the base; it is however very doubtful whether this has any connection with Leonardo's design.

Nos. 731—740, which treat of casting bronze, have probably a very indirect bearing on the arrangements made for casting the equestrian statue of Francesco Sforza. Some portions evidently relate to the casting of cannon. Still, in our researches about Leonardo's work on the monument, we may refer to them as giving us some clue to the process of bronze casting at that period.
De statua.

Se vuoi fare una figura di marmo, fa ne' prima una cassa di terra, la quale, finita che l'ài, secch immettila in una cassa che sia ancora aperta, dopo la figura tratta d'esso loco, a riecuere il marmo che vuoi scoprivi dentro la figura alla similitudine di quella di terra; e poi messa la figura di terra in detta cassa, abbi bacchette ch'ètrino aposto per i suoi busi, e spingle dentro tato per ciascuno buso che ciascuna bacchetta biaça tocca la figura in diuersi lochi, e la parte d'esse bacchette, che resta fori della cassa, tigni di nero, e fa il trassegno alla bacchetta e al suo buso in modo che a tua posta si scotti; e trai d'essa cassa la figura di terra e mettivi il tuo pezzo di marmo, e tato leua del marmo, che tutte le tuae bacchette si nascondino sino al loro segno in detti busi, e per potere questo meglio fare fa che tutta la cassa si poissaja leuare in alto, e l'fondo d'essa cassa resti sèpre sotto il marmo ed a questo modo ne potrai leuare coi ferri con grà facilità.

If you wish to make a figure in marble, first make one of clay, and when you have finished it, let it dry and place it in a case which should be large enough, after the figure is taken out of it, to receive also the marble, from which you intend to reveal the figure in imitation of the one in clay. After you have put the clay figure into this said case, have little rods which will exactly slip in to the holes in it, and thrust them so far in at each hole that each white rod may touch the figure in different parts of it. And colour the portion of the rod that remains outside black, and mark each rod and each hole with a countersign so that each may fit into its place. Then take the clay figure out of this case and put in your piece of marble, taking off so much of the marble that all your rods may be hidden in the holes as far as their marks; and to be the better able to do this, make the case so that it can be lifted up; but the bottom of it will always remain under the marble and in this way it can be lifted with tools with great ease.

706. 1. desctatua. 2. sevoll. 3. tera... chellai essechha mettila avna. 4. chassa chessi aanchora [dop atta] “capace”. 5. loco... [chel] schoprir. 7. tera... chassa... abì bacchette. 8. apìco... espigule... òto [che] per ciaschuno. 9. ciascuna bacchetta bìca tocha. 10. bacchette... restas. 11. chassa... effa... chòtrassegno... bacchetta. 12. dio buso imodo... atta... siscchêti [ettare las]. 13. etri... chassa... tera. 14. ppo... estàto... chettutter. 15. bacchette... maschêdino... alore. 16. chettutta... chassa. 17. chasa ressi. 18. acquesto... cho. 19. chon.

Vol. II.
707. Some have erred in teaching sculptors to measure the limbs of their figures with threads as if they thought that these limbs were equally round in every part where these threads were wound about them.

708. Measurement and division of a statue.

Divide the head into 12 degrees, and each degree divide into 12 points, and each point into 12 minutes, and the minutes into minims and the minims into semi minims.

Degree—point—minute—minim.

709. Sculptured figures which appear in motion, will, in their standing position, actually look as if they were falling forward.

710. Three braces which bind the mould. [If you want to make simple casts quickly, make them in a box of river sand wetted with vinegar.]

W. P. 539

Alcuni anò errato a insegnare alli scultori 2 circundare con fili i membr. delle loro figure, 3 quasi credendo che essi membri sieno d'equale 4 rotondità, in qualunque parte da essi fili 5 circundati siano.

A. 1 of

Misure e còpartitione della statua.

2 Diuidi la testa in 12 gradi, e ciascuno grado diuidi in 12 punti, e ciascuno 3 punto in 12 minuti, e i minuti in minimi, e i minimi in semiminimi.

4 Grado — punto — minuto — minimo.

Ash. I. 196]

3 Le figure di rilievo che pajono 1 moto, posandole in piè, per ragione deò cadere jażi.

W. X.]

3 Ferri che cingà la forma. 2 [Se vulli fare i progetti e 3 semplici, tagli con una cassa 4 di sabbione di fiume invindito con 5 acieta.]
6 [Quando tu avrai fatto la forma sopra il cavallo e tu farai la grossezza del metallo 9 di terra.]

Nota nello allegarc quante ore vai per cérinajo 11 nel gittare ognuno tenga stoppato il fornello col suo infocato; nel dentro di tutta la forma sia inbeueto olio di lin seme o di tremètina; e poi sia dato vna mano 15 di polvere di borace e di pece grecia con acqua vite, 16 e la forma di fori incepiata, accioch'è stàdo sotto 17 terra l'umido non la...

[When you shall have made the mould upon the horse you must make the thickness of the metal in clay.]

Observe in alloying how many hours are wanted for each hundredweight. [In casting each one keep the furnace and its fire well stopped up.] [Let the inside of all the moulds be wetted with linseed oil or oil of turpentine, and then take a handful of powdered borax and Greek pitch with aqua vitae, and pitch the mould over outside so that being under ground the damp may not [damage it?]

[To manage the large mould make a model of the small mould, make a small room in proportion.]

[Make the vents in the mould while it is on the horse.]

Hold the hoofs in the tongs, and cast them with fish glue. Weigh the parts of the mould and the quantity of metal it will take to fill them, and give so much to the furnace that it may afford to each part its amount of metal; and this you may know by weighing the clay of each part of the mould to which the quantity in the furnace must correspond. And this is done in order that the furnace for the legs when filled may not have to furnish metal from the legs to help out the head, which would be impossible. [Cast at the same casting as the horse the little door]

W. XI.

FORMA DEL CAVALLO.

2 Fa il cavallo sopra gambe di ferro ferme e stabili in bo'no fondamento, poi lo inseva e fa glia la cappa di sopra, lasciando ben seccare a suolo a suolo, e questa ingrasserà tre dita, di poi arma e ferra secondo il bisogno; oltre a di questo cava

facto. 7. cawanlu ctau. 8. grossea. 16. bòra va... cérinano. 11. hognuvuo... stopato... chon. 12. infochato màdrriano ca a tempe di stopp. 13. holio. 14. poi dato. 15. grecha chon sec'nu. 16. ella... chesstàdo. 17. torno nola [infinite] chose. 18. fatte subito chella [infinite]. 19. il såbione di for [infinite] azzo ciò di. 20. quello da forne [infinite] chou aceto. 21. e bea [infinite]. 22. misià nella forma [infinite] uno quadrato. 23. pesto... e ciener eò ciara dono e a ceto. 24. manegiare. 25. cholla... falle una pichulla. 26. falle boche. 27. choma imole esfondé cholla di pesce. 28. pena [la forma] le. 30. essa essere ochopata. 31. ettàto. 32. acquella parte a porgiere. 33. essuesto chogno. 34. sciacon... tera. 35. forne. 36. cholla... rispòde. 37. essuesto. 38. gòbe épinteche dountful. 39. aie... abiascherrer. 40. chessa rebe impossib. 42. cawanlu. 43. sportello della. Here the text breaks off.

711. 2. ghanbe... estable. 3. sondometo... effagi la chappa. 4. seechhure assooluo assuco... eecuesta. 5. efera sechhondo. 6. cawa

710. The importance of the notes included under this number is not diminished by the fact that they have been lightly crossed out with red chalk. Possibly they were the first scheme for some fuller observations which no longer exist; or perhaps they were crossed out when Leonardo found himself obliged to give up the idea of casting the equestrian statue. In the original the first two sketches are above l. 1, and the third below l. 9.
la forma, e poi fa la grossezza, e poi ricopre la forma a mezza a mezza, e quella integra, poi con sua ferri cierchiala e cigni e la ricuoci di detto dove a toccare il brozo.

**DEL FAR LA FORMA DI PEZZI.**

12 Segnita sopra il cavallo finito tutti li pezzi della forrma, di che tu voi vestire tal cavallo, e nello intrecciare 11 li taglia in ogni interratura, acciocchè quado si è finito la forma che tu la possi cavare e poi rimettere al primo loco colli sua scoriotti delle cortasaggni.

12' a b quadretto starà infra la cappella al maschio, cioè 18 nel uacuo dove a stare il bròzo liquefatto e questi 19 tali quadretti di bròzo mantengono li spatii della forrma alla cappella con equal distația, e per questo tali 21 quadretti sò di gràde importanta.

21 La terra sia mista 21 sò rena;

21 tollicera, a redere, e pagare la compostura.

27 Sceca la a suoli. 29 Fa la forma di fori 31 di giesso per fugire 31 il tòpo del seccare, e la spesa di legnie, e cò 33 tal giesso ferma 31 li ferri di fori e di dentro có due dita di 36 grossezza, fa terra 37otta.

37 E questa tal forma 39 farai in un di; vna mezziza navata di giesso 31 di serue.

38 Bono.

41 Ritasa có 44 colla terra 45 over chiara d’ovo 45 e mattone e ro8sume.

43 A. 2116, 6684

Tutti i capi de’lle chiavarde.

712. All the heads of the large nails.

711. See Pl. LXXV. The figure “40,” close to the sketch in the middle of the page between lines 16 and 17 has been added by a collector’s hand.

In the original, below line 21, a square piece of the page has been cut out about 9 centimetres by 7 and a blank piece has been ginned into the place.

Lines 22—24 are written on the margin. l. 27 and 28 are close to the second marginal sketch. l. 42 is a note written above the third marginal sketch and on the back of this sheet is the text given as No. 642. Compare also No. 802.

712. See Pl. LXXVI, No. 1. This drawing has already been published in the “Saggio delle Opere di L. da Vinci.” Milano 1872, Pl. XXIV, No. 1. But, for various reasons I cannot regard the editor’s suggestions as satisfactory. He says: “Veggonsi le armature de legname nelle quali forse vanno sostenuto il modello, quando per le nozze di Bianca Maria Sforza con Massimiliano imperatore, esso fu collocato sotto un arco triunfale davanti al Castello.”
Salt may be made from human excrements, burnt and calcined, made into lees and dried slowly at a fire, and all the excrements produce salt in a similar way and these salts when distilled, are very strong.

714. Vasari repeatedly states, in the fourth chapter of his *Introduzione della Scultura*, that in preparing to cast bronze statues horse-dung was frequently used by sculptors. If, notwithstanding this, it remains doubtful whether I am justified in having introduced here this text of but little interest, no such doubt can be attached to the sketch which accompanies it.
MODE OF FOUNCING AGAIN.

Method of founding again. This may be done when the furnace is made [4] strong and bruised.

W. XII.

modo di ricucere.

Questo si potrebbe fare fatto il for-
Vedesi in nelle montagne di Parma e l'acceità la moltitudine di richi e coralli interlati ancora appiccati all'assis, de' quali quando facevo il gra cavallo di Milano, me ne fu portato un gra saccio nella mia fabbrica da certi villani che in tal loco trovati.

C. A. 3884; 958a

Credetelo a me, Leonardo fiorétino che fa il cavallo del duca Francesco di brôzo che non ne bisogna fare stima, perchè è che fare il tempio di sua vita è dubito che per l'essere si gràde opera, che non la finirà mai.

C. A. 3884; 953a

Del cavallo nó dirò nicte perchè cognosco i tépi.

C. A. 2726; 833a

Del marmo operasi dieci anni; io nó vo aspettare che l mio pa'gamito passi il termine del fine della opera mia.

C. A. 1764; 533a

SEPUTRCO DI MESSER GIOVÀNI JACOMO DA TREVULZIO.

Spesa della manifattura e materià del cavallo.

2 Spesa della manifattura e materià del cavallo.

721. This passage is quoted from a letter to a committee at Piacenza for whom Leonardo seems to have undertaken to execute some work. The letter is given entire in section XXI.; in it Leonardo renounces as to some unreasonable demands.

722. This passage occurs in a rough copy of a letter to Ludovico il Moro, without date (see below among the letters).

724. This possibly refers to the works for the pedestal of the equestrian statue concerning which we have no farther information in the MSS. See p. 6.

725. In the original, lines 2—5, 12—14, 33—35, are written on the margin. This passage has been recently published by G. Govi in Vol. V, Ser. 33, of Transunti, Reale Accademia dei Lincei, sed. del 5 Giugno, 1881, with the following introductory note: "Desidero intanto che siano stampati questi pochi frammenti perchè so che sono stati trascritti ultimamente, e verranno messi in luce tra poco fuori d'Italia. Li ripubblicherò pure chi vuole, ma si sappia almeno che anche tra noi si conoscono, e sono raccolti da anni per commorre, quando che fosse, una edizione ordinata degli scritti di Leonardo."

The learned editor has left out line 22 and has written 3 piedi for 8 piedi in line 25. There are other deviations of less importance from the original.

722. Believe me, Leonardo the Florentine, who has to do the equestrian bronze statue of the Duke Francesco that he does not need to care about it, because he has work for all his life time, and, being so great a work, I doubt whether he can ever finish it.

723. Of the horse I will say nothing because I know the times.

724. During ten years the works on the marbles have been going on I will not wait for my payment beyond the time, when my works are finished.

725. The MONUMENT TO MESSER GIOVÀNI JACOMO DA TREVULZIO.

[2] Cost of the making and materials for the horse[5].
6 V'no corsiero grade al naturale coll'omo sopra vuole per la spesa del metallo . . . . . . . . . . . . duc. 500.  
7 E per la spesa del ferrameto che ua in nel modello e carboni e legname e la fossa per gittarlo e per serrare la forma, e col fornello dove si de' gittare duc. 200.  
8 Per fare il modello di terra e poi di cera . . . . . . . . . . . . duc. 432.  
9 E per li lavorati che lo netterano quiado ha gittato . . . . . . . . . . . . duc. 450.  
11 In somma sono . . . . . . . . . . . . duc. 1582.  
12 Spesa de' m° armi della 14 sepultura.  
15 Spesa del marmo secondo il disegno; il pezzo del marmo che ua sotto il cauallo 16 ch'è lungo braccia 4 e largo braccia 2 e once 2 e grosso once 9, cètinar 58, a L. 4 e S. 10 per cètinara . . . . . . . . . . . . duc. 58.  
17 E per 13 braccia di cornice e 6, larga 6, e grossa 4, cèt. 24, br. 24.  
18 E per lo fregio e architrave ch'è lungo br. 4 e 6, largo br. 2 e grosso 6, cèt 20 . . . . . . . . . . . . duc. 20.  
19 E per li capitelli fatti di metallo, che sono 8, vano i tavola 5, e grossi 2, a prezzo di 20 ducati 15 per ciascuno montano . . . . . . . . . . . . duc. 120.  
21 E per 8 colonne di br. 2 e 7, grosse 4 e 1/2, cètinar 20 . . . . . . . . . . . . duc. 20.  
22 E per 8 base che sono in tavola 6 e 1/2 e alte 2 cent. 5 . . . . . . . . . . . . duc. 20.  
23 E per la pietra dou' è su la sepultura, liuga br. 4 e 10, larga br. 2 e 4 e 1/2 cètinara 36 . . . . . . . . . . . . duc. 36.  
25 E per 8 piedi di piedistalli che uà lunghi br. 8 e larghi 6 e 1/2 grossi 6 6/13 26 centinar 20, mòtano . . . . . . . . . . . . duc. 20.  
27 E per la cornice ch'è di sotto, ch'è liuga br. 4 e 10, larga br. 2 e 6, e grossa 6, cèt. 32 . . . . . . . . . . . . duc. 32.  
28 E per la pietra di che si fa il morto ch'è lunga br. 3 e 6, larga br. uno e 6, grossa 9, cent 30, duc. 30.  
29 E per la pietra che ua sotto il morto ch'è liuga br. 3 e 6, larga br. uno e 6, grossa 4 4/2 . . . . . . . . . . . . duc. 16.  
30 E per le tauole del marmo i terposte infra li piedistalli, che sono 8 e son lunghe br. 9. 31 larghe 9, grosse 3 cent 8 . . . . . . . . . . . . duc. 8.  
32 In somma sono . . . . . . . . . . . . duc. 389.

A courser, as large as life, with the rider requires for the cost of the metal, duc. 500.  
And for cost of the iron work which is inside the model, and charcoal, and wood, and the pit to cast it in, and for binding the mould, and including the furnace where it is to be cast . . . . . . . . . . . . duc. 200.  
To make the model in clay and then in wax . . . . . . . . . . . . duc. 432.  
To the labourers for polishing it when it is cast . . . . . . . . . . . . duc. 450.  
In all . . . . . . . . . . . . duc. 1582.

[12] Cost of the marble of the monument [14].

Cost of the marble according to the drawing. The piece of marble under the horse which is 4 braccia long, 2 braccia and 2 inches wide and 9 inches thick 58 hundredweight, at 4 Lire and 10 Soldi per hundredweight . . . . . . . . . . . . duc. 58.  
And for 13 braccia and 6 inches of cornice, 7 in. wide and 4 in. thick, 24 hundredweight . . . . . . . . . . . . duc. 24.  
And for the frieze and architrave, which is 4 br. and 6 in. long, 2 br. wide and 6 in. thick, 29 hundredweight . . . . . . . . . . . . duc. 20.  
And for the capitals made of metal, which are 8, 5 inches in. square and 2 in. thick, at the price of 15 ducats each, will come to . . . . . . . . . . . . duc. 122.  
And for 8 columns of 2 br. 7 in., 4 1/2 in. thick, 20 hundredweight . . . . . . . . . . . . duc. 20.  
And for 8 bases which are 5 1/2 in. square and 2 in. high 5 hundred . . . . . . . . . . . . duc. 5.  
And for the slab of the tombstone 4 br. 10 in. long, 2 br. 4 1/2 in. wide 36 hundredweight . . . . . . . . . . . . duc. 36.  
And for 8 pedestal feet each 8 br. long and 6 1/2 in. wide and 6 1/2 in. thick, 20 hundredweight come to . . . . . . . . . . . . duc. 20.  
And for the cornice below which is 4 br. and 10 in. long, and 2 br. and 5 in. wide, and 4 in. thick, 32 hundred . . . . . . . . . . . . duc. 32.  
And for the stone of which the figure of the deceased is to be made which is 3 br. and 8 in. long, and 1 br. and 6 in. wide, and 9 in. thick, 30 hundred . . . . . . . . . . . . duc. 30.  
And for the stone on which the figure lies which is 3 br. and 4 in. long and 1 br. and 2 in. wide and 4 1/2 in. thick duc. 16.  
And for the squares of marble placed between the pedestals which are 8 and 9 br. long and 9 in. wide, and 3 in. thick, 8 hundredweight . . . . . . . . . . . . duc. 8.  
in all . . . . . . . . . . . . duc. 389.
THE TRIVULZIO MONUMENT.

726.]

Spesa della 34 manifattu^Sra ne' marmi.
Attorno allo inbasamèto del cauallo va figure 8 di 25 ducati l' una,

[33] Cost of the
the base

3^

due.

Round

stands there are 8 figures at 25 ducats
due.
And on the same base there are 8
festoons with some other ornaments,

each

200.

"E

nel medesimo inbasamèto ci
va festoni 8 co certi altri ornamcti e
di questi
ve n'è 4 a prezzo di ducati

per ciascuno,

15

uno
due.
isquadrare dette pietre,
due.
•1°
Ancora pel cornicione che ua
ducati

di 8

E

35

and of these there are 4
of 15 ducats each, and 4

4 a prezzo

e

1'

6.

27.

per br
due.
*^E per 12 br. d'architrave, a ducati I e ^2 per br
due.
t^E per 3 fioroni che fa soffitta
alla sepultura, a 20 ducati per fiorone,
due.
'''E per 8 colonne accanalate, a
8 ducati r,una
due.
15 E per 8 base, a un ducato l'una,

60.

due.

8.

5

i*"

E

per 8

piedistalli,

18.

60.

And

.

.

And

64.

due.
trofei,

a 25 ducati l'uno
19 E
per la
scorniciatura

della

pietra che

ua

sotto

morto

il

due.

.

.

due.

150.

Zecca

do

31. larghi.

in

VOL.

for

.

.

due.

due.

well

it

16.

150.

40.

statue of the deceased, to

For 6 harpies with candelabra,

100.

at 25

due. 150.
ducats each
For squaring the stone on which
the statue lies, and carving the moul20.
due.
ding
due. 1075.
in all
The sum total of every thing added
due. 3046.
together amount to
.

.

Mint at Rome.

Roma.

di

ancora fare sanza molla; ^Ma
sempre il maschio di sopra debbe Ostare
congiunto alla parte della gu^aina mobile;

726.

64.

64.

And

For the

can also be made without a sprmg. The
But the screw above must always be joined

^Puosi

used

60.

726.

43 «)

tura.

18.

8.

for 8 pedestals, of

deceased

100.

60.

due.

And

.

40.

27,

ducat each,

....

16.

s'Per 6 arpie colli candelieri, a 25
ducati l'una
due. 150.
5^ Per isquadrare la pietra dove si
posa il morto e sua incorniciatura
due.
20.
sjJn somma
due. 1075.
SI In
somma ogni cosa insieme
giùta so
due. 3046.

46.

i

6.

8

due.
8 bases at

for

92.

which 4 are
at 10 due. each, which go above the
angles; and 4 at 6 due. each
due.

s°Per la figura del morto a farla

bene

at

squaring and carving the
moulding of the pedestals at 2 due.
each, and there are 8
due.
And for 6 square blocks with figures
due.
and trophies, at 25 due. each
And for carving the moulding of
under the figure of the
the
stone

.

due.

columns

fluted

.

i^E per isquadrare e incorniciare li
piedistalli, a due due. l'uno, che sono 8,

i^E per 6 tavole con figure e

at the price

ducats each

64.

de' quali n' è

4 a IO due. l'uno, che uà sopra li
catoni, e 4 a 6 due. l'uno
due.

8

for

200.

at the price

of 8 ducats each
due.
And for squaring the stones due.
Again, for the large cornice which
goes below the base on which the
horse stands, which is 13 br. and 6 in.,
at 2 due. per br
due.
And for 12 br. of frieze at 5 due.
per br
due.
And for 1 2 br. of architrave at
due. per br
due.
And for 3 rosettes which will be
the soffit of the monument, at 20 ducats each
due.

92.

per

sotto lo inbasamèto del cauallo, eh'
br. 13 e ó 6 a due. 2 per br.
due.
l'E per 12 br. di fregio, a ducati

work in marble [35].
on which the horse

36. va.

piedistalle.
54.

37.

soma onicossa

.See PI.

va fessto 8 c5

li

47. issguadrare

LXXVI.

.

.

.

.

queste.

It

to the part of the

38. ciasscuna

esscornicare lipiedisstallo

.

.

.

.

chessono

luna.
.

.

movable sheath:

39. issguadare.

luma.

48.

trufei.

40.

cornicone.

50. affarla.

52. essa

is

frego.

scornica-

taken from a note book which can be proved to have been

Rome.
11.

41.

gùta so due.

This passage

mint of

C

.


6 Tutte le monete che non anno il cier-chio intero, non sieno acciottolate per buone, e a fare la perfezione del lor cier-chio è necessario che in prima le monete sien tutte di perfetto circolo, e a fare questo si debbe in prima fare una moneta perfetta in peso e in larghezza e grossezza, e di questa tal larz'ghessa e grossezza si fabbricano molte lamine, tirate per una medesima tre fili, le quali resteranno a modo di righe, e di queste tali righe si stampi fuori le monete tòde, a modo che si faranno i crueili da castagnerie, e queste monete poi si stampino nel modo sopra detto ecc.

31 Il vacuo della stampa sia più largo da alto che da basso vni34ormemente, e inséribile.

35 Questo taglia le monete di perfetta ro37'ondità e grossezza e peso e ris3sparmia l'omo che taglia e pesa, e risparmià l'omo che fa le monete 49'tonde; adunque sol passa per li mani di bellissimo stampatore e fa monete bellissime.

727.

POLUERE DA MEDAGLIE.

2 Stoppini incombustibili di fungo ridotto in polvere, stanno bruciato e tutti i metalli, 4 allume scagliuolo, 5 fumo di fucina da ottone, e ciascuna cosa inumidiscì con acqua o maluagia o aceto forte di grã, uno bianco, o di quella prima acqua di trementina destillata, o olio, pure che poco sia inumidità, e gitta in telaroi.

728.

OF TAKING CASTS OF MEDALS.

A paste of emery mixed with aqua vitae, or iron filings with vinegar, or ashes of walnut leaves, or ashes of straw very finely powdered.
1 Il diametro si presta involto in nel piombo, è battuto con martello e disteso poi voltato; tal piombo è raddoppiato e si tiene involto nella carta, acciocché tal polvere non si versi, e poi fondi il piombo e la polvere vi è di sopra al piombo fonduto, la qual poi sia fregata infra due piastre d'acciaio tanto si polverizzi bene, di poi la si lassa coll'acqua da partire e risoluirassi la negrezza del ferro, e lasciora la polvere netta.

10 Lo smeriglio in pezzi grossi si rove col metterlo sopra vn panno in molti doppi, e si percuote per fianco col martello, e così se ne va; poi mischia li a poco a poco, e poi si pesta co' facilità, e se tu lo tenessi sopra l'anu' dice, mai lo riferestili, essendo esso grosso.

14 Chi macina li smalti debbe fare tale esercizio sopra le piastre d'acciaio, temperato col macinatojo da conto, e poi metterlo nell' acqua forte, la qual risolue tutto esso acciaio che si è così consumato e misto con esso smalto e lo fece nero, onde poi rimira purificato e netto, e se tu lo macini sul porfido, esso porfido si consuma e si mischia collo smalto e lo guasta, e l'acqua da partire mai lo levia da dosso, perché no può risoluirsi tale porfido.

22 Se volli fare colore bello azzurro risolui lo smalto, fatto col tartaro, e poi li leva il sal da dosso.

24 L'ottone verificato fa bello rosso.

G. 756]

Stucco.

2 Fa stucco sopra il gobblo del di gesso, il quale sia còposto di venere e mercurio, e impasta bene sopra esso gobblo con quoyr grossese di costa di coltello fatta colla 'sagoma, e queste copri cò coperchio di campa'n da stillare, e rivarai il tuo vimo e cò che inpastasti, el rimanente asciugna bene e poi i'foca e batti over.


729. 1. stucco. 2. faustocho . gobblo del . a engu del gesso. 3. còposto de eressu e. 4. oirucrém e impasta . gobblo. 5. grossza . cholla. 6. saghoma ecquesta . choperchua. 7. dassillare erizara. 8. impastatisti . aiscinguha. 9. focha

729. In this passage a few words have been written in a sort of cipher—that is to say backwards; as in l. 3 orewe for Venus, l. 4 oirucrém for Mercurio, l. 12 il orewe e oaror for il cuerno (?) ci borae. The meaning of the word before "di gesso" in l. 1 is unknown; and the sense, in which sagoma is used here and in other passages is obscure.—Venus and Mercurio may mean 'marble' and 'lime', of which stucco is composed.

12. The meaning of orewe is unknown.

STUCCO.

Place stucco over the prominence of the . . . . . . which may be composed of Venus and Mercury, and lay it well over that prominence of the thickness of the side of a knife, made with the ruler and cover this with the bell of a still, and you will have again the moisture with which you applied the paste. The rest you may dry.
brunisci ciò buon brunitoio e fa 10° grosso

inverso la costa.

**STUCCO.**

10° Poluerizza il . . . . cò borace e acqua, in\(^3\)pasta e fa stucco, e poi scalda in modo si sec\(^4\)chi, e poi vernica con foco in modo che lustri.

**STUCCO.**

Powder . . . with borax and water to a paste, and make stucco of it, and then heat it so that it may dry, and then varnish it, with fire, so that it shines well.

C. A. 313 a 951 a]

**STUCCO DA FORMARE.**

2 Togli butiro parti 6 ; ciera parti 2 ; e tata farina volatile che, messa sopra le cose strutte, le facci sode a modo di cera o di terra da formare.

**CULL.**

2 Togli mastice tremëtina stillata e biacca.

S. K. M. III 50 a]

**DA GITTARE.**

3 Il tartaro bruciato e polverizzato col giesso e gittato fa che esso giesso si tiene insieme poi, ch'è ricotëto, e poi nell' acqua si disfa.

55/.

**DA GITTARE.**

3 Il tartaro bruciato e polverizzato col giesso e gittato fa che esso giesso si tiene insieme poi, ch'è ricotettò, e poi nell' acqua si disfa.

S. K. M. III 55 a]

**PER GITTARE BRÒZO IN GIESSO.**

2 Togli per ogni 2 scodelle di giesso una di cornò di bo bruciato e mischia insieme e gitta.

S. K. M. II 95 e]

Quando voi gittare di ciera, abbrucia la sciuma con una candela, e l' gietto verrà senza busi.

S. K. M. III 55 a]

**TO CAST.**

Take of butter 6 parts, of wax 2 parts, and as much fine flour as when put with these 2 things melted, will make them as firm as wax or modelling clay.

Glue.

Take mastic, distilled turpentine and white lead.

730.

**TO CAST BRONZE IN PLASTER.**

Take to every 2 cups of plaster 1 of ox-horns burnt, mix them together and make your cast with it.

732.

When you want to take a cast in wax, burn the scum with a candle, and the cast will come out without bubbles.

733.

2 0cic di giesso da libbra di metallo; noce che fa simile alla curva.

2 ounces of plaster to a pound of metal;—walnut, which makes it like the curve.

On bronze casting generally (732—736).

730.

732.

733.

734. The second part of this is quite obscure.
ON CASTING BRONZE.

735.

S. K. M. III. 594]

[Terra asciutta 16 ³ libbre, 100 libbre di metallo 3 la bagniata terra 20, 3 di bagniato 100, di metà, 5 che cresce 4 libbre d'acqua, 6 una di cera, una libbra di me'tallo, al-quatto mäco, 8 cimatura cò terra, 9 misura per misura.]

736.

Tal fia il gietto 2 qual fia la stäpa.

Such as the mould is, so will the cast be.

737.

COME SI DEBONO PULIRE I GIEITI.

2 Farai uno mazzo · di fila · di ferro, grosso · come spaghetto, 3 e coll' acqua fregherai, tenèdo sotto uno tinello, acciò no facci 4 fago sotto.

How casts ought to be polished.

Make a bunch of iron wire as thick as thread, and scrub them with [this and] water; hold a bowl underneath that it may not make a mud below.

COME SI DE' LEUARE I RICCI DEL BRÔZO.

6 Farai uno · palo di ferro che sia a uso d'uno largo · sarpello, 7 e co quello fregherai · su per quelle · creste · del brôzo, che rimarran 8 sopra · i gietti delle bóbarde, che diriume dalle schiappature della 9 forma, · ma fa che 'l palo · pesi · bene · e' colpi sieno lughi e grädi.

Facilità di fondere.

11 Allega · prima · una parte del metallo alla · manica, di poi lo metti i fornace, 12 e questo farà pricipio · col suo bagnio al fondere del rame.

How to remove the rough edges from bronze.

Make an iron rod, after the manner of a large chisel, and with this rub over those seams on the bronze which remain on the casts of the guns, and which are caused by the joins in the mould; but make the tool heavy enough, and let the strokes be long and broad.

PER PROVEDERE AL RAME CHE SI FREDDASSE NELLA FORNACE.

14 Quando · il rame · si freddasse nella fornace fa · che subito, quando tu te n'avedi, 15 di tagliarlo co frugatojo · metre ch'eli · è i paniccia ·, overo se fusse 16 iteramète · rafrreddato, taglialo, come si fa il piobo · co larghi e grossi scarfellëi.

To facilitate melting.

First alloy part of the metal in the crucible, then put it in the furnace, and this being in a molten state will assist in beginning to melt the copper.

To prevent the copper cooling in the furnace.

When the copper cools in the furnace, be ready, as soon as you perceive it, to cut it with a long stick while it is still in a paste; or if it is quite cold cut it as lead is cut with broad and large chisels.

735. The translation is given literally, but the meaning is quite obscure.
Se avessi a fare vno grà gietto.

Se avessi a fare uno gietto di cento mila libbre, falò co' 2 fornelli con 2000 libbre per ciascuno, o isino, in 3000 libbre il piv.

Tr. 51

COME FARE BENE A RÒPERE VNA GRÀ MASSA DI BROZÒ.

Se volìsi ròperere una grà massa di brozo. sospérdito prima, poi lì fa da 4 lati uno muro, a vso di trugo, di mattoni, e fa lì grà foco, e quâdo è bê rosso, dali uno colpo con vao grà peso levato in alto có grà forza.

739.

COME SI DEBE FONDERE IN UNO FORNELLO.

Il fornello de' essere ifra 4 pilastri bê fòdati.

Della grossezza della cappa.

La cappa nò deve prevalicare la grossezza di 2 dita, e debesi interrâre in quatro volte, sopra la terra sottile e poi bene armare, e sia sola mete ricotta di dìetro e dato poi sottimète di cenere e bouina.

Della grossezza della bòbarda.

La bòbarda de' essere da 600 libbre di ballotta; è su, có questa regola; farai la misura del diametro della ballotta e quel-

738. 1 be a ... 1 grà. 2. 1 grà. 3. l muro ... cia. 4. sostile. 5. eppoi ... arame. 6. fondere il fornello. 7. grosseza ... chappa. 8. chappa ... sottile. 9. gutro ... soultile. 10. essa ... richotta. 11. grosseza. 12. libr. 13. bòl"ta ... dia-

739. 1. chol. 2. e per soperire. 3. esce ... fà. 4. eceuâdo ... dali 1 colpo chòm.
la diuidi · i 6 · parti. 14 e una d’esse parti fia la grossezza · dinâzi e la metà sepre · piv rieto. 15 e se la ballotta fia di libbre 700, 1/2 del diametro della ballotta fia la sua 16 grossezza · dinâzi , e se la ballotta · fia 800 , l’ottavo del suo diametro 17 dinâzi , e se 900 · 1/8 e 1/9 e se 1000 · 1/9.

**Della Lügezza della tròba della bôbarda.**

19 Se voi · ch’ella · gitti · una ballotta · di pietra · fa la lügezza della tròba 20 in 6 · o insino i 7 ballotte , e se la · ballotta · fusse di ferro , fa 21 detta tròba · insino in 12 ballotte , e se la ballotta · fusse di 22 piobo · farai la insino · in diciotto · ballotte, dico quâdo la bôbarda 23 avesse · la bocca · atta · a riceuire · in se da 600 libr · di ballotta · di pietra · su.

**Della grossezza de’ passavolanti.**

25 La grossezza dinâzi de’ passavolantinó deve passare dalla · metà 26 insino · al terzo del diametro della ballotta, E la lügezza da 30 insino i 36 27ballotte.

**Tr. 55]**

**I DELLO · ILLOTARE · IL FORNELLO · DEI · DÉTRO.**

Il fornello · debbe inâzi · che tu · iforni · il metallo · essere · illotato · di terra · di Valenza, 2 · sopra quella · cieneri · .

**I DEL RISTORARE · IL METALLO · QUÀDO · RIVOLESE · FREDDARE.**

Quàdo · tu · vedi · il brôzo · volersi · cógielar · toli · legnie · di salice, schiappate · 5 · sottilmête · e có quelle · fa · foco.

**I LA CAGIONE · DEL CóGIELARSI.**

Dico · la cagione · d’essa · cógielatione · derivar · spesse · volte · da troppo · foco · e ancora · da legnie · mal · secche.

**I A CONOSCIERE · LA DISPOSITIONE · DEL · FOÇO.**

Il foco · conoscierai · quâdo · sia · bono · e · vitile · · alle · fiamme · chiare · e · se · vedrai · dividere · it · into · 6 · parts · and · one · of · these · parts · will · be · its · thickness · at · the · muzzle; · but · at · the · breech · it · must · always · be · half. · And · if · the · ball · is · to · be · 700 · lbs., · 1/2 · the · diameter · of · the · ball · must · be · its · thickness · in · front; · and · if · the · ball · is · to · be · 800, · the · eighth · of · its · diameter · in · front; · and · if · 900, · 1/8 · and · 1/2 · 3/16, · and · if · 1000, · 1/8 · th.

**Of the length of the body of the gun.**

If you want it · to · throw · a · ball · of · stone, · make · the · length · of · the · gun · to · be · 6 · or · as · much · as · 7 · diameters · of · the · ball; · and · if · the · ball · is · to · be · of · iron · make · it · as · much · as · 12 · balls, · and · if · the · ball · is · to · be · of · lead, · make · it · as · much · as · 18 · balls. · I · mean · when · the · gun · is · to · have · the · mouth · fitted · to · receive · 600 · lbs. · of · stone · ball, · and · more.

**Of the thickness of small guns.**

The thickness · at · the · muzzle · of · small · guns · should · be · from · a · half · to · one · third · of · the · diameter · of · the · ball, · and · the · length · from · 30 · to · 36 · balls.

**Of luting the furnace within.**

The · furnace · must · be · luted · before · you · put · the · metal · in · it, · with · earth · from · Valenza, · and · over · that · with · ashes.

**Of restoring the metal when it is becoming cool.**

When you · see · that · the · bronze · is · congealing · take · some · willow-wood · cut · in · small · chips · and · make · up · the · fire · with · it.

**The cause of its curdling.**

I · say · that · the · cause · of · this · congealing · often · proceeds · from · too · much · fire, · or · from · ill-dried · wood.

**To know the condition of the fire.**

You · may · know · when · the · fire · is · good · and · fit · for · your · purpose · by · a · clear · flame,
più • d’esse • flame turbe e finire cò molto • fumo •, nò te ne fidare, e massime 13 quádo • avrai il bagnio • quasi • in acqua.

**DElLO ALLEGARE IL METALLO.**

15 Il metallo • si uole fare universalmète nelle bòbarde cò • 6 • o uisino 8 16 per ciéto •, cioè 6 di stagno • sopra • ciéto • di rame, e quáto meno ve ne metti, 17 pìv sicura fia • la bobarda.

**QUÁDO SI DEBE ACCÒPAGNIARE • LO STAGNIO COL RAME.**

19 Lo stagno • col rame si debbe • mettere • quádo • ài il rame còdotto in acqua.

**COME SI DEBE AVMÈTARE IL FONDERE.**

21 Il fondere fia da te avmètato • quádo sarà còdotto il rame in 1/2 22 in acqua •, alhora • con v • legnio di castagnio 1spesso rimaneggerai il rimamènète del rame ancora • iter • ira la • parte • fonduta.

and if you see the tips of the flames dull and ending in much smoke do not trust it, and particularly when the flux metal is almost fluid.

**Of alloying the metal.**

Metal for guns must invariably be made with 6 or even 8 per cent, that is 6 of tin to one hundred of copper, for the less you put in, the stronger will the gun be.

**When the tin should be added to the copper.**

The tin should be put in with the copper when the copper is reduced to a fluid.

**How to hasten the melting.**

You can hasten the melting when 2/3ds of the copper is fluid; you can then, with a stick of chestnut-wood, repeatedly stir what of copper remains entire amidst what is melted.
Introductory Observations on the Architectural Designs (XII), and Writings on Architecture (XIII).

Until now very little has been known regarding Leonardo's labours in the domain of Architecture. No building is known to have been planned and executed by him, though by some contemporary writers incidental allusion is made to his occupying himself with architecture, and his famous letter to Lodovico il Moro,—which has long been a well-known document,—in which he offers his service as an architect to that prince, tends to confirm the belief that he was something more than an amateur of the art. This hypothesis has lately been confirmed by the publication of certain documents, preserved at Milan, showing that Leonardo was not only employed in preparing plans but that he took an active part, with much credit, as member of a commission on public buildings; his name remains linked with the history of the building of the Cathedral at Pavia and that of the Cathedral at Milan.

Leonardo's writings on Architecture are dispersed among a large number of MSS., and it would be scarcely possible to master their contents without the opportunity of arranging, sorting and comparing the whole mass of materials, so as to have some comprehensive idea of the whole. The sketches, when isolated and considered by themselves, might appear to be of but little value; it is not till we understand their general purport, from comparing them with each other, that we can form any just estimate of their true worth.

Leonardo seems to have had a project for writing a complete and separate treatise on Architecture, such as his predecessors and contemporaries had composed—Leon Battista Alberti, Filarete, Francesco di Giorgio and perhaps also Bramante. But, on the other hand, it cannot be denied that possibly no such scheme was connected with the isolated notes and researches, treating on special questions, which are given in this work; that he was merely working at problems in which, for some reason or other he took a special interest.

A great number of important buildings were constructed in Lombardy during the period between 1472 and 1499, and among them there are several by unknown architects,
of so high an artistic merit, that it is certainly not improbable that either Bramante or Leonardo da Vinci may have been, directly or indirectly, concerned in their erection.

Having been engaged, for now nearly twenty years, in a thorough study of Bramante's life and labours, I have taken a particular interest in detecting the distinguishing marks of his style as compared with Leonardo's. In 1869 I made researches about the architectural drawings of the latter in the Codex Atlanticus at Milan, for the purpose of finding out, if possible the original plans and sketches of the churches of Santa Maria delle Grazie at Milan, and of the Cathedral at Pavia, which buildings have been supposed to be the work both of Bramante and of Leonardo. Since 1876 I have repeatedly examined Leonardo's architectural studies in the collection of his manuscripts in the Institut de France, and some of these I have already given to the public in my work on "Les Projets Primitifs pour la Basilique de St. Pierre de Rome", Pl. 43. In 1879 I had the opportunity of examining the manuscript in the Palazzo Trinciuzio at Milan, and in 1880 Dr. Richter showed me in London the manuscripts in the possession of Lord Ashburnham, and those in the British Museum. I have thus had opportunities of seeing most of Leonardo's architectural drawings in the original, but of the manuscripts themselves I have deciphered only the notes which accompany the sketches. It is to Dr. Richter's exertions that we owe the collected texts on Architecture which are now published, and while he has undertaken to be responsible for the correct reading of the original texts, he has also made it his task to extract the whole of the materials from the various MSS. It has been my task to arrange and elucidate the texts under the heads which have been adopted in this work. MS. B. at Paris and the Codex Atlanticus at Milan are the chief sources of our knowledge of Leonardo as an architect, and I have recently subjected these to a thorough re-investigation expressly with a view to this work.

A complete reproduction of all Leonardo's architectural sketches has not, indeed, been possible, but as far as the necessarily restricted limits of the work have allowed, the utmost completeness has been aimed at, and no efforts have been spared to include every thing that can contribute to a knowledge of Leonardo's style. It would have been very interesting, if it had been possible, to give some general account at least of Leonardo's work and studies in engineering, fortification, canal-making and the like, and it is only on mature reflection that we have reluctantly abandoned this idea. Leonardo's occupations in these departments have by no means so close a relation to literary work, in the strict sense of the word as we are fairly justified in attributing to his numerous notes on Architecture.

Leonardo's architectural studies fall naturally under two heads:

I. Those drawings and sketches, often accompanied by short remarks and explanations, which may be regarded as designs for buildings or monuments intended to be built. With these there are occasionally explanatory texts.

II. Theoretical investigations and treatises. A special interest attaches to these because they discuss a variety of questions which are of practical importance to this day. Leonardo's theory as to the origin and progress of cracks in buildings is perhaps to be considered as unique in its way in the literature of Architecture.

Henry de Gymüller.
XII.

Architectural Designs.

I. Plans for towns.

A. Sketches for laying out a new town with a double system of high-level and low-level road-ways.

Pl. LXXVII, No. 1 (MS. B, 15\(^b\)). A general view of a town, with the roads outside it sloping up to the high-level ways within.

Pl. LXXVII, No. 3 (MS. B, 16\(^b\), see No. 741; and MS. B, 15\(^b\), see No. 742) gives a partial view of the town, with its streets and houses, with explanatory references.

Pl. LXXVII, No. 2 (MS. B, 15\(^b\); see No. 743). View of a double staircase with two opposite flights of steps.

Pl. LXXXVIII, Nos. 2 and 3 (MS. B, 37\(^a\)). Sketches illustrating the connection of the two levels of roads by means of steps. The lower galleries are lighted by openings in the upper road-way.

B. Notes on removing houses (MS. Br. M., 270\(^b\), see No. 744).

741. Le strade sono pivi alte che le strade...
più che debba scolare nelle case fatte ad medesimo piano di $p$ e da ogni strettura della larghezza di detta strada. Sia uno portico di larghezza di braccia 6 i sul le colonne, e sappi che, chi volesse andare per tutta la terra per le strade alte, potrà a suo accioncio usarle, e chi volesse andare per le basse, ancora il simile; per le strade alte non devono andare i carri, né altre simili cose, anzi siano solamente per lì gíetli omini; per le basse decono andare i carri e altre some al uso e comodità del popolo; l'una casa de' volgere la strada bassa in mezzo, ed agli usci si mettano le vetovaglie, conie legne, vino e simili cose; per le vie sotterranee si de' votare destri, stalle e simili cose fetide dall'uno arco all'altro.

B. 546

ARCHITECTURAL DESIGNS.

più che debba scolare nelle case fatte ad medesimo piano di $p$, e da ogni strettura della larghezza di detta strada. Sia uno portico di larghezza di braccia 6 i sulle colonne, e sappi che, chi volesse andare per tutta la terra per le strade alte, potrà a suo accioncio usarle, e chi volesse andare per le basse, ancora il simile; per le strade alte non devono andare i carri, né altre simili cose, anzi siano solamente per lì gíetli omini; per le basse decono andare i carri e altre some al uso e comodità del popolo; l'una casa de' volgere la strada bassa in mezzo, ed agli usci si mettano le vetovaglie, conie legne, vino e simili cose; per le vie sotterranee si de' votare destri, stalle e simili cose fetide dall'uno arco all'altro.

B. 546

The construction of the stairs: The stairs $c'd$ go down to $fg$, and in the same way $fg$ goes down to $hk$.

Br. M. 2706

743.

MUTATIONE DI CASE.

744.

Le case sieno trasmutate e messe per ordine; e questo có facilità si farà, per

... I portico di larghezza di br... 15. le colonne essapiche... volessi... terra. 8. asso anch'io... volessi. 9. no de avare. 10. cari... simile... sia. 11. cari. 12. chimodita... chasa... lasciato. 13. lasciato... inero edal ussi. 14. mettono le vetto vaglio... essimielu. 15. sootusare... essimielu. 16. arche all'alto $f$.

745. 1. br. 3.00. ciaschuna... ilume. 2. l' schala. 3. chiù dele... pisa a de. 4. piscasi... schala... elle. 6. abbi. 7. chomposte lalteza... facia detta terra. 8. mere... aciole le bructure. 9. cita.

746. 1. discilidano... essilimelètè.

744. 1. chasa. 2. chasa. 3. ecquesto có facilita (?). 5. eppoi. 6. còmmétano. 11. chasa... novela.
ch’è tali case son prima fatte #di pezzi sopra le piazze, e poi #si com’ettono insieme colli lor #legniami nel sito dove si debbono #stabilire.

because such houses are at first made in pieces on the open places, and can then be fitted together with their timbers in the site where they are to be permanent.

9 Li omni del paese abitino le nuove case in parte, 12 quando no ’è la cortecce.

[9] Let the men of the country [or the village] partly inhabit the new houses when the court is absent[12].

744. On the same page we find notes referring to Romolontino and Villafranca with a sketch-map of the course of the “Sodro” and the “(Lo)era” (both are given in the text farther on). There can hardly be a doubt that the last sentence of the passage given above, refers to the court of Francis I. King of France.—L.9—13 are written inside the larger sketch, which, in the original, is on the right hand side of the page by the side of lines 1—8. The three smaller sketches are below.

J. F. R.
11. Plans for canals and streets in a town.

Pl. LXXIX, 1. and 2, (MS. B. 37, see No. 745, and MS. B. 36, see No. 746). A Plan for streets and canals inside a town, by which the cellars of the houses are made accessible in boats. The third text given under No. 747 refers to works executed by Leonardo in France.

B. 37 a

La faccia a m darà il lume alle stà- &ze; a c e sarà braccia 6. a b fia braccia 8. b c fia braccia 30; acciòchè le stanze sotto i portici siano luminose. c d f fia il loco donde se vadi a scaricare le navi in nel'le case; A volere che questa cosa abbia effetto bisogna che la inondatione de' fiumi non màdasse l' acqua alle can- nove; è necessario elegiare sito accomo- dato, come porsi vicino a vno fiume, il quale ti dia i canali, che non ti possino nè per inodazione o secchezza delle acquè dare mutatione alle altezze d'esse acque, e il modo è qui di sotto figurato, e fac- ciasì eletione di bel fiume che non intorbidì, nè per pioggia, come Tesino Adda e molti altri; il modo che l' acque sempre

The front a m will give light to the rooms; a c will be 6 braccia—a b 8 braccia—b c 30 braccia, in order that the rooms under the porticoes may be lighted; c d f is the place where the boats come to the houses to be unloaded. In order to render this arrangement practicable, and in order that the inundation of the rivers may not penetrate into the cellars, it is necessary to chose an appropriate situation, such as a spot near a river which can be diverted into canals in which the level of the water will not vary either by inundations or drought. The construction is shown below; and make choice of a fine river, which the rains do not render muddy, such as the Ticino, the Adda and many others. [12] The construction


745: L. 1—4 are on the left hand side and within the sketch given on Pl. LXXIX, No. 1. Then follows after line 14, the drawing of a sluicegate—cone—which of the use is explained in the text of it.

12 Tesino, Adda e molti altri, i.e. rivers coming from the mountains and flowing through lakes. On the page 385, which comes next in the original MS. is the sketch of an oval plan of a town over which is written "modo di canali per la città" and through the longer axis of it "canale magior" is written with "Tesino" in the prolongation of the canal.

J. P. R.
stieno \textsuperscript{13} a un'altezza sarà una còca, come qui disotto, la quale sia all' entrare della \textsuperscript{14} terra, e meglio alquato detro aciôchè nimici nò la disfacciessino.

B. 36[.]

Tanto sia larga la strà'da-, quanto è la universale \textsuperscript{3} altezza delle case.

Br. M. 2704]

Il fiume di mezzo \textsuperscript{2} nò riceva acqua \textsuperscript{3} torbida, ma tale acqua vada per li fossi \textsuperscript{5} di fori della terra \textsuperscript{6} con 4 molina nell'ètrata e 4 nella uscita, e questo si farà col ringorgare l'acqua \textsuperscript{10} di sopra a Romorantino;

\textsuperscript{11} Facciasi fonti \textsuperscript{15} in ciascuna piazza.

to oblige the waters to keep constantly at the same level will be a sort of dock, as shown below, situated at the entrance of the town; or better still, some way within, in order that the enemy may not destroy it\[14].

Let the width of the streets be equal to the average height of the houses.

The main underground channel does not receive turbid water, but that water runs in the ditches outside the town with four mills at the entrance and four at the outlet; and this may be done by damming the water above Romorantin.

\[11\] There should be fountains made in each piazza\[13].

746. 747.

746. \textsuperscript{3} alceza... chase.
747. \textsuperscript{1} el... mezo. \textsuperscript{3} mattale. \textsuperscript{7} nella vs. \textsuperscript{8} ecquesto. \textsuperscript{9} ringherghare. \textsuperscript{12} chome] in ciascuna piazza.

747. In the original this text comes immediately after the passage given as No. 744. The remainder of the writing on the same page refers to the construction of canals and is given later, in the "Topographical Notes".

10. Romolontino is Romorantin, South of Orleans in France.

Lines 1—11 are written to the right of the plan lines 11—13 underneath it.

J. P. R.
III. Castles and Villas.

A. Castles.

Pl. LXXX, No. 1 (P. V. fol. 39\(^b\); No. d’ordre 2282). The fortified place here represented is said by Vallardi to be the “castello” at Milan, but without any satisfactory reason. The high tower behind the “rivellino” ravelin—seems to be intended as a watch-tower.

Pl. LXXX, No. 2 (MS. B, 23\(^b\)). A similarly constructed tower probably intended for the same use.

Pl. LXXX, No. 3 (MS. B). Sketches for corner towers with steps for a citadel.

Pl. LXXX, No. 4 (W. XVI). A cupola crowning a corner tower; an interesting example of decorative fortification. In this reproduction of the original pen and ink drawing it appears reversed.

B. Projects for Palaces.

Pl. LXXXI, No. 2 (MS. C. A, 75\(^b\); 221\(^a\), see No. 748). Project for a royal residence at Amboise in France.

Pl. LXXXII, No. 1 (C. A. 308\(^a\); 939\(^a\)). A plan for a somewhat extensive residence, and various details; but there is no text to elucidate it; in courts are written the three names:

Sām (St. Mark) cosi (Cosmo) giovā (John),
arch mo nino

c. Plans for small castles or Villas.

The three following sketches greatly resemble each other.

Pl. LXXXII, No. 2 (MS. K\(^3\) 36\(^b\); see No. 749).
Pl. LXXXII, No. 3 (MS. B 60\(^{a}\); see No. 759).

Pl. LXXXIII (W. XVII). The text on this sheet refers to Cyprus (see Topographical Notes No. 1103), but seems to have no direct connection with the sketches inserted between.

Pl. LXXXVIII, Nos. 6 and 7 (MS. B, 12\(^{a}\); see No. 751). A section of a circular pavilion with the plan of a similar building by the side of it. These two drawings have a special historical interest because the text written below mentions the Duke and Duchess of Milan.

The sketch of a villa on a terrace at the end of a garden occurs in C. A. 150; and in C. A. 77\(^{b}\); 225\(^{b}\) is another sketch of a villa somewhat resembling the Belvedere of Pope Innocent VIII, at Rome. In C. A. 62\(^{b}\); 193\(^{b}\) there is a Loggia.

Pl. LXXXII, No. 4 (C. A. 387\(^{a}\); 1198\(^{a}\)) is a tower-shaped Loggia above a fountain. The machinery is very ingeniously screened from view.

C. A. 754; 2216]

[Il palazzo del principe de' auere dinati una piazza.]

1. Le abitazioni doue s'abba a ballare o fare duersi 3 salti o uari movimenti con moltitudine di gente sieno terràrene, perché già n'è veduto ruinare colla morte di 5 molti; E sopra tutto fa che ogni muro, per sottile che sì sia, abbia fondameto in terra o sopra archi bene 7 fondati.

8. Sieno li mezzanelli deli' abitacioli 9 diuisi da muri fatti di stretti mattoni e sanza legginami per ri 11 spetto del fuoco.

12. Tutti li necessari abbinno esalatio' 13 ne per le grossezze de' muri, e in 14 modo che spirino per li tetti.

15. Li mezzanelli sieno in volta, le quali 16 sarà tanto più forti quàto e' sarà mi 17 nori.

18. Li catene di quercia sìe rinchiuse 19 per li muri accio nó sié offese 20 da foco.

The Palace of the prince must have a piazza in front of it.

Houses intended for dancing or any kind of jumping or any other movements with a multitude of people, must be on the ground-floor; for I have already witnessed the destruction of some, causing death to many persons, and above all let every wall, be it ever so thin, rest on the ground or on arches with a good foundation.

Let the mezzanines of the dwellings be divided by walls made of very thin bricks, and without wood on account of fire.

Let all the privies have ventilation [by shafts] in the thickness of the walls, so as to exhale by the roofs.

The mezzanines should be vaulted, and the vaults will be stronger in proportion as they are of small size.

The tiles of oak must be enclosed in the walls in order to be protected from fire.

748. The remarks accompanying the plan reproduced on Pl. LXXI, No. 2 are as follows: Above, to the left: "In a angolo sin la guarida de la statla" (in the angle a may be the keeper of the stable). Below are the words "attra da Abbe" (road to Amboise), parallel with this "fossa br 40" (the most 40 braccia) fixing the width of the moat. In the large court surrounded by a portico "in terre No. — Lorsha br. 80 e lagha br 120." To the right of the castle is a large basin for aquatic sports with the words "Giostre colle nave ciò li giustra li stano sopra la na" (jousting in boats that is the men are to be in boats). J. P. R.
The privies must be numerous and going one into the other in order that the stench may not penetrate into the dwellings, and all their doors must shut off themselves with counterpoises.

The main division of the façade of this palace is into two portions; that is to say the width of the court-yard must be half the whole façade; the 2nd...
Il terreno che si cava dalle canove si deve elevare da cada taho in alto che fa faccia un orto; che sia alto quanto la sala, ma che tra'l terreno dell'orto e'l muro della casa sia uno intervallo, acciò che l'umido nò guasti i muri maestri.

The earth that is dug out from the cellars must be raised on one side so high as to make a terrace garden as high as the level of the hall; but between the earth of the terrace and the wall of the house, leave an interval in order that the damp may not spoil the principal walls.

all doubt that the MS. B, from which this passage is taken, is older than the dated MSS. of 1492 and 1493. In that case the Duke of Milan here mentioned would be Gian Galeazzo (1469—1494) and the Duchess would be his wife Isabella of Aragon, to whom he was married on the second February 1489.

J. P. R.
IV. Ecclesiastical Architecture.

A. General Observations.

A building should always be detached on all sides so that its form may be seen.

Here there cannot and ought not to be any campanile; on the contrary it must stand apart like that of the Cathedral and of San Giovanni at Florence, and of the Cathedral at Pisa, where the campanile is quite detached as well as the dome. Thus each can display its own perfection. If however you wish to join it to the church, make the lantern serve for the campanile as in the church at Chiaravalle.

Sempre vn edificio vole essere spic-cato dintorno a volere dimostra’re la sua vera forma.

A building should always be detached on all sides so that its form may be seen.

Qui nò si può nè si deve fare campanile, anzi deve stare separato come à il domo e Sà Giovanni di Fireze, e così il domo di Pisa che mostra il capanile per se dispiaceto circa e così il domo, e ogni vno per se può mostrare la sua perfectione, e chi lo uolessse pure fare colla chiesa, faccia la larna scusare capanile come è la chiesa di Chiaravalle.

Here there cannot and ought not to be any campanile; on the contrary it must stand apart like that of the Cathedral and of San Giovanni at Florence, and of the Cathedral at Pisa, where the campanile is quite detached as well as the dome. Thus each can display its own perfection. If however you wish to join it to the church, make the lantern serve for the campanile as in the church at Chiaravalle.

753. The original text is reproduced on Pl. XCII, No. 1 to the left hand at the bottom.
754. This text is written by the side of the plan given on Pl. XCI. No. 2.
12. The Abbey of Chiaravalle, a few miles from Milan, has a central tower on the intersection of the cross in the style of that of the Certosa of Pavia, but the style is mediaeval (A.D. 1330). Leonardo seems here to mean, that in a building, in which the circular form is strongly conspicuous, the campanile must either be separated, or rise from the centre of the building and therefore take the form of a lantern.
A nessuna chiesa sta bene vedere tetti, àzi sia rappianato e per canali l’acqua discenda ai condotti fatti nel fregio.

It never looks well to see the roofs of a church; they should rather be flat and the water should run off by gutters made in the frieze.

755: This text is to the left of the domed church reproduced on Pl. LXXXVII, No. 2.
B. The theory of Dome Architecture.

This subject has been more extensively treated by Leonardo in drawings than in writing. Still we may fairly assume that it was his purpose, ultimately to embody the results of his investigation in a "Trattato delle Cupole." The amount of materials is remarkably extensive. MS. B is particularly rich in plans and elevations of churches with one or more domes—from the simplest form to the most complicated that can be imagined. Considering the evident connexion between a great number of these sketches, as well as the impossibility of seeing in them designs or preparatory sketches for any building intended to be erected, the conclusion is obvious that they were not designed for any particular monument, but were theoretical and ideal researches, made in order to obtain a clear understanding of the laws which must govern the construction of a great central dome, with smaller ones grouped round it; and with or without the addition of spires, so that each of these parts by itself and in its juxtaposition to the other parts should produce the grandest possible effect.

In these sketches Leonardo seems to have exhausted every imaginable combination. The results of some of these problems are perhaps not quite satisfactory; still they cannot be considered to give evidence of a want of taste or of any other defect in Leonardo's architectural capacity. They were no doubt intended exclusively for his own instruction, and, before all, as it seems, to illustrate the features or consequences resulting from a given principle.

1 In MS. B, 32 (see Pl. C III, No. 2) we find eight geometrical patterns, each drawn in a square; and in MS. C.A., fol. 87 to 98 form a whole series of patterns done with the same intention.
I have already, in another place, pointed out the law of construction for buildings crowned by a large dome: namely, that such a dome, to produce the greatest effect possible, should rise either from the centre of a Greek cross, or from the centre of a structure of which the plan has some symmetrical affinity to a circle, this circle being at the same time the centre of the whole plan of the building.

Leonardo’s sketches show that he was fully aware, as was to be expected, of this truth. Few of them exhibit the form of a Latin cross, and when this is met with, it generally gives evidence of the determination to assign as prominent a part as possible to the dome in the general effect of the building.

While it is evident, on the one hand, that the greater number of these domes had no particular purpose, not being designed for execution, on the other hand several reasons may be found for Leonardo’s perseverance in his studies of the subject.

Besides the theoretical interest of the question for Leonardo and his Trattato and besides the taste for domes prevailing at that time, it seems likely that the intended erection of some building of the first importance like the Duomos of Pavia and Como, the church of Sta. Maria delle Grazie at Milan, and the construction of a Dome or central Tower (Tiburio) on the cathedral of Milan, may have stimulated Leonardo to undertake a general and thorough investigation of the subject; whilst Leonardo’s intercourse with Bramante for ten years or more, can hardly have remained without influence in this matter. In fact, now that some of this great Architect’s studies for S. Peter’s at Rome have at last become known, he must be considered henceforth as the greatest master of Dome-Architecture that ever existed. His influence, direct or indirect even on a genius like Leonardo seems the more likely, since Leonardo’s sketches reveal a style most similar to that of Bramante, whose name indeed, occurs twice in Leonardo’s manuscript notes. It must not be forgotten that Leonardo was a Florentine; the characteristic form of the two principal domes of Florence, Sta. Maria del Fiore and the Battisterio, constantly appear as leading features in his sketches.

The church of San Lorenzo at Milan, was at that time still intact. The dome is to this day one of the most wonderful cupolas ever constructed, and with its two smaller domes might well attract the attention and study

of a never resting genius such as Leonardo. A whole class of these sketches betray in fact the direct influence of the church of S. Lorenzo, and this also seems to have suggested the plan of Bramante’s dome of St. Peter’s at Rome.

In the following pages the various sketches for the construction of domes have been classified and discussed from a general point of view. On two sheets: Pl. LXXXIV (C.A. 354b; 118a) and Pl. LXXXV, Nos. 1—11 (Ash. II, 6b) we see various dissimilar types, grouped together; thus these two sheets may be regarded as a sort of nomenclature of the different types, on which we shall now have to treat.
1. Churches formed on the plan of a Greek cross.

Group I.

Domes rising from a circular base.

The simplest type of central building is a circular edifice.
Pl. LXXXIV, No. 9. Plan of a circular building surrounded by a colonnade.
Pl. LXXXIV, No. 8. Elevation of the former, with a conical roof.
Pl. XC. No. 5. A dodecagon, as most nearly approaching the circle.
Pl. LXXXVI, No. 1, 2, 3. Four round chapels are added at the extremities of the two principal axes;—compare this plan with fig. 1 on p. 44 and fig. 3 on p. 47 (W. P. 54) where the outer wall is octagonal.

Group II.

Domes rising from a square base.

The plan is a square surrounded by a colonnade, and the dome seems to be octagonal.
Pl. LXXXIV. The square plan below the circular building No. 8, and its elevation to the left, above the plan: here the ground-plan is square, the upper storey octagonal. A further development of this type is shown in two sketches C. A. 3 (not reproduced here), and in
Pl. LXXXVI, No. 5 (which possibly belongs to No. 7 on Pl. LXXXIV.
Pl. LXXXV, No. 4, and p. 45, Fig. 3, a Greek cross, repeated p. 45, Fig. 3, is another development of the square central plan.
The remainder of these studies show two different systems; in the first the dome rises from a square plan,—in the second from an octagonal base,
Group III.

Domes rising from a square base and four pillars.

a) First type. *A Dome resting on four pillars in the centre of a square edifice, with an apse in the middle, of each of the four sides.* We have eleven variations of this type.

\( \text{aa)} \) Pl. LXXXVIII, No. 3.

\( \text{bb)} \) Pl. LXXX, No. 5.

\( \text{cc)} \) Pl. LXXXV, Nos. 2, 3, 5.

\( \text{dd)} \) Pl. LXXXIV, No. 1 and 4 beneath.

\( \text{ee)} \) Pl. LXXXV, Nos. 1, 7, 10, 11.

b) Second type. *This consists in adding aisles to the whole plan of the first type; columns are placed between the apses and the aisles; the plan thus obtained is very nearly identical with that of S. Lorenzo at Milan.*

Fig. 1 on p. 56. (MS. B, 75\( ^a \)) shows the result of this treatment adapted to a peculiar purpose about which we shall have to say a few words later on.

Pl. XCV, No. 1, shows the same plan but with the addition of a short nave. This plan seems to have been suggested by the general arrangement of S. Sepolcro at Milan.

MS. B. 57\( ^b \) (see the sketch reproduced on p. 51). By adding towers in the four outer angles to the last named plan, we obtain a plan which bears the general features of Bramante’s plans for S. Peter’s at Rome.\( ^2 \) (See p. 51 Fig. 1.)

Group IV.

Domes rising from an octagonal base.

This system, developed according to two different schemes, has given rise to two classes with many varieties.

In a) On each side of the octagon chapels of equal form are added.

In b) The chapels are dissimilar; those which terminate the principal axes being different in form from those which are added on the diagonal sides of the octagon.

a. First Class.

The Chapel "degli Angeli," at Florence, built only to a height of about 20 feet by Brunellesco, may be considered as the prototype of this group; and, indeed it probably suggested it. *The fact that we see in MS. B. 11\( ^b \)*

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1 The ancient chapel San Satiro, via del Felcine, Milan, is a specimen of this type.

2 See Les projets primitifs etc., Pl. 9—12.
(Pl. XCIV, No. 3) by the side of Brunellesco’s plan for the Basilica of Sto. Spirito at Florence, a plan almost identical with that of the Capella degli Angeli, confirms this supposition. Only two small differences, or we may say improvements, have been introduced by Leonardo. Firstly the back of the chapels contains a third niche, and each angle of the Octagon a folded pilaster like those in Bramante’s Sagrestia di S. M. presso San Satiro at Milan, instead of an interval between the two pilasters as seen in the Battistero at Florence and in the Sacristy of Sto. Spirito in the same town and also in the above named chapel by Brunellesco.

The first set of sketches which come under consideration have at first sight the appearance of mere geometrical studies. They seem to have been suggested by the plan given on page 44 Fig. 2 (MS. B, 55°) in the centre of which is written “Santa Maria in pertieha da Pavia”, at the place marked A on the reproduction.

a) (MS. B, 34°, page 44 Fig. 3). In the middle of each side a column is added, and in the axes of the intercolumnar spaces a second row of columns forms an aisle round the octagon. These are placed at the intersection of a system of semicircles, of which the sixteen columns on the sides of the octagon are the centres.

b) The preceding diagram is completed and becomes more monumental in style in the sketch next to it (MS. B, 35°, see p. 45 Fig. 1). An outer aisle is added by circles, having for radius the distance between the columns in the middle sides of the octagon.

c) (MS. B, 96°, see p. 45 Fig. 2). Octagon with an aisle round it; the angles of both are formed by columns. The outer sides are formed by 8 niches forming chapels. The exterior is likewise octagonal, with the angles corresponding to the centre of each of the interior chapels.

Pl. XCI, No. 2 (MS. B. 96°). Detail and modification of the preceding plan—half columns against piers—an arrangement by which the chapels of the aisle have the same width of opening as the inner arches between the half columns. Underneath this sketch the following note occurs: questo vole averi 12 face e cõ 12 tabernaculi • come • a • b. (This will have twelve sides with twelve tabernacles as a b.) In the remaining sketches of this class the octagon is not formed by columns at the angles.

The simplest type shows a niche in the middle of each side and is repeated on several sheets, viz: MS. B 3; MS. C.A. 354° (see Pl. LXXXIV, No. 11), and MS. Ash II 6°; (see Pl. LXXXV, No. 9 and the elevations No. 8; Pl. XCI, No. 3; MS. B. 4° [not reproduced here] and Pl. LXXXIV, No. 2).
Fig. 1.

Fig. 2.

Fig. 3.
Pl. XCII, 3 (MS. B, 56b) corresponds to a plan like the one in MS. B 35a, in which the niches would be visible outside or, as in the following sketch, with the addition of a niche in the middle of each chapel.

Pl. XC, No. 6. The niches themselves are surrounded by smaller niches (see also No. 1 on the same plate).

Octagon expanded on each side.

A. by a square chapel:
MS. B. 34b (not reproduced here).

B. by a square with 3 niches:
MS. B. 11b (see Pl. XCIV, No. 3).

C. by octagonal chapels:
   a) MS. B, 21a; Pl. LXXXVIII, No. 14.
   b) No. 2 on the same plate. Underneath there is the remark: "queste come le 8 cappele anò a essere facte" (this is how the eight chapels are to be executed).
   c) Pl. LXXXVIII, No. 5. Elevation to the plans on the same sheet, it is accompanied by the note: "ciasscuno de' 9 tiburi no' uole passare l'alteza di 2 quadri" (neither of the 9 domes must exceed the height of two squares).
   d) Pl. LXXXVIII, No. 1, Inside of the same octagon.
MS. B, 30a, and 34b; these are three repetitions of parts of the same plan with very slight variations.

D. by a circular chapel:
MS. B, 18a (see Fig. 1 on page 47) gives the plan of this arrangement in which the exterior is square on the ground floor with only four of the chapels projecting, as is explained in the next sketch.

Pl. LXXXIX, MS. B, 17b. Elevation to the preceding plan sketched on the opposite side of the sheet, and also marked A. It is accompanied by the following remark, indicating the theoretical character of these studies: "questo edificio anchora starebbe bene affarlo dalla linia a b c d insù. ("This edifice would also produce a good effect if only the part above the lines a b c d were executed").

Pl. LXXXIV, No. 11. The exterior has the form of an octagon, but the chapels project partly beyond it. On the left side of the sketch they appear larger than on the right side.

Pl. XC, No. 1, (MS. B, 25b); Repetition of Pl. LXXXIV, No. 11.

Pl. XC, No. 2. Elevation to the plan No. 1, and also to No. 6 of the same sheet.
E. By chapels formed by four niches:

Pl. LXXXIV, No. 7 (the circular plan on the left below) shows this arrangement in which the central dome has become circular inside and might therefore be classed after this group.\(^1\)

The sketch on the right hand side gives most likely the elevation for the last named plan.

F. By chapels of still richer combinations, which necessitate an octagon of larger dimensions:

Pl. XCI, No. 2 (MS. Ash. II. 3\(^b\))\(^2\); on this plan the chapels themselves appear to be central buildings formed like the first type of the third group. Pl. LXXXVIII, No. 3.

Pl. XCI, No. 2 above; the exterior of the preceding figure, particularly interesting on account of the alternation of apses and niches, the latter containing statues of a gigantic size, in proportion to the dimension of the niches.

b. Second Class.

Composite plans of this class are generally obtained by combining two types of the first class—the one worked out on the principal axes, the other on the diagonal ones.

MS. B. 22 shows an elementary combination, without any additions on the diagonal axes, but with the dimensions of the squares on the two principal axes exceeding those of the sides of the octagon.

In the drawing W. P. 5\(^b\) (see page 44 Fig. 1) the exterior only of the edifice is octagonal, the interior being formed by a circular colonnade; round chapels are placed against the four sides of the principal axes.

The elevation, drawn on the same sheet (see page 47 Fig. 3), shows the whole arrangement which is closely related with the one on Pl. LXXXVI No. 1, 2.

MS. B. 21\(^a\) shows:

a) four sides with rectangular chapels crowned by pediments

Pl. LXXXVII No. 3 (plan and elevation);

b) four sides with square chapels crowned by octagonal domes.

Pl. LXXXVII No. 4; the plan underneath.

MS. B. 18\(^a\) shows a variation obtained by replacing the round chapels in the principal axes of the sketch MS. B. 18\(^a\) by square ones, with an

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\(^1\) This plan and some others of this class remind us of the plan of the Mausoleum of Augustus as it is represented for instance by Durand. See Cab. des Estampes, Bibliothèque Nationale, Paris, Topographie de Rome, V, 6, 82.

\(^2\) The note accompanying this plan is given under No. 754.
apse. Leonardo repeated both ideas for better comparison side by side, see page 47. Fig. 2.

Pl. LXXXIX (MS. B. 17\textsuperscript{b}). Elevation for the preceding figure. The comparison of the drawing marked M with the plan on page 47 Fig. 2, bearing the same mark, and of the elevation on Pl. LXXXIX below (marked A) with the corresponding plan on page 47 is highly instructive, as illustrating the spirit in which Leonardo pursued these studies.

Pl. LXXXIV No. 12 shows the design Pl. LXXXVII No. 3 combined with apses, with the addition of round chapels on the diagonal sides.

Pl. LXXXIV No. 13 is a variation of the preceding sketch.

Pl. XC No. 3, MS. B. 25\textsuperscript{b}. The round chapels of the preceding sketch are replaced by octagonal chapels, above which rise campaniles.

Pl. XC No. 4 is the elevation for the preceding plan.

Pl. XCI No. 1. (MS. B. 39\textsuperscript{b}); the plan below. On the principal as well as on the diagonal axes are diagonal chapels, but the latter are separated from the dome by semicircular recesses. The communication between these eight chapels forms a square aisle round the central dome.

Above this figure is the elevation, showing four campaniles on the angles.

Pl. CXXXIV No. 3. On the principal axes are square chapels with three niches; on the diagonals octagonal chapels with niches. Cod. Atl. 340\textsuperscript{b} gives a somewhat similar arrangement.

MS. B. 30. The principal development is thrown on the diagonal axes by square chapels with three niches; on the principal axes are inner recesses communicating with outer ones.

The plan Pl. XCIII No. 2 (MS. B. 22) differs from this only in so far as the outer semicircles have become circular chapels, projecting from the external square as apses; one of them serves as the entrance by a semicircular portico.

The elevation is drawn on the left side of the plan.

MS. B. 19. A further development of MS. B. 18, by employing for the four principal chapels the type Pl. LXXXVII No. 3, as we have already seen in Pl. XCI No. 2; the exterior presents two varieties.

a) The outer contour follows the inner.

b) It is semicircular.

Pl. LXXXVII No. 2 (MS. B. 18\textsuperscript{b}) Elevation to the first variation MS. B. 19. If we were not certain that this sketch was by Leonardo, we might feel tempted to take it as a study by Bramante for St. Peter's at Rome.\textsuperscript{3}

\textsuperscript{1} The note accompanying this drawing is reproduced under No. 753.

\textsuperscript{2} These chapels are here sketched in two different sizes; it is the smaller type which is thus formed.

\textsuperscript{3} See Les projets primitifs Pl. 43.
MS. P. V. 39b. In the principal axes the chapels of MS. B. 19, and semicircular niches on the diagonals. The exterior of the whole edifice is also an octagon, concealing the form of the interior chapels, but with its angles on their axes.

Group V.

Suggested by San Lorenzo at Milan.

In MS. C. A. 266 IIb, 812b there is a plan almost identical with that of San Lorenzo.—The diagonal sides of the irregular octagon are not indicated. If it could be proved that the arches which, in the actual church, exist on these sides in the first story, were added in 1574 by Martino Bassi, then this plan and the following section would be still nearer the original state of San Lorenzo than at present. A reproduction of this slightly sketched plan has not been possible. It may however be understood from Pl. LXXXVIII No. 3, by suppressing the four pillars corresponding to the apses.

Pl. LXXXVII No. 1 shows the section in elevation corresponding with the above-named plan. The recessed chapels are decorated with large shells in the half-domes like the arrangement in San Lorenzo, but with proportions like those of Bramante’s Sacristy of Santa Maria presso S. Satiro.

MS. C. A. 266; a sheet containing three views of exteriors of Domes. On the same sheet there is a plan similar to the one above-named but with uninterrupted aisles and with the addition of round chapels in the axes (compare Pl. XCVII No. 3 and page 44 Fig. 1), perhaps a reminiscence of the two chapels annexed to San Lorenzo.—Leonardo has here sketched the way of transforming this plan into a Latin cross by means of a nave with side aisles.

Pl. XCI No. 1. Plan showing a type deprived of aisles and comprised in a square building which is surrounded by a portico. It is accompanied by the following text:

Ash. II. 7a]

Questo edificio è abitato di sotto · e di sopra come · è san Sepulcro, · ed è sopra come sotto, salvo che ’l di sopra · al tiburio · c · d · e’l di sotto · al tiburio · a · b · e quado

756. The church of San Sepolcro at Milan, founded in 1030 and repeatedly rebuilt after the middle of the XVIth century, still stands over the crypt of the original structure.
entri nella chiesa di sotto, tu cali 10 scalini, e quando môti in quello di sopra tu sali 20 scalini, che a 1/3 l’uno fano 10 braccia, e questo è lo spazio ch’è intero fra i piani dell’una e l’altra chiesa.

Above the plan on the same sheet is a view of the exterior. By the aid of these two figures and the description, sections of the edifice may easily be reconstructed. But the section drawn on the left side of the building seems not to be in keeping with the same plan, notwithstanding the explanatory note written underneath it: “dentro il diitio di sopra” (interior of the edifice above).¹

Before leaving this group, it is well to remark that the germ of it seems already indicated by the diagonal lines in the plans Pl. LXXXV No. 11 and No. 7. We shall find another application of the same type to the Latin cross in Pl. XCVII No. 3.

¹ The small inner dome corresponds to a b on the plan—it rises from the lower church into the upper—above, and larger, rises the dome c d. The aisles above and below thus correspond (è di sopra come di sotto, salvoche etc). The only difference is, that in the section Leonardo has not taken the trouble to make the form octagonal, but has merely sketched circular lines in perspective.
2. Churches formed on the plan of a Latin cross.

We find among Leonardo's studies several sketches for churches on the plan of the Latin cross; we shall begin by describing them, and shall add a few observations.

A. Studies after existing Monuments.

Pl. XCIV No. 2. (MS. B. 11.) Plan of Santo Spirito at Florence, a basilica built after the designs of Brunellesco.—Leonardo has added the indication of a portico in front, either his own invention or the reproduction of a now lost design.

Pl. XCV No. 2. Plan accompanied by the words: "A è santo sepolcro di milano di sopra" (A is the upper church of S. Sepolcro at Milan); although since Leonardo's time considerably spoilt, it is still the same in plan.

The second plan with its note: "B è la sua parte sotto tera" (B is its subterranean part [the crypt]) still corresponds with the present state of this part of the church as I have ascertained by visiting the crypt with this plan. Excepting the addition of a few insignificant walls, the state of this interesting part of the church still conforms to Leonardo's sketch; but in the Vestibolo the two columns near the entrance of the winding stairs are absent.

B. Designs or Studies.

Pl. XCV No. 1. Plan of a church evidently suggested by that of San Sepolcro at Milan. The central part has been added to on the principle of the second type of Group III. Leonardo has placed the "coro" (choir) in the centre.
Pl. XCVI No. 2. In the plan the dome, as regards its interior, belongs to the First Class of Group IV, and may be grouped with the one in MS. B. 35º. The nave seems to be a development of the type represented in Pl. XCIV No. 2, B. by adding towers and two lateral porticos.

On the left is a view of the exterior of the preceding plan. It is accompanied by the following note:

B. 24ª

Questo edificio è abitato di sopra e di sotto; di sopra si va per li campanili e uassi su per lo piano dove sono fondati i 4. tiburi, e detto piano è uno parapetto di nazi, e di detti tiburi nessuno ne riesce in chiesa, anzi sono separati i tutto.

This building is inhabited below and above; the way up is by the campaniles, and in going up one has to use the platform, where the drums of the four domes are, and this platform has a parapet in front, and none of these domes communicate with the church, but they are quite separate.

Pl. XCVI No. 1 (MS. C. A. 16ª; 65ª). Perspective view of a church seen from behind; this recalls the Duomo at Florence, but with two campaniles.

Pl. XCVII No. 3 (MS. B. 52ª). The central part is a development of S. Lorenzo at Milan, such as was executed at the Duomo of Pavia. There is sufficient analogy between the building actually executed and this sketch to suggest a direct connection between them. Leonardo accompanied Francesco di Giorgio when the latter was consulted on June 21st, 1490 as to this church; the fact that the only word accompanying the plan is: "sagrestia", seems to confirm our supposition, for the sacristies were added only in 1492, i.e. four years after the beginning of the Cathedral, which at that time was most likely still sufficiently unfinished to be capable of receiving the form of the present sketch.

Pl. XCVII No. 2 shows the exterior of this design. Below is the note: edificio al proposito del sòdameto figurato di sotto (edifice proper for the ground plan figured below).

Here we may also mention the plan of a Latin cross drawn in MS. C. A. fol. 266 (see p. 50).

Pl. XCIV No. 1 (MS. L. 15ª). External side view of Brunellesco’s Florentine basilica San Lorenzo, seen from the North.

Pl. XCIV No. 4 (V. A. V, 1). Principal front of a nave, most likely of a church on the plan of a Latin cross. We notice here not only the

1 Already published in Le’s projets primitifs Pl. IX.
2 Already published in the Saggio Pl. IX.
3 See MALASPINA, il Duomo di Pavia. Documents.
principal features which were employed afterwards in Alberti's front of S. Maria Novella, but even details of a more advanced style, such as we are accustomed to meet with only after the year 1520.

In the background of Leonardo's unfinished picture of St. Jerome (Vatican Gallery) a somewhat similar church front is indicated (see the accompanying sketch).

The view of the front of a temple, apparently a dome in the centre of four corinthian porticos bearing pediments (published by Amoretti Tav. II. B as being by Leonardo), is taken from a drawing, now at the Ambrosian Gallery. We cannot consider this to be by the hand of the master.
C. Studies for a form of a Church most proper for preaching.

The problem as to what form of church might answer the requirements of acoustics seems to have engaged Leonardo's very particular attention. The designation of "teatro" given to some of these sketches, clearly shows which plan seemed to him most favourable for hearing the preacher's voice.

Pl. XCVII, No. 1 (MS. B, 52). Rectangular edifice divided into three naves with an apse on either side, terminated by a semicircular theatre with rising seats, as in antique buildings. The pulpit is in the centre. Leonardo has written on the left side of the sketch: "teatro da predicaré" (Theatre for preaching).

MS. B, 55a (see page 56, Fig. 1). A domed church after the type of Pl. XCV, No. 1, shows four theatres occupying the apses and facing the square "coro" (choir), which is in the centre between the four pillars of the dome. The rising arrangement of the seats is shown in the sketch above. At the place marked B Leonardo wrote teatri per uldire messa (rows of seats to hear mass), at T teatri, and at C coro (choir).

In MS. C.A. 260, are slight sketches of two plans for rectangular choirs and two elevations of the altar and pulpit which seem to be in connection with these plans.

In MS. Ash II, 8a (see p. 56 and 57, Fig. 2 and 3). "Locho dove si predica" (Place for preaching). A most singular plan for a building. The interior is a portion of a sphere, the centre of which is the summit of a column destined to serve as the preacher's pulpit. The inside is somewhat

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1 The note teatro de predicar, on the right side is, I believe, in the handwriting of Pompeo Leoni.  J. P. R.
like a modern theatre, whilst the exterior and the galleries and stairs recall the ancient amphitheatres.

Page 57, Fig. 4. A plan accompanying the two preceding drawings. If this gives the complete form Leonardo intended for the edifice, it would have comprised only about two thirds of the circle. Leonardo wrote in the centre "fondamento", a word he often employed for plans, and on the left side of the view of the exterior: locho dove si predicha (a place for preaching in).
D. Design for a Mausoleum.

Pl. XCVIII (P. V., 182. No. d'ordre 2386). In the midst of a hilly landscape rises an artificial mountain in the form of a gigantic cone, crowned by an imposing temple. At two thirds of the height a terrace is cut out with six doorways forming entrances to galleries, each leading to three sepulchral halls, so constructed as to contain about five hundred funeral urns, disposed in the customary antique style. From two opposite sides steps ascend to the terrace in a single flight and beyond it to the temple above. A large circular opening, like that in the Pantheon, is in the dome above what may be the altar, or perhaps the central monument on the level of the terrace below.

The section of a gallery given in the sketch to the right below shows the roof to be constructed on the principle of superimposed horizontal layers, projecting one beyond the other, and each furnished with a sort of heel, which appears to be undercut, so as to give the appearance of a beam from within. Granite alone would be adequate to the dimensions here given to the key stone, as the thickness of the layers can hardly be considered to be less than a foot. In taking this as the basis of our calculation for the dimensions of the whole construction, the width of the chamber would be about 25 feet but, judging from the number of urns it contains—and there is no reason to suppose that these urns were larger than usual—it would seem to be no more than about 8 or 10 feet.

The construction of the vaults resembles those in the galleries of some etruscan tumuli, for instance the Regulini Galeassi tomb at Cervetri (late-ly discovered) and also that of the chamber and passages of the pyramid of Cheops and of the treasury of Atreus at Mycenae.

The upper cone displays not only analogies with the monuments men-tioned in the note, but also with Etruscan tumuli, such as the Cocumella
tomb at Vulci, and the Regulini Galeassi tomb. The whole scheme is one of the most magnificent in the history of Architecture.

It would be difficult to decide as to whether any monument he had seen suggested this idea to Leonardo, but it is worth while to enquire, if any monument, or group of monuments of an earlier date may be supposed to have done so.

1 See FERGUSON, Handbook of Architecture, I, 291.

2 There are, in Algiers, two Monuments, commonly called "Le Madracen" and "Le tombeau de la Chrétienne," which somewhat resemble Leonardo's design. They are known to have served as the Mausolea of the Kings of Mauritania. Pomponius Mela, the geographer of the time of the Emperor Claudius, describes them as having been "Monumentum commune regiae gentis." See Le Madracen, Rapport fait par M. le Grand Rabbin AB. CAHEN, Constantine 1873.—Mémoire sur les fouilles exécutées au Madras'en par le Colonel BRUNON, Constantine 1873.—Deux Mausolées Africains, le Madracen et le tombeau de la Chrétienne par M. J. de LAURIÈRE, Tours 1874.—Le tombeau de la Chrétienne, Mausolée des rois Mauritanians par M. BERBRUGGER, Alger 1867.—I am indebted to M. LE BLANC, of the Institut, and M. LUD. LALANNE, Bibliothécaire of the Institut for having first pointed out to me the resemblance between these monuments; while M. ANTOINE HÉRON DE VILLEFOSSE of the Louvre was kind enough to place the abovementioned rare works at my disposal. Leonardo's observations on the coast of Africa are given later in this work. The Herodium near Bethlehem in Palestine (Jebel el Fureidis, the Frank Mountain) was, according to the latest researches, constructed on a very similar plan. See DER FRANKENBERG, von Baurath C. SCHICK in Jerusalem, Zeitschrift des Deutschen Palästina-Vereins, Leipzig 1880, Vol. III, pages 88—99 and Plates IV and V.
E. Studies for the Central Tower, or Tiburio of Milan Cathedral.

Towards the end of the fifteenth century the Fabbriceria del Duomo had to settle on the choice of a model for the crowning and central part of this vast building. We learn from a notice published by G. L. Calvi that among the artists who presented models in the year 1488 were: Bramante, Pietro da Gorgonzola, Luca Paperio (Fancelli), and Leonardo da Vinci.—

Several sketches by Leonardo refer to this important project:

Pl. CXIX, No. 2 (MS. S. K. III. No. 36a) a small plan of the whole edifice.—The projecting chapels in the middle of the transept are wanting here. The nave appears to be shortened and seems to be approached by an inner "vestibolo".—

Pl. C, No. 2 (Tr. 21). Plan of the octagon tower, giving the disposition of the buttresses; starting from the eight pillars adjoining the four principal piers and intended to support the eight angles of the Tiburio. These buttresses correspond exactly with those described by Bramante as existing in the model presented by Omodeo.¹

Pl. C, 3 (MS. Tr. 16). Two plans showing different arrangements of the buttresses, which seem to be formed partly by the intersection of a system of pointed arches such as that seen in

Pl. C, No. 5 (MS. B, 27a) destined to give a broader base to the drum. The text underneath is given under No. 788.

MS. B, 3—three slight sketches of plans in connexion with the preceding ones.

¹ G. L. Calvi, Notizie sulla vita e sulle opere dei principali architetti scultori e pittori che florirono in Milano, Part III, 20. See also: H. de Geymüller, Les projets primitifs etc. I, 37 and 116—119.—The Fabbriceria of the Duomo has lately begun the publication of the archives, which may possibly tell us more about the part taken by Leonardo, than has hitherto been known.

² Bramante's opinion was first published by G. Mongeri, Arch. stor. Lomb. V, fasc. 3 and afterwards by me in the publication mentioned in the preceding note.
Pl. XCIX, No. 1 (MS. Tr. 15) contains several small sketches of sections and exterior views of the Dome; some of them show buttress-walls shaped as inverted arches. Respecting these Leonardo notes:

Tr. 15

L’arco rivescio è migliore per fare spalla che l’ordinario, perché il rovescio trova sotto se muro resistette alla sua debolezza, e l’ordinario nó trova nel suo debole se non aria.

The inverted arch is better for giving a shoulder than the ordinary one, because the former finds below it a wall resisting its weakness, whilst the latter finds in its weak part nothing but air.

Three slight sketches of sections on the same leaf—above those reproduced here—are more closely connected with the large drawing in the centre of Pl. C, No. 4 (MS. Tr. 41) which shows a section of a very elevated dome, with double vaults, connected by ribs and buttresses ingeniously disposed, so as to bring the weight of the lantern to bear on the base of the dome.

A sketch underneath it shows a round pillar on which is indicated which part of its summit is to bear the weight: "il pilastro sarà charicho in a b." (The column will bear the weight at a b.) Another note is above on the right side: Larcho regierà tanto sotto asse chome di sopra e (The arch supports as much below it [i.e. a hanging weight] as above it).

Pl. C, No. 1 (C.A. 303a). Larger sketch of half section of the Dome, with a very complicated system of arches, and a double vault. Each stone is shaped so as to be knit or dovetailed to its neighbours. Thus the inside of the Dome cannot be seen from below.

MS. C.A. 303b. A repetition of the preceding sketch with very slight modifications.

Fig. 1.

Fig. 2.

MS. Tr. 9 (see Fig. 1 and 2). Section of the Dome with reverted buttresses between the windows, above which iron anchors or chains seem to be intended. Below is the sketch of the outside.
Pl. XCIX, No. 3 (C.A., 262ª) four sketches of the exterior of the Dome.

C. A. 12. Section, showing the points of rupture of a gothic vault, in evident connection with the sketches described above.

It deserves to be noticed how easily and apparently without effort, Leonardo manages to combine gothic details and structure with the more modern shape of the Dome.

The following notes are on the same leaf, oni cosa pòderosa, and oni cosa pòderosa desidera de(scendere); farther below, several multiplications most likely intended to calculate the weight of some parts of the Dome, thus

\[
16 \times 47 = 720; \quad 720 \times 800 = 176000,
\]

next to which is written: peso del pilastro di 9 teste (weight of the pillar 9 diameters high).

Below: \(176000 \times 8 = 1408000\); and below:

\[
1408000 \times 80 = 80 \text{ millions six hundred} \]

Il peso del tiburio (weight of the Dome).

Bossi hazarded the theory that Leonardo might have been the architect who built the church of Sta. Maria delle Grazie, but there is no evidence to support this, either in documents or in the materials supplied by Leonardo's manuscripts and drawings. The sketch given at the side shows the arrangement of the second and third socle on the apses of the choir of that church; and it is remarkable that those sketches, in MS. S. K. M. II², 2ª and 1ª, occur with the passage given in Volume I as No. 665 and 666 referring to the composition of the Last Supper in the Refectory of that church.
F. The Project for lifting up the Battistero of Florence and setting it on a basement.

Among the very few details Vasari gives as to the architectural studies of Leonardo, we read: "And among these models and designs there was one by way of which he showed several times to many ingenious citizens who then governed Florence, his readiness to lift up without ruining it, the church of San Giovanni in Florence (the Battistero, opposite the Duomo) in order to place under it the missing basement with steps; he supported his assertions with reasons so persuasive, that while he spoke the undertaking seemed feasible, although every one of his hearers, when he had departed, could see by himself the impossibility of so vast an undertaking."¹

In the MS. C. A. fol. 293, there are two sketches which possibly might have a bearing on this bold enterprise. We find there a plan of a circular or polygonal edifice surrounded by semicircular arches in an oblique position. These may be taken for the foundation of the steps and of the new platform. In the perspective elevation the same edifice, forming a polygon, is shown as lifted up and resting on a circle of inverted arches which rest on an other circle of arches in the ordinary position, but so placed that the inverted arches above rest on the spandrels of the lower range.

What seems to confirm the supposition that the lifting up of a building is here in question, is the indication of engines for winding up, such as jacks, and a rack and wheel. As the lifting apparatus represented on this sheet does not seem particularly applicable to an undertaking of such magnitude, we may consider it to be a first sketch or scheme for the engines to be used.

¹ This latter statement of Vasari's must be considered to be exaggerated. I may refer here to some data given by LIBRI, Histoire des sciences mathématiques en Italie (II, 216, 217): “On a cru dans ces derniers temps faire un miracle en mécanique en effectuant ce transport, et cependant dès l'année 1455, Gaspard Nadi et Aristote de Fioravantio avaient transporté, à une distance considérable, la tour de la Magione de Bologne, avec ses fondements, qui avait presque quatre-vingts pieds de haut. Le continuateur de la chronique de Pagnoliot dit que le trajet fut de 35 pieds et que durant le transport auquel le chroniqueur affirme avoir assisté, il arriva un accident grave qui fit pencher de trois pieds la tour pendant qu'elle était suspendue, mais que cet accident fut promptement réparé (Muratori, Scriptores rer. ital. Tom. XVIII, col. 717, 718). Alidosi a rapporté une note où Nadi rend compte de ce transport avec une rare simplicité. D'après cette note, on voit que les opérations de ce genre n'étaient pas nouvelles. Celle-ci ne coûta que 150 livres (monnaie d'alors) y compris le cadeau que le Légit fit aux deux mécaniciens. Dans la même année, Aristote redressa le clocher de Cento, qui penchait de plus de cinq pieds (Alidosi, instruzione p. 188 — Muratori, Scriptores rer. ital., tom. XXIII, col. 888. — Bossi, chronic Mediol., 1492, in-fol. ad ann. 1455). On ne conçoit pas comment les historiens des beaux-arts ont pu négliger de tels hommes.” J. P. R.
G. Description of an unknown Temple.

C. A. 2804: 8520] 759-

Per dodici gradi di scale al magno tempio si saliva, il quale otto cento braccia circundava, e con ottagonale figura era fabricato, e sopra li otto angoli otto gran base si posauano a un braccio e mezzo, e grosse 3, 3e lunghe 6 nel suo sodo, col-l'angolo in mezzo, sopra delle quali si fon-dauano 8 grà pilastri; sopra del sodo della base si levava per ispatio di 24 braccia, e nel suo termine erano stabiliti 8 capitelli di 3 braccia l'uno, e largo 6, sopra di questi se'guiva architrae fregio e cornice con altezza di 4 braccia e 1/2, il quale per retta linea 6 dall'un pilastro all'altro s'estendeva, e così con circuito d'otto cento braccia il tempio circundava infra l'uno pilastro e l'altro; per sostentacolo di tal micro erano stabiliti dieci gran colone dell'altezza de' pilastri e così grossezza di 3 braccia sopra le base, le quali erano alte vn braccio e 1/2.

Salivas a questo tempio per 12 gradi di scale, il quale tempio era sopra il dodecimo grado fondato in figura ottanugolare, e sopra ciascuno angolo nasceva vn gran pilastro; e infra li pilastri erano inframesi 1/2 dieci Twelve flights of steps led up to the great temple, which was eight hundred braccia in circumference and built on an octagonal plan. At the eight corners were eight large plinths, one braccia and a half high, and three wide, and six long at the bottom, with an angle in the middle; on these were eight great pillars, standing on the plinths as a foundation, and twenty four braccia high. And on the top of these were eight capitals three braccia long and six wide, above which were the architrave frieze and cornice, four braccia and a half high, and this was carried on in a straight line from one pillar to the next and so, continuing for eight hundred braccia, surrounded the whole temple, from pillar to pillar. To support this entablature there were ten large columns of the same height as the pillars, three braccia thick above their bases which were one braccia and a half high.

The ascent to this temple was by twelve flights of steps, and the temple was on the twelfth, of an octagonal form, and at each angle rose a large pillar; and between the pillars were placed ten columns of the

759. Either this description is incomplete, or, as seems to me highly probable, it refers to some ruin. The enormous dimensions forbid our supposing this to be any temple in Italy or Greece. Syria was the native land of colossal octagonal buildings, in the early centuries A. D. The Temple of Baalbek, and others are even larger than that here described.

J. P. R.
null
colonne colla medesima altezza de' pilastri, i quali si levaua sopra del pavimento 28 braccia e 1/2; sopra di questa medesima altezza si posaua architraue fregio e cornice con lunghezza d'otto ceto braccia, e cignea il tempio a vna medesima altezza circuiua dentro a tal circuito sopra il medesimo piano; in giro in centro del tempio per spatio di 24 braccia nascono le corrispondentie deli' 8 pilastri delli angoli, e delle colonne poste a esse prime faccie, e si lauauano alla medesima altezza sopra detta, e sopra tal pilastri li architraui perpetui ritor-

navano sopra li primi detti pilastri e colonne.

same height as the pillars, rising at once from the pavement to a height of twenty eight braccia and a half; and at this height the architrave, frieze and cornice were placed which surrounded the temple having a length of eight hundred braccia. At the same height, and within the temple at the same level, and all round the centre of the temple at a distance of 24 braccia farther in, are pillars corresponding to the eight pillars in the angles, and columns corresponding to those placed in the outer spaces. These rise to the same height as the former ones, and over these the continuous architrave returns towards the outer row of pillars and columns.

br e 12. di queste sta...alteza...frego e corice cho collungeza dotto ceto br eigea. 13. alteza...attat...piano..."iiero il centro del tempio per ispatio di 24 br...massieo. 14. e delle [ottamta] colon...facc essi. 15. alteza sopra [di que] detta.
V. Palace architecture.

But a small number of Leonardo's drawings refer to the architecture of palaces, and our knowledge is small as to what style Leonardo might have adopted for such buildings.

Pl. CII No. 1 (W. XVIII). A small portion of a façade of a palace in two stories, somewhat resembling Alberti's Palazzo Rucellai.—Compare with this Bramante's painted front of the Casa Silvestri, and a painting by Montorfano in San Pietro in Gessate at Milan, third chapel on the left hand side and also with Bramante's palaces at Rome. The pilasters with arabesques, the rustica between them, and the figures over the window may be painted or in sgraffito. The original is drawn in red chalk.

Pl. LXXXI No. 1 (MS. Tr. 42). Sketch of a palace with battlements and decorations, most likely graffiti; the details remind us of those in the Castello at Vigezano.1

MS. Mz. o”, contains a design for a palace or house with a loggia in the middle of the first story, over which rises an attic with a Pediment reproduced on page 67. The details drawn close by on the left seem to indicate an arrangement of coupled columns against the wall of a first story.

Pl. LXXXV No. 14 (MS. S. K. M. III 79”) contains a very slight

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1 Count Giulio Porro, in his valuable contribution to the Archivio Storico Lombardo, Anno VIII, Fasc. IV (31 Dec. 1881): Leonardo da Vinci, Libro di Annotazioni e Memorie, refers to this in the following note: “Alla pag. 41 vi è uno schizzo di volta ed accanto scrisse: ‘il pilastro sarà charicho in su 6’ e potrebbe darsi che si riferisse alla cupola della chiesa delle Grazie tanto più che a pag. 42 vi è un disegno che rassomiglia assai al basamento che oggi si vede nella parte esterna del coro di quella chiesa.” This may however be doubted. The drawing, here referred to, on page 41 of the same manuscript, is reproduced on Pl. C No. 4 and described on page 61 as being a study for the cupola of the Duomo of Milan.

J. P. R.
sketch in red chalk, which most probably is intended to represent the façade of a palace. Inside is the short note he 7 (7 and 7).

MS. J² 8ª (see pages 68 Fig. 1 and 2) contains a view of an unknown palace. Its plan is indicated at the side.

In MS. Br. M. 126ª (see Fig. 3 on page 68) there is a sketch of a house, on which Leonardo notes: casa con tre terrazi (house with three terraces).
Pl. CX, No. 4 (MS. L. 36b) represents the front of a fortified building drawn at Cesena in 1502 (see No. 1040).

Here we may also mention the singular building in the allegorical composition represented on Pl. LVIII in Vol. I. In front of it appears the head of a sphinx or of a dragon which seems to be carrying the palace away.

The following texts refer to the construction of palaces and other buildings destined for private use:

W. XIX]

La corte de' auere le parieti 2 per l'altezza la metà della sua 3 larghezza, cioè se la corte 4 sarà braccia 40, la casa deve essere 5 alta 20 nelle parieti di tal 6 corte, e tal corte vol essere 7 larga per la metà di tutta la 8 facciata.

In the courtyard the walls must be half the height of its width, that is if the court be 40 braccia, the house must be 20 high as regards the walls of the said courtyard; and this courtyard must be half as wide as the whole front.

760. See Pl. CI, no. 1, and compare the dimensions here given, with No. 748 lines 26—29; and the drawing belonging to it Pl. LXXXI, no. 2.
I disegni di Leonardo da Vinci, incluso l'iscrizione "Imp Evades"
The manner in which one must arrange a stable. You must first divide its width in 3 parts, its depth matters not; and let these 3 divisions be equal and 6 braccia broad for each part and 10 high, and the middle part shall be for the use of the stablemasters; the 2 side ones for the horses, each of which must be 6 braccia in width and 6 in length, and be half a braccio higher at the head than behind. Let the manger be at 2 braccia from the ground, to the bottom of the rack, 3 braccia, and the top of it 4 braccia. Now, in order to attain to what I promise, that is to make this place, contrary to the general custom, clean and neat: as to the upper part of the stable, i.e. where the hay is, that part must have at its outer end a window 6 braccia high and 6 broad, through which by simple means the hay is brought up to the loft, as is shown by the machine 'l'; and let this be erected in a place 6 braccia wide, and as long as the stable, as seen at 'k.' The other two parts, which are on either side of this, are again divided; those nearest to the hay-loft are 4 braccia, p, s, and only for the use and circulation of the servants belonging to the stable; the other two which reach to the outer walls are 2 braccia, as seen at s k, and these are made for the purpose of giving hay to the mangers, by means of funnels, narrow at the top and wide over the manger, in order that the hay should not choke them. They must be well plastered and clean and are represented at 4 f/s. As to the giving the horses water, the troughs must be of stone and above them [cisterns of] water. The mangers may be opened as boxes are uncovered by raising the lids.

761. a chome . . . chomponere . . . installa. 3. gera in parte. 3. ella . . . luage . . . dete . . . larga . . . br . . . 12 br . . . 1/2 br. 7. la maggiatiera stinta dacciua . . . [l'attesta era] il . . . della rastelliua. 8. br . . . ellulimo br . . . attenera . . . promecto. 9. detto . . . detto . . . neta. 11. feno. 12. apare . . . essia coloata . . . large. 13. br . . . apare in K. p. latre e latre. 14. metano imere . . . si diuisa . . . feno. 15. no br 4 "p . . . s. . . . ofitio [de mani si ribe] e andamento. 16. 2 che che chontano chole parte . . . br 2 . . . apare. 17. ecuste . . . magiatore . . . per condoci strecti. 18. sule magiatore acio. 20. le magiatore . . . sia la sichessi. 21. magiatore chome si scho-

761. See Pl. LXXVIII, No. 1.
The way to construct a framework for decorating buildings.

The way in which the poles ought to be placed for tying bunches of juniper on to them. These poles must lie close to the framework of the vaulting and tie the bunches on with osier withes, so as to clip them even afterwards with shears.

Let the distance from one circle to another be half a braccia; and the juniper [sprigs] must lie top downwards, beginning from below. Round this column tie four poles to which willows about as thick as a finger must be nailed and then begin from the bottom and work upwards with bunches of juniper sprigs, the tops downwards, that is upside down.

The water should be allowed to fall from the whole circle a b.

Sia lasciata cadere l'acqua in tutto il cerchio di a b.

The words here given as the title line, lines 1–4, are the last in the original MS.—Lines 5–16 are written under fig. 4.

Other drawings of fountains are given on Pl. Cl (W. XX); the original is a pen and ink drawing on blue paper; on Pl. ClII (MS. B.) and Pl. LXXXII.
VI. Studies of architectural details.

Several of Leonardo's drawings of architectural details prove that, like other great masters of that period, he had devoted his attention to the study of the proportion of such details. As every organic being in nature has its law of construction and growth, these masters endeavoured, each in his way, to discover and prove a law of proportion in architecture. The following notes in Leonardo's manuscripts refer to this subject.

MS. S. K. M. III, 47\textsuperscript{b} (see Fig. 1). A diagram, indicating the rules as given by Vitruvius and by Leon Battista Alberti for the proportions of the Attic base of a column.

MS. S. K. M. III 55\textsuperscript{a} (see Fig. 2). Diagram showing the same rules.
764. | Steps of Urbino.

The plinth must be as broad as the thickness of the wall against which the plinth is built.

C. A. 318 a; 96 a.]  
I nostri antichi architetti . . . . cominciando in prima dagli Egitii, i quali seco-

do che descrive Diodoro Siculo : furono i primi edificatori e componitori di città grand-
dissime e di castelli ed edificii pubblici e privati di forma, grandezza e qualità per le quali i loro antecédéti riguardevoli con stupefaezione e maraviglia le elevate e grandissime macchine paleso loro . . . .
5 La colonna ch' à la sua grosseza nel terzo . . . . quella che fosse sottile nel mezzo rospirarsi nelle; . . . quella ch' è di pari grossezza e di pari fortezza è migliore per l' edi-
fizio; seconda di bontà sarà quella ch' à la maggior grossezza dov' ella si cogivinse nella . . .

764. 1. toro superio . . . super. 2. nestroli. 3. torcata. 4. inferio. 5. feri. 6. [plate] plinto.
765. 1. [il muro]. 2. illastoro debole. 3. [il largo]. 5. grosseza di quanta. 7. lastro. 8. poggia.
766. 1. . . . . written from left to right. 1. nostri . . . ostacoli chiamando . . . dagli . . . scendendo . . . descrive . . . sichendo. 2. edifici- tori e componitori di cia . . . chasellate. 4. grandessa . . . antecedent [are possa] che riguardavoli chiamiu stupefaezione . . . loro; here the text breaks off. 5. colonna . . . grossezza terzo qui . . . ve am aroper se (t) . . . . mero . . . nelle 2 isapia.

764. No explanation can be offered of the meaning of the letter B, which precedes each name. It may be meant for basa (base). Perhaps it refers to some author on architecture or an architect (Bramante?) who employed the designations, thus marked for the moldings.
765. trocata. Philander: Trochlae aev trochaiae aut rechonum.
766. Laterculus or latastro is the Latin name for Plinthus (ξινεξοεξ), but Vitruvius adopted this Greek name and "latastro" seems to have been little in use. It is to be found besides the text given above, as far as I am aware, only on two drawings of the Uffizi Collection, where, in one instance, it indicates the abacus of a Doric capital.
765. See Pl. CX No. 3. The hasty sketch on the right hand side illustrates the unsatisfactory effect produced when the plinth is narrower than the wall.
766. See Pl. CII, No. 3, where the sketches belonging to lines 10—16 are reproduced, but reversed. The sketch of columns, here reproduced by a wood cut, stands in the original close to lines 5—8.
Il capitello a essere questo formato, 
dividi la sua grossezza da capo 7 d’u pié . . . . . . 12 fa che sia alto 12/12 e ver-
rà a essere quadrato, dipoi dividi l’altezza 7, 
come facesti la colonna, di poi poni 1/12 l’uovolo 12 e un altro ottavo 
la grossezza della tavola che sta di sopra al capitello; 13 cirn del 
della tavola del capitello anò a 
sportare fuori dalla maggior larghezza della 
càpana 12/14 cioè settimi del di sopra della 
càpana che tocca a ciascù cornò di sporto 
12/14 e la mozzatura de’ corni vuole essere 
largh quatt’è alta, cioè 1/12; il resto degli or-
namètt lascio 12/in libertà degli scultori; 17 
ma per tornare alle colomne, e provare 
la ragione secondo la forma di lor forèezza 
10 o deboleza, dico così, che quando le 
line si partiranno dalla sommità della 19 
colonna e termineranno in suo nascimeto e 
e la lor 
uita e lieghèza sia di pari 20 
9'57; l'abaco è 3/16. The capital must be formed in this 
way. Divide its thickness at the top into 
8; at the foot make it 3/16, and let it be 3/16 
high and you will have a square; afterwards 
divide the height into 8 parts as you did for 
the column, and then take 1/12 for the echinus 
and another eighth for the thickness of the aba-
cus on the top of the capital. The horns of 
the abacus of the capital have to project beyond 
the greatest width of the bell 17/12, i.e. sevenths 
of the top of the bell, so 17/12 falls to 
the projection of each horn. The truncated part 
of the horns must be as broad as it is high. 
1 I leave the rest, that is the ornaments, to 
the taste of the sculptors. But to return to 
the columns and in order to prove the 
reason of their strength or weakness according 
to their shape, I say that when the lines starting 
from the summit of the column and ending at 
its base and their direction and length . . . . , 
their distance apart or width may be equal; I say 
that this column . . . .

Ash. III. 13[6]

Il cilindro d’un corpo di figura colò nale, 
e le sua opposit fronti so due cierch 
d’interposizion paralleale 4 e infra li lor 
ciètr s’estède una linia 5 retta, che passa 
per il mezzo della grossezza 6 del cilindro 
e termina nelle cierch 7 d’essi cierch, la 
quale linia dall’antichi è detta axis.

767.

Il cilindro d’un corpo di figura colò nale, 
e le sua opposit fronti so due cierch 
d’interposizion paralleale 4 e infra li lor 
ciètr s’estède una linia 5 retta, che passa 
per il mezzo della grossezza 6 del cilindro 
e termina nelle cierch 7 d’essi cierch, la 
quale linia dall’antichi è detta axis.

768.

a + b = 1/3 di n + m ; 2 m o 1/6 di r o ; 
a l’ovo sporta 1/6 di r o ; 4 s = 7/12 di r o 
5 n b si diuidia in 9 e 1/2 o l’abaco è 3/16; 
a l’ovo 4/16; 8 fusaiolo e listello 7/9 e 1/2. 

767. Leonardo wrote these lines on the margin of a page of the Trattato di Francesco di Giorgio, 
where there are several drawings of columns, as well as a head drawn in profile inside an outline 
sketch of a capital.

768. See Pl. LXXXV, No. 16. In the original the drawing and writing are both in red chalk.
Pl. LXXXV No. 6 (MS. Ash. II 6b) contains a small sketch of a capital with the following note, written in three lines: I chorni del capitello deono essere la quarta parte d’uno quadro (The horns of a capital must measure the fourth part of a square).

MS. S. K. M. III 72b contains two sketches of ornamentations of windows. In MS. C. A. 308a; 938a (see Pl. LXXXII No. 1) there are several sketches of columns. One of the two columns on the right is similar to those employed by Bramante at the Canonica di S. Ambrogio. The same columns appear in the sketch underneath the plan of a castle. There they appear coupled, and in two stories one above the other. The archivolti which seem to spring out of the columns, are shaped like twisted cords, meant perhaps to be twisted branches. The walls between the columns seem to be formed out of blocks of wood, the pedestals are ornamented with a reticulated pattern. From all this we may suppose that Leonardo here had in mind either some festive decoration, or perhaps a pavilion for some hunting place or park. The sketch of columns marked “35” gives an example of columns shaped like candelabra, a form often employed at that time, particularly in Milan, and the surrounding districts for instance in the Cortile di Casa Castiglione now Silvestre, in the cathedral of Como, at Porta della Rana &c.

Delli architravi di uno e di più pezzi.

L’architrave di più pezzi è più potente che quel d’un sol pezzo, essendo essi pezzi colle lor lunghesse situati per inverso il cetro del modo; pruvvasi perchè le pietre annò il neroo overo tiglio gienereato per il traìverso, cioè per il uerso dell’orizzonti oppositi d’un medesimo emisferio, e questo è contrario al tiglio delle pezzi le quali annò . . .

An architrave of several pieces is stronger than that of one single piece, if those pieces are placed with their length in the direction of the centre of the world. This is proved because stones have their grain or fibre generated in the contrary direction i.e. in the direction of the opposite horizons of the hemisphere, and this is contrary to fibres of the plants which have...

The Proportions of the stories of a building are indicated by a sketch in MS. S. K. M. II 11b (see Pl. LXXXV No. 15). The measures are written on the left side, as follows: br 1' , 6/12 — br ' 2 br — g e 9 e 1/2 — br 5 — 6 9 — 6 3 [br — braccia; 6 — oncie].

Pl. LXXXV No. 13 (MS. B. 62a) and Pl. XCIII No. 1 (MS. B. 15a) give a few examples of arches supported on piers.

769. The text is incomplete in the original.
Leonardo's original writings on the theory of Architecture have come down to us only in a fragmentary state; still, there seems to be no doubt that he himself did not complete them. It would seem that Leonardo entertained the idea of writing a large and connected book on Architecture; and it is quite evident that the materials we possess, which can be proved to have been written at different periods, were noted down with a more or less definite aim and purpose. They might all be collected under the one title: "Studies on the Strength of Materials". Among them the investigations on the subject of fissures in walls are particularly thorough, and very fully reported; these passages are also especially interesting, because Leonardo was certainly the first writer on architecture who ever treated the subject at all. Here, as in all other cases Leonardo carefully avoids all abstract argument. His data are not derived from the principles of algebra, but from the laws of mechanics, and his method throughout is strictly experimental.

Though the conclusions drawn from his investigations may not have that precision which we are accustomed to find in Leonardo's scientific labours, their interest is not lessened. They prove at any rate his deep sagacity and wonderfully clear mind. No one perhaps, who has studied these questions since Leonardo, has combined with a scientific mind anything like the artistic delicacy of perception which gives interest and lucidity to his observations.

I do not assert that the arrangement here adopted for the passages in question is that originally intended by Leonardo; but their distribution into five groups was suggested by the titles, or headings, which Leonardo himself prefixed to most of these notes. Some of the longer sections perhaps should not, to be in strict agreement with this divi-
sion, have been reproduced in their entirety in the place where they occur. But the comparatively small amount of the materials we possess will render them, even so, sufficiently intelligible to the reader; it did not therefore seem necessary or desirable to subdivide the passages merely for the sake of strict classification.

The small number of chapters given under the fifth class, treating on the centre of gravity in roof-beams, bears no proportion to the number of drawings and studies which refer to the same subject. Only a small selection of these are reproduced in this work since the majority have no explanatory text.
I.

ON FISSURES IN WALLS.

First write the treatise on the causes of the giving way of walls and then, separately, treat of the remedies.

Parallel fissures constantly occur in buildings which are erected on a hill side, when the hill is composed of stratified rocks with an oblique stratification, because water and other moisture often penetrates these oblique seams carrying in greasy and slippery soil; and as the strata are not continuous down to the bottom of the valley, the rocks slide in the direction of the slope, and the motion does not cease till they have reached the bottom of the valley, carrying with them, as though in a boat, that portion of the building which is separated by them from the rest. The remedy for this is always to build thick piers under the wall which is slipping, with arches from one to another, and with a good scarp and let the piers have a firm foundation in the strata so that they may not break away from them.

In order to find the solid part of these strata, it is necessary to make a shaft at the foot of the wall of great depth through the strata; and in this shaft, on the side from which the hill slopes, smooth and flatten a...
dalla sommità insino al fondo da quel lato, donde il mòte disciède, 27 e in capo d’al-
quìato tempo questa parte pulita, che si fecie
nella parte del pozzo, mostrerà manifesto
segnio qual parte del mòte si move.

Mai le fessure de’ muri 2 sarà parallele,
fuor che se la 3 parte del muro, la qual 4 si
separa dal suo rimanente, 5 non disciède.

Quale regola è quella che fa 7 li edifìti
permanenti.

La permanètica deli’ edifìti è la regola
cornerà alla antecedenti, cioè che le mu-
raglic 9 sieno elevate in alto tutte equal-
mente con e quali 11 gradi, che abbraccino
l’intera circuitione dello 12 edifìto colle intere
grossezzè di qualunque sorte di 13 muri, e
ancora che il muro sottile segchi più pre-
visto che il grosso, e’ nò si avrà a ròper
per il peso che lui 15 possa acquistare dal-
1’une all’altra giornata, perché, 16 se il suo
duplo seccasi in una giornata il doppio
seccerà in due o circa, si uerrà ragguagli-
ado 18 cò piccola differètia del peso in piccola
differètia di tépo.

Dicé l’aversario 20 che a becca 21 tello
disciède.

E qui dicie l’auersario 23 che r disciède
e non e.

Pronostici delle cause 25 delle fessure di
qualche 26 muro.

Quella parte del muro che nò disciède
riscura 28 in se l’obliquità del beccatello,
copritore dell’obliquità del muro dà lui
discesa.

De’ siti de’ fondamèti e in quali 31 loco sò
causa delle ruine.

Quando la fessura del muro è più
di sopra 33 che di sotto ellì è manifesto
segnio che la mu ragglìa a la causa della
ruina remota dal perpètuo diculare d’essa fessura.

771. The cracks in walls will never be parallel
unless the part of the wall that separates from
the remainder does not slip down.

What is the law by which buildings have
stability.

The stability of buildings is the result
of the contrary law to the two former
cases. That is to say that the walls must
be all built up equally, and by degrees, to
equal heights all round the building, and the
whole thickness at once, whatever kind of
walls they may be. And although a thin wall
dries more quickly than a thick one it will
not necessarily give way under the added
weight day by day and thus, [16] although
a thin wall dries more quickly than a thick
one, it will not give way under the weight
which the latter may acquire from day to
day. Because if double the amount of it
dries in one day, one of double the thick-
ness will dry in two days or thereabouts;
thus the small addition of weight will be
balanced by the smaller difference of time [18].

The adversary says that a which projects,
drops down.

And here the adversary says that r slips
and not e.

How to prognosticate the causes of
cracks in any sort of wall.

The part of the wall which does not
slip is that in which the obliquity projects
and overhangs the portion which has parted
from it and slipped down.

On the situation of foundations and in
what places they are a cause of ruin.

When the crevice in the wall is wider at the
top than at the bottom, it is a manifest sign,
that the cause of the fissure in the wall is remote
from the perpendicular line through the crevice.

771. Lines 1—5 refer to Pl. CV, No. 2.
Line 9 alle due antecedètæ, see on the same page.
Lines 16—18. The translation of this is doubt-
ful, and the meaning in any case very obscure.

Lines 19—23 are on the right hand margin close
to the two sketches on Pl. CI, No. 3.
4. Of cracks in walls, which are wide at the bottom and narrow at the top and of their causes.

That wall which does not dry uniformly in an equal time, always cracks.

A wall though of equal thickness will not dry with equal quickness if it is not everywhere in contact with the same medium. Thus, if one side of a wall were in contact with a damp slope and the other were in contact with the air, then this latter side would remain of the same size as before; that side which dries in the air will shrink or diminish and the side which is kept damp will not dry. And the dry portion will break away readily from the damp portion because the damp part not shrinking in the same proportion does not adhere and follow the movement of the part which dries continuously.

Of arched cracks, wide at the top, and narrow below.

Arched cracks, wide at the top and narrow below are found in walled-up doors, which shrink more in their height than in their breadth, and in proportion as their height is greater than their width, and as the joints of the mortar are more numerous in the height than in the width.

The crack diminishes less in $r \circ$ than in $m \circ$, in proportion as there is less material between $r$ and $\circ$ than between $m$ and $\circ$.

Any crack made in a concave wall is wide below and narrow at the top; and this originates, as is here shown at $b\ c\ d$, in the side figure.

1. That which gets wet increases in proportion to the moisture it imbibes.

2. And a wet object shrinks, while drying, in proportion to the amount of moisture which evaporates from it.
Della causa del ronpere dell'edilìci pubblici e privati.

Rompensi li muri per fessure, che anno del diretto e alcune che anno dello obliquo; le rotture che anno del diretto son generate dalli muri novi in cogiutio de' muri vecchi divisiti o co morse giute alli muri vecchi, perché tali morse, no potendo resistere allo insopportable peso del muro a lor'cogiuto, è necessario a quelle ronpersi e dar loco al disciexo del predetto muro novo, il quale cala un braccio per ogni 10 braccia, o più meno, secondo la maggiore o minore sorta di calcina 13 interposta infra le pietre murate e co calcina più 13 o mc liquida; E nota che sempre si deve imprima fare 13 li muri e poi vestirli delle pietre che li anno a vestire, 14 perche se così no si facesse, il muro facciedo maggiore calo che 13 la crosta di fori, c' errebbe necessario che le lati de' muri si róppessino; perché le pietre che vestono li mu1511, essendo di maggiore grandezza che le pietre da quel16 le vestite, è necessario che ricievino minor qualità di calcina 17 nelle loro comessure e per conseguenza faccino minore calo, 18 il che accadere no, essendo murate tali croste poi ch.el mu190 no è secco.

22 a b muro mo30v, c e muro vecchio 24 che gia à fatto il calo, 25 c lo a b fa il calo poi, 26 bèchec a, essèdo fon17to sopra il c muro 28 vecchio, no si può in nes29su modo ròpere per ave30re stabile fondamèto 31 sopra del muro ve1chier, ma sol si rompe31 ria il rimanente del mu34ro novo b a25cioia ch'elli è murato di 36 sopra dalla sommità del edifizio insino al fondo, 37 facciedo il rimanente del muro nuovo beccatello 38 sopra il muro che disciède.

OF THE CAUSES OF FISSURES IN [THE WALLS OF] PUBLIC AND PRIVATE BUILDINGS.

The walls give way in cracks, some of which are more or less vertical and others are oblique. The cracks which are in a vertical direction are caused by the joining of new walls, with old walls, whether straight or with indentations fitting on to those of the old wall; for, as these indentations cannot bear the too great weight of the wall added on to them, it is inevitable that they should break, and give way to the settling of the new wall, which will shrink one braccia in every ten, more or less, according to the greater or smaller quantity of mortar used between the stones of the masonry, and whether this mortar is more or less liquid. And observe, that the walls should always be built first and then faced with the stones intended to face them. For, if you do not proceed thus, since the wall settles more than the face settling, the projections left on the sides of the wall must inevitably give way; because the stones used for facing the wall being larger than those over which they are laid, they will necessarily have less mortar laid between the joints, and consequently they settle less; and this cannot happen if the facing is added after the wall is dry.

a b the new wall, c the old wall, which has already settled; and the part a b settles afterwards, although a, being founded on c, the old wall, cannot possibly break, having a stable foundation on the old wall. But only the remainder b of the new wall will break away, because it is built from top to bottom of the building; and the remainder of the new wall will overhang the gap above the wall that has sunk.

773. 1. chauss... publici. 2. ronpai... alcunche. 3. rociure. 4. novi (murati in tèpo brevisimo). 5. in chëgiùnìo de muri [non ve "echi" ... chè. 7. allor chëgiùnìo. 8. sequele... toco al disceèco. 9. chal va' br per ogni 10 br. oppia 10. sechendo... 5'minore... chalcina. 11. interposta infla... chè chalcina. 12. òme... chessempre. 13. oppo vesitir... chelli... avestir. 14. chowi... facessì... magiore chalo chel. 15. lascrosa... farebì... chelle. 16. vessano. 17. essendo... chelle... dascue. 18. vessile... chalcina. 19. chòmessure e per chòseghëuèra... chalo. 20. achadere... muro tale croste. 21. escecho. 22. muro (vechio) nov. 24. afasto il chalo. 25. ello... chalo. 30. fondamè. 31. chò. 30. ci chelli. 31. bechattello. 38. [il muro chediscède.}
774—776. ON FISSURES IN WALLS. 81

Br. M. 1576]

Torre nova fundata sopra la vecchia in parte.

A new tower founded partly on old masonry.

Br. M. 1576]

Delle pietre che si disgiugono dalla lor calcina.

Le pietre d'equal numero nella loro altezza, mutrate con equal qualità di calcina, fanno equal calo nella partita dell'umido che molti non cò essa calcina. 

Per lo passato si provava che la poca qualità del muro nuovo interposta infra A. n farà po'eco calo rispetto alla qualità del medesimo mutrro che s'interpone infra c. d, e tal fia la pro[portione che anno infra loro le rareità delle dette calcine qual'è la propo[zione delle nu[meri over delle qualità delle calcine interporste nelle còmesure delle pietre murate so[pra le varie altezze delli muri vecchi.

775.

Of stones which disjoin themselves from their mortar.

Stones laid in regular courses from bottom to top and built up with an equal quantity of mortar settle equally throughout, when the moisture that made the mortar soft evaporates.

By what is said above it is proved that the small extent of the new wall between A and n will settle but little, in proportion to the extent of the same wall between c and d. The proportion will in fact be that of the thinness of the mortar in relation to the number of courses or to the quantity of mortar laid between the stones above the different levels of the old wall.

776.

Questo muro si röparà sotto l'arco e f perché i sette quadrelli integrò no sono sottitetti a sostenere il pié dell'arco sopra postoli e röparannosi questi 7 quadrelli nel mezzo apùto come appare in a b; la ragione si è che il quadrello a a sola-mète sopra se il peso a k e l'ultimo quadrello sotto l'arco a sopra se il peso c d x a; e d' pare che facci fare for-

This wall will break under the arch e f, because the seven whole square bricks are not sufficient to sustain the spring of the arch placed on them. And these seven bricks will give way in their middle exactly as appears in a b. The reason is, that the brick 'a' has above it only the weight a k, whilst the last brick under the arch has above it the weight c d x a.

774. 2. sopra il vechio.
775. 1. chesi. 2. giuuggano. chalcina. 3. pute. 4. chon. chalcina. 5. la passata. chella pocha. 6. pocho chalo rispecto. 10. chesinterpone. etal. 11. portone d[hi che anno infralloro. 12. chalcine. 13. chalcine. 14. ste chômesure.
776. 1. Quesssto. larcho [c] e f. 2. assostenere. archo. postoli. 3. e röparannosi. quesse. mero. chome apare. 6. larcho. 7. cheffacci. archo uerlasspalla. 8. archo. 9. chome. dopo.
za all’arco verso la spalla nel punto \( p \), ma il peso \( p o \) li fa resistenza, onde tutto il peso ne va nella radice dell’arco; \( adu \) c d seems to press on the arch towards the abutment at the point \( p \) but the weight \( p o \) opposes resistance to it, whence the whole

diagram

que fa la radice deli archi come \( 7 \cdot 6 \), ch’è più forte il doppio che \( x \cdot z \).

pressure is transmitted to the root of the arch. Therefore the foot of the arch acts like \( 7 \cdot 6 \), which is more than double of \( x \cdot z \).
II.

ON FISSURES IN NICHES.

An arch constructed on a semicircle and bearing weights on the two opposite thirds of its curve will give way at five points of the curve. To prove this let the weights be at \( n m \) which will break the arch \( a, b, f \). I say that, by the foregoing, as the extremities \( c \) and \( a \) are equally pressed upon by the thrust \( u \), it follows, by the \( 5^\text{th} \), that the arch will give way at the point which is furthest from the two forces acting on them and that is the middle \( e \). The same is to be understood of the opposite curve, \( d g b \); hence the weights \( n m \) must sink, but they cannot sink by the \( 7^\text{th} \) without coming closer together, and they cannot come together unless the extremities of the arch between them come closer, and if these draw together the crown of the arch must break; and thus the arch will give way in two places as was at first said &c.

I ask, given a weight at \( a \) what counteracts it in the direction \( n f \) and by what weight must the weight at \( f \) be counteracted.

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777. 1. rocture. 2. semil. . charicho. 3. churviita. 4. churvitpro esieino. 5. ropano . . archo . . per la 6. passato chome ca"stremi" sono equalmente agravati. 7. seguita "per la 5" cheliarcho." 8. chello priemano . . altrec. 9. archo . . addi. 10. véghano addiscièdere e discièder no possa. 12. sano dellarcho che infrillor. 13. achoostare. 14. lacro . . chome fu pre"o", ne risponde. 17. chó . . possato.

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Delle rotture delli nichil.

L'arco fatto del semicircolo, il quale fia carico nellì due oppišiti terzi della sua curvità, ròperà in 4 cinque lochi della sua curvità; provasi e sieno li pe'si \( n m \), li quali rompono esso arco \( a \cdot b \cdot f \), dico per lo 5 passato come \( c \) a stremi sono equalmente agravati dal peso \( u \), 7 seguita per lì 5\text{°} che l'arco ronperà nella parte più remota dalle 8 due potentie che lo premono, il quale è il mezzo \( e \), e altre tanto intědo aver detto dell'arco opposito \( d \), \( g \), \( b \); adunque \( n m \) pesi vegono a discèdere, e discèder no possi'nno per la 7\text{°} che non si facci più vicini, e avicinar nò si posi'sono, se l'arco che infra lor s'intèpone non avicini li sua 13 stremi, li quali nò si possono accostare sanza rottura del 14 suo mezzo; adunque l'arco si ronperà in 2 lochi come fu primo 15 posto ece.

16 Domáda del peso dato in \( a \), che parte ne risponde 1 \( n \cdot f \) linea, e có che peso s'à a vinciere il peso posto in \( f \).
ON THE SHRINKING OF DAMP EODIES OF DIFFERENT THICKNESS AND WIDTH.

The window a is the cause of the crack at b; and this crack is increased by the pressure of n and m which sink or penetrate into the soil in which foundations are built more than the lighter portion at b. Besides, the old foundation under b has already settled, and this the piers n and m have not yet done. Hence the part b does not settle down perpendicularly; on the contrary, it is thrown outwards obliquely, and it cannot on the contrary be thrown inwards, because a portion like this, separated from the main wall, is larger outside than inside and the main wall, where it is broken, is of the same shape and is also larger outside than inside; therefore, if this separate portion were to fall inwards the larger would have to pass through the smaller—which is impossible. Hence it is evident that the portion of the semi-circular wall when disunited from the main wall will be thrust outwards, and not inwards as the adversary says.

When a dome or a half-dome is crushed from above by an excess of weight the vault will give way, forming a crack which diminishes towards the top and is wide below, narrow on the inner side and wide outside; as is the case with the outer husk of a pomegranate, divided into many parts lengthwise; for the more it is pressed in the direction of its length, that part of the joints will open most, which is most distant from the cause of the pressure; and for that reason the arches of the vaults of any apse should never be more loaded than the arches of the principal building. Because that which weighs most, presses most on the parts below, and they sink into the foundations; but this cannot happen to lighter structures like the said apses.

The figure on Pl. CV, No. 4 belongs to the first paragraph of this passage, lines 1—14; fig. 5 is sketched by the side of lines 15—and following. The sketch below of a pomegranate refers to line 22. The drawing fig. 6 is, in the original, over line 37 and fig. 7 over line 54.
Qual di questi due cubi dimoirà più uiformemente, o il cubo \( A \) posato sopra il pavimento, o il cubo \( b \) sospeso \( a \) infra l'aria, essendo l'uno \( 42 \) e l'altro cubo equali in peso \( 43 \) e in quantità e di terra mista \( 44 \) con eguale umidità? —

Quel cubo che si posa sopra \( 46 \) il pavimento più diminuirà delle sua altezza che per la \( 48 \) sua larghezza, il che \( 49 \) far no può il cubo ch'è di \( 50 \) sopra e sospeso infra l'aria; \( 51 \) provasi così, il cubo poi s'astetaculo sopra questa medesima \( 53 \) sta meglio qui di sotto.

Il fine delli due cilindri di \( 55 \) terra fresca cioè \( a \) \( b \) sa\( ^{55} \) rà le figure piramidale di \( 57 \) sotto \( c \) \( d \) provasi così: il cilindro \( a \), posato \( 59 \) sopra il suo pavimento per esse\( ^{60} \) re lui di terra assai mista \( 61 \) coll'umido, va calàdo ne\'\( ^{62} \) diante il suo peso che dà di se \( 63 \) alla sua basa, e tató più cal\( ^{64} \) derà e ingrosserà, quedo e\( ^{65} \) rà colle sua parti più presso \( 66 \) alla sua basa, perchè lì s'è car\( ^{67} \) ca il suo tutto ecc; E se\( ^{68} \) milce farà il peso \( b \), il quale \( p \) \( e \) \( e \) s'asteterà, quato elli a mag\( ^{70} \) gir\( ^{71} \) or peso sotto se, la qual maggiorità \( 77 \) è ne\'còfini del suo sostetaculo.

Which of these two cubes will shrink the more uniformly: the cube \( A \) resting on the pavement, or the cube \( b \) suspended in the air, when both cubes are equal in weight and bulk, and of clay mixed with equal quantities of water?

The cube placed on the pavement diminishes more in height than in breadth, which the cube above, hanging in the air, cannot do. Thus it is proved. The cube shown above is better shown here below.

The final result of the two cylinders of damp clay that is \( a \) and \( b \) will be the pyramidal figures below \( c \) and \( d \). This is proved thus: The cylinder \( a \) resting on block of stone being made of clay mixed with a great deal of water will sink by its weight, which presses on its base, and in proportion as it settles and spreads all the parts will be somewhat nearer to the base because that is charged with the whole weight, \&c.; and the case will be the same with the weight of \( b \) which will stretch lengthwise in proportion as the weight at the bottom is increased and the greatest tension will be the neighbourhood of the weight which is suspended by it.
III.

ON THE NATURE OF THE ARCH.

A. 594]

CHÉ COSA È ARCO.

7 Arco non è altro che una forza -
cavata da due debolezze, ipero'ché
l'arco negli edifici è còposto di 2
quarti di circulo, i quali cir-
culi, ciascuno debolissimo per se, desi-
derà cadere, e opponendosi alla ruina
l'uno dell'altro, de' due debolezze,
si còvertono in una forza.

DELLA QUALITÀ DEL PESO DELL'ARCHI.

8 Poiché l'arco sia còposto, quello ri-
mane in equilibrio, ipero'ché tato spi-
gie l'uno, l'altro quato l'altro
l'uno, e se pesa píu l'uno quarto
circolo, che l'altro, qui vi sia levata
e negata la permanenza, ipero'ché
l maggior vicercà il minore peso.

DEL CARICO DATO AGLI ARCHI.

13 Dopo il peso equale de' quarti
circuli è necessario dare loro equale
peso di sopra, altrementi si corre-
rebbe nel sopra detto errore.

WHAT IS AN ARCH?

The arch is nothing else than a force
originated by two weaknesses, for the
arch in buildings is composed of two
segments of a circle, each of which
being very weak in itself tends to fall;
but as each opposes this tendency in
the other, the two weaknesses combine to
form one strength.

OF THE KIND OF PRESSURE IN ARCHES.

As the arch is a composite force it
remains in equilibrium because the
thrust is equal from both sides; and
if one of the segments weighs more
than the other the stability is lost,
because the greater pressure will out-
weigh the lesser.

OF DISTRIBUTING THE PRESSURE ABOVE AN ARCH.

Next to giving the segments of
the circle equal weight it is neces-
sary to load them equally, or you will
fall into the same defect as before.

779. 1. chosa e archo. 2. archo . . . forteras . . . deboleze. 3. archo . . . chìposto . . . circhuli. 4. circhuli ciaschuno . . debolissimo . . . caderà eoponè. 5. deboleze . . . chìverto. 6. cha forteras. 7. dela . . . deli. 8. chìposto quelo . . equilibra. 9. chettàto . . . esse e pessa. 10. circhulo . . . premanerà. 11. magior. 12. chvichho dati all. 13. circhuli. 14. chorerebe . . errore
Dove l'arco si ròpe.

16 L'arco si ròperà j quella · parte che passa · il suo mezzo sotto il cietro.

Secondo ròpimento dell'arco.

18 Se l superchio · peso · sia posto i mezzo · l'arco nel punto · a · quello desiòdra cadere · in · b · e ronpesi ne' 2/3 della sua altezza in · c · c · e tato sia più potente · g · c · che c · a · quanto · 3/4 · m · o · entra · in · m · n.

D'un altra cagione di ruina.

23 L'arco verrà · ancora · meno · per essere sospito da traverso · inpero23 ché quando il carico nò · si dirizza ai pie · de · l'arco · 25 l'arco poco dura.

Where an arch breaks.

An arch breaks at the part which lies below half way from the centre.

Second rupture of the arch.

If the excess of weight be placed in the middle of the arch at the point a, that weight tends to fall towards b, and the arch breaks at 2/3 of its height at c c; and g c is as many times stronger than c a, as m o goes into m n.

On another cause of ruin.

The arch will likewise give way under a transversal thrust, for when the charge is not thrown directly on the foot of the arch, the arch lasts but a short time.

780.

Della fortezza dell'arco.

Il modo di fare l'arco permanète si è a riempiere i sua angoli · di buono ripieno 3insino · al suo raso overo · culmine.

The way to give stability to the arch is to fill the spandrils with good masonry up to the level of its summit.

On the strength of the arch.

Del caricare sopra l'arco tòdo.

The loading of round arches.

On the proper manner of loading the pointed arch.

On the evil effects of loading the pointed arch directly above its crown.

15. larchó. 16. larchó · mezo [id]. 17. sechido · archo. 18. mezo larchó · quello. 19. chadere · dela · alteza. 20. c · in · qu in · c · g · c. 22. chagione. 23. larchó vera · anchora · esserre. 24. charicho · diriza · archo. 25. larchó pocho.

780. 1. dela forteza delarcho. 2. larchó. 3. culmine. 4. charichare · larchó. 5. charichare larchó acuto. 6. delo inchò venète · charichare. 7. larchó acuto · mezo. 8. dano · larchó acuto. 9. charichato sopra a sua fìchi. 10. larchó
8 Del danno che riceve l’arco acuto a essere 9 caricato sopra i suoi flãchi.

A. 51. 8]

Del riparo a terremoti.

9 L’arco il quale mài derà il peso perpêdiculare alle sue radici 8 farà il suo oﬀitio per 6 qualûque verso si stia, 7 o rovescio, o a giacere, 8 o ritto.

9 L’arco nò si rôperà se la corda dell’arco di fori nò toccherà l’arco di dentro 10; 10 Questo appare per isperîenza, che ogni volta che la corda a o n dell’arco 11 di fori n v a toccherà l’arco di dentro x b y, l’arco darà prêcipio a sua 12 debolezza, e tåto si farà pîv debole quàto l’arco di dêtro rôperà dessa corda.

13 Quell’arco il quale ﬁa carìco dall’una de’lati, 14 il peso si carìcherà sulla sômità its function whatever be its direction, upside down, sideways or upright.

The arch will not break if the chord of the outer arch does not touch the inner arch. This is manifest by experience, because whenever the chord a o n of the outer arch n v a approaches the inner arch x b y the arch will be weak, and it will be weaker in proportion as the inner arch passes beyond that chord. When an arch is loaded only on one side the thrust will press on the top of the other side and be transmitted

780. Inside the large figure on the right is the note: Da però la forza dell’arco.
ON THE NATURE OF THE ARCH.

782. The two lower sketches are taken from the MS. S. K. M. III, 103; they have there no explanatory text.

vol. ii.
Della potetia dell'arco nell'architettura.

La permanenza dell'arco fabbricato dallo architetto con siste nella corda e nelle spalle sue.

Della situazione della corda nel sopra detto arco.

La situazione della corda è eguale necessitù nel principio dell'arco, e nel fine della rettitudine del pilastro dove si posa; prouasi per la 2ª dell'ostetaculi che dice: 2ª Quella parte del sostentaculo manco resiste che è più remota dal ferma méto del suo tutto; adunque essendo la 1ª somità del pilastro vittima remotione di suo ferma méto, e l'1ª2miule accordado nell'oppositi stremi dell'arco, che sono VIª tima distanta dal mezzo, suo vero ferma méto, noi abbia concluso che tal corda a b di necessitù richiede la situazione dell'1ª sua oppositi stremi infra li 4 opposti stremi predetti;

Dicel'auersario che tale arco vole essere più che mezzo tondo, e allora non avrà bisogno di corda perché tali stremi non spigheranno infuori, ma indentro, come si dice mostra nello eccesso a c. b. d. Qui si risponde, tale 1ª invenzione essere trista per 5 cause, e la prima è inquantà alla fortèzza, perché è provato il paralello circulare, essendo coposto di due semicirculi, sol rópersi dove 2ª tali semicirculi insieme si congiungono, come mostra la figura m n; oltre a di questo seguita, ch'egli è maggiore spatio infra li stremi del semicirculo che infra le pa stitching della muri; terza è che l'peso posto per cótro alla fortèzza della corda diminuisce tanto di peso, quanto la poste dell'arco sono più larghi che detto spatio interposto infra li pilastri, 4ª è 2ª che li pilastri indeboliscono per tácio quanto la parte loro

On the strength of the arch in architecture.

The stability of the arch built by an architect resides in the tie and in the flanks.

On the position of the tie in the above named arch.

The position of the tie is of the same importance at the beginning of the arch and at the top of the perpendicular pier on which it rests. This is proved by the 2ª "of supports" which says: that part of a support has least resistance which is farthest from its solid attachment; hence, as the top of the pier is farthest from the middle of its true foundation and the same being the case at the opposite extremities of the arch which are the points farthest from the middle, which is really its [upper] attachment, we have concluded that the tie a b requires to be in such a position as that its opposite ends are between the four above-mentioned extremes.

The adversary says that this arch must be more than half a circle, and that then it will not need a tie, because then the ends will not thrust outwards but inwards, as it is seen in the excess at a c, b d. To this it must be answered that this would be a very poor device, for three reasons. The first refers to the strength of the arch, since it is proved that the circular parallel being composed of two semicircles will only break where these semicircles cross each other, as is seen in the figure n m; besides this it follows that there is a wider space between the extremes of the semicircle than between the plane of the walls; the third reason is that the weight placed to counterbalance the strength of the arch diminishes in proportion as the piers of the arch are wider than the space between the piers. Fourthly in proportion as the parts at c a b d turn outwards, the piers are weaker to support the arch above them. The 5ª is that all the material and weight of the

785. 1. dell'arch. 2. premenzhe dell'arco fabbrichato. 3. arch. 4. ch. 5. arch. 6. arch. 7. ch. 8. arch. 9. tucto essendo [la somita dell'la. 10. somita . 11. sostentaculi. 12. sostentaculi. 13. arch. 14. arch. 15. arc. 16. ch. 17. ch. 18. ch. 19. ch. 20. arch. 21. arch. 22. arch. 23. arch. 24. arch. 25. arch. 26. arch. 27. arch. 28. arch. 29. arch. 30. arch. 31. arch. 32. arch. 33. arch. 34. arch. 35. arch. 36. arch. 37. arch. 38. arch. 39. arch. 40. arch. 41. arch. 42. arch. 43. arch. 44. arch. 45. arch. 46. arch. 47. arch. 48. arch. 49. arch. 50. arch. 51. arch. 52. arch. 53. arch. 54. arch. 55. arch. 56. arch. 57. arch. 58. arch. 59. arch. 60. arch. 61. arch. 62. arch. 63. arch. 64. arch. 65. arch. 66. arch. 67. arch. 68. arch. 69. arch. 70. arch. 71. arch. 72. arch. 73. arch. 74. arch. 75. arch. 76. arch. 77. arch. 78. arch. 79. arch. 80. arch. 81. arch. 82. arch. 83. arch. 84. arch. 85. arch. 86. arch. 87. arch. 88. arch. 89. arch. 90. arch. 91. arch. 92. arch. 93. arch. 94. arch. 95. arch. 96. arch. 97. arch. 98. arch. 99. arch. 100. arch.
arch which are in excess of the semicircle are useles and indeed mischievous; and here it is to be noted that the weight placed above the arch will be more likely to break the arch at a b, where the curve of the excess begins that is added to the semicircle, than if the pier were straight up to its junction with the semicircle [spring of the arch].

An arch loaded over the crown will give way at the left hand and right hand quarters.

This is proved by the 7th of this which says: The opposite ends of the support are equally pressed upon by the weight suspended to them; hence the weight shown at f is felt at b c, that is half at each extremity; and by the third which says: in a support of equal strength [throughout] that portion will give way soonest which is farthest from its attachment; whence it follows that a being equally distant from f, e . . . .

If the centering of the arch does not settle as the arch settles, the mortar, as it dries, will shrink and detach itself from the bricks between which it was laid to keep them together; and as it thus leaves them disjoined the vault will remain loosely built, and the rains will soon destroy it.

ON THE STRENGTH AND NATURE OF ARCHES, AND WHERE THEY ARE STRONG OR WEAK; AND THE SAME AS TO COLUMNS.

That part of the arch which is nearer to the horizontal offers least resistance to the weight placed on it.

A. 476]
When the triangle \( a \cdot z \cdot n \), by settling, drives backwards the \( \frac{1}{2} \), of each \( \frac{1}{2} \) circle that is \( a \cdot s \) and in the same way \( z \cdot m \), the reason is that \( a \) is perpendicularly over \( b \) so and likewise \( z \) is above \( f \).

Either half of an arch, if overweighted, will break at \( \frac{1}{2} \) of its height, the point which corresponds to the perpendicular line above the middle of its bases, as is seen at \( a \cdot b \); and this happens because the weight tends to fall past the point \( r \).—And if, against its nature it should tend to fall towards the point \( s \) the arch \( n \cdot s \) would break precisely in its middle. If the arch \( n \cdot s \) were of a single piece of timber, if the weight placed at \( n \) should tend to fall in the line \( n \cdot m \), the arch would break in the middle of the arch \( e \cdot m \), otherwise it will break at one third from the top at the point \( a \) because from \( a \) to \( n \) the arch is nearer to the horizontal than from \( a \) to \( o \) and from \( o \) to \( s \), in proportion as \( p \cdot s \) is greater than \( t \cdot n \), \( a \cdot o \) will be stronger than \( a \cdot n \) and likewise in proportion as \( s \cdot o \) is greater than \( o \cdot a \), \( p \cdot s \) will be greater than \( p \cdot t \).

The arch which is double to four times of its thickness will bear four times the weight that the single arch could carry, and more in proportion as the diameter of its thickness goes a smaller number of times into its length. That is to say that if the thickness of the single arch goes ten times into its length, the thickness of the doubled arch will go five times into its length. Hence as the thickness of the double arch goes only half as many times into its length as that of the single arch does, it is reasonable that it should carry half as much more weight as it would have to carry if it were in direct proportion to the single arch. Hence as this double arch has 4 times the thickness of the single arch, it would seem that it ought to bear 4 times the weight; but by the above rule it is shown that it will bear exactly 8 times as much.

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ON THE NATURE OF THE ARCH.

That pier, which is charged most unequally, will soonest give way.

The column $c\ b$, being charged with an equal weight, [on each side] will be most durable, and the other two outward columns require on the part outside of their centres as much pressure as there is inside of their centre, that is, from the centre of the column, towards the middle of the arch.

Arches which depend on chains for their support will not be very durable.

L'arco · fia di pìv lúga perpetuità ·, il quale avrà bônò contrariol al suo spëgiere.

That arch will be of longer duration which has a good abutment opposed to its thrust.

But if you do not wish to strengthen the arch with an iron tie you must give it such abutments as can resist the thrust; and you can do this thus: fill up the spandrels $m\ n$ with stones, and direct the lines of the joints between them to the centre of the circle of the arch, and the reason why this makes the arch durable is this. We know very well that if the arch is loaded with an excess of weight above its quarter as $a\ b$, the wall $f\ g$ will be thrust outwards because the arch would yield in that direction; if the other quarter $b\ c$ were loaded, the wall $f\ g$ would be thrust inwards, if it were not for the line of stones $x\ y$ which resists this.

Plan.

Here it is shown how the arches made in the side of the octagon thrust the piers.

Fondaméto.

Qui si dimostra ·come li archi ·fatti ne' lati dell'ottágolo spingo·no i pilastri dellí richa ·soma ·premanéte. 51. anó ·tido ·daleró ·dalaró ·chelena ·mero. 51. stano ·chateau. 51. larcho ·ara ·chontrario. 55. larcho ·chadere. 56. larcho ·50. br. ·Iternalo. 56. sostégnano ·sapiano. 57. anó. ·larcho ·diriza. 58. laprano edano ·sla ·arch. 59. Massetu ·archo ·chorda. 60. spale. ·chaffo ·cossa. ·chariche ·charicchi. 61. chelle · dele · dirinno. 62. círculo ·archo ·larcho ·premanéte. 63. sapiano ·chariche larcho. 64. larcho si uora dirizarre ·charichassí. 65. tirerebe ·fussi. 66. cheffà.

S. K. M. II. 2 664]
An Experiment to show that a weight placed on an arch does not discharge itself entirely on its columns; on the contrary the greater the weight placed on the arches, the less the arch transmits the weight to the columns. The experiment is the following. Let a man be placed on a steel yard in the middle of the shaft of a well, then let him spread out his hands and feet between the walls of the well, and you will see him weigh much less on the steel yard; give him a weight on the shoulders, you will see by experiment, that the greater the weight you give him the greater effort he will make in spreading his arms and legs, and in pressing against the wall and the less weight will be thrown on the steel yard.

La sperienza, che vn peso posto sopra vn'arco no si carica tutto sopra alle sua colonne, anzi questo è maggior peso fra-posto sopra l'archi, tanto più pesa l'arco il peso alle colone; la sperienza si è questa: sia messo vn'omo sopra le stadera in mezzo la tróba d'uno pozzo; fa dipoi che questo allarghi le mani e piedi infra le paretì di detto pozzo, vedrai questo pesare alla stadera mol'to meno; da li vno peso alle spalle, uedrai per sperienza quanto maggior pesò ti darai, maggiore forza farà in aprire le braccia e gambe, e pia'pia'dare nelle paretì, e pia màcare il pòdo alle stadera.
IV.

ON FOUNDATIONS, THE NATURE OF THE GROUND AND SUPPORTS.

The first and most important thing is stability.

As to the foundations of the component parts of temples and other public buildings, the depths of the foundations must bear the same proportions to each other as the weight of material which is to be placed upon them.

Every part of the depth of earth, in a given space is composed of layers, and each layer is composed of heavier or lighter materials, the lowest being the heaviest. And this can be proved, because these layers have been formed by the sediment from water carried down to the sea, by the current of rivers which flow into it. The heaviest part of this sediment was that which was first thrown down, and so on by degrees; and this is the action of water when it becomes stagnant, having first brought down the mud whence it first flowed. And such layers of soil are seen in the banks of rivers, where their constant flow has cut through them and divided one slope from the other to a great depth; where in gravelly strata the waters have run off, the ma-

789. 1. ella loro permanenza. 2. chean le mèbrificazioni chemoni. 3. pubblici. 4. debbe . dapprofondita approfondita. 5. dappeso . . . chescarichare si debbe. 8. alla. 9. spatio, 10. faetata assuoli. 11. chòpessato. 12. parte . . . grave [opi]. 13. eppiv lievi lua chèlla. 14. tra “nel - grave” ecuesto si prove. 15. questi. 16. turbulente, 17. scharichate. 21. luc. 22. prim“a”. 23. siscarichcho. 24. ecuesto fálle. 25. ferne. 29. manifesta. 30. cholor chon. 31. chorsi an seghati. 32. esparitii. 34. dallaltr. 35. giorosi. 37. se secha. 38. chèverita. 40. figho. 41. ecuesto. 43. tereste. 45. chos de chèverso.
790. The heaviest part of the foundations of buildings settles most, and leaves the lighter part above it separated from it.

And the soil which is most pressed, if it be porous yields most.

You should always make the foundations project equally beyond the weight of the walls and piers, as shown at \( m a b \). If you do as many do, that is to say if you make a foundation of equal width from the bottom up to the surface of the ground, and charge

\[ \text{si dimostra in } b \cdot e \text{ e in } e \cdot o, \text{ la parte del fonda}^\text{mento } b \cdot e, \text{ perché è piena dal pilastro del catorne, p} \text{iv pesa e p} \text{iv spigie in basso il suo fonda}^\text{mento che n} \text{ò fa il muro } e \cdot o \text{ che non occupa interamente il suo fonda}^\text{mento, e però meno spengne e me sì ficca, onde ficcadosi il pilastro } b \cdot e \text{ e si diumisce e parte dal m} \text{v}^\text{ro } e \cdot o \text{ come si uede nel pilov dell'edifi} \text{ti che sono spicati intorno a detti pilastri.}

791. The window \( a \) is well placed under the window \( e \), and the window \( b \) is badly placed under the pier \( d \), because this latter is without support and foundation; mind therefore never to make a break under the piers between the windows.

\[ \text{La finestra } a \text{ sta bene sotto la finestra } e \text{ e la finestra } b \text{ sta male sotto lo spatio } d \cdot d', \text{ perché detto spatio è sanza sostegno e fondamento, } b \text{ sì che ricordati di nò ròper } b \text{ mai sotto li spati delle finestre.} \]
792.

A. 484]

Del sostétaculo.

2 Il pilastro moltiplicato per grossezza crescerà tanto piv che la sua debita potetia quatro e màca della ragionevole altezza.

Example.

If a pillar should be nine times as high as it is broad—that is to say, if it is one braccio thick, according to rule it should be nine braccia high—then, if you place 100 such pillars together in a mass this will be ten braccia broad and 9 high; and if the first pillar could carry 10000 pounds the second being only about as high as it is wide, and thus lacking 8 parts of its proper length, it, that is to say, each pillar thus united, will bear eight times more than when disconnected; that is to say, that if at first it would carry ten thousand pounds, it would now carry 90 thousand.

792. 1. sostétaculo. 2. pilastro moltiplicato per grossezza cresciuta. tantò “piv che”. 3. màca . . . alteza. 5. Se i . . . grossezza. . . . choselè . . . 1 br. [de] la. 6. 9 br. . . . cholegerai . . . grosseza . br. 10. 7. esse . . . lbr. . . . sechòdo . . . circha. 8. a l grosseza e màchìdòlì . . . dela lungaza. 9. cholegato . . . tochera. 10. chosè . . . mila lbr. . . . sosterà.
V.

ON THE RESISTANCE OF BEAMS.

S. K. M. II. 72o]

That angle will offer the greatest resistance which is most acute, and the most obtuse will be the weakest.

If the beams and the weight $o$ are 100 pounds, how much weight will be wanted at $a\cdot b$ to resist such a weight, that it may not fall down?

S. K. M. III. 793.

Se i travi e'l peso $o$ fia 100 libbre, quarto peso sarà in $a\cdot b$ a faire resistenzia a esso peso che non caggia in basso?

Della lunghezza delle travi.

That beam which is more than 20 times as long as its greatest thickness will be of brief duration and will break in half; and

793. The three smaller sketches accompany the text in the original, but the larger one is not directly connected with it. It is to be found on fol. 89a of the same Manuscript and there we read in a note, written underneath, overchio della perdicha del castello (roof of the flagstaff of the castle).—Compare also Pl. XCIII, No. 1.
la parte ch'ètra nel mvro, sia penetrata
5 di pece calda e fasciata d'asse di querchia,
acor essa penetrata. 6 Ogni trave vole pas-
sare i suoi muri e esser ferma di là da essi
mvrì ci soffitìci catene, perché spesso si
vede e temeromì le travi usa'te de'mvri e rovi-
nare poi i mvri e solari; dove, se sono icatenate,
9 terranno i mvri in si-emfermi, e i mvri fermano i solari.
10 Ancora ti ricordo che tu nò faci mai
i smalì sopra legnìame, imperoìch nel
crescire e discrescire che fa il legname
12 per l'umìdo e secco, spesse volte cre-
pano detti solai e crepa 13 te le loro diuisioni
a poco a poco si fano in polvere e fano
14 brutta evidètia.
15 Ancora ti ricordo ò facci solari suste-
nuti da archì 16 e travi, imperoìch col tépo il
solaro, ch'è sostenuto dalle travi 17 vi, cala al-
quàto in nel suo mezzo, e quella parte
18 del solaro, ch'è sostenuta dal arco, resta
nel suo loco, onde 19 solari che sono soste-
nuti da 2 varie nature di sostèta 20 col paiono
col tépo fatti a colli.

and floors; whilst if they are chained they will
hold the walls strongly together and the
walls will hold the floors. Again I remind
you never to put plaster over timber.
Since by expansion and shrinking of
the timber produced by damp and dryness
such floors often crack, and once cracked
their divisions gradually produce dust and
an ugly effect. Again remember not to
lay a floor on beams supported on arches;
for, in time the floor which is made on
beams settles somewhat in the middle
while that part of the floor which rests on
the arches remains in its place; hence, floors
laid over two kinds of supports look, in
time, as if they were made in hills [19].

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795. 19. M. Ravaïsson, in his edition of MS. A gives a very different rendering of this passage
translating it thus: *Les planchers qui sont soutenus par deux différentes natures de supports paraissent avoir le
temps faits en volute [a chèta].*
Remarks on the style of Leonardo's architecture.

A few remarks may here be added on the style of Leonardo's architectural studies. However incomplete, however small in scale, they allow us to establish a certain number of facts and probabilities, well worthy of consideration.

When Leonardo began his studies the great name of Brunellesco was still the inspiration of all Florence, and we cannot doubt that Leonardo was open to it, since we find among his sketches the plan of the church of Santo Spirito¹ and a lateral view of San Lorenzo (Pl. XCIV No. 1), a plan almost identical with the chapel Degli Angeli, only begun by him (Pl. XCIV, No. 2) while among Leonardo's designs for domes several clearly betray the influence of Brunellesco's Cupola and the lantern of Santa Maria del Fiore².

The beginning of the second period of modern Italian architecture falls during the first twenty years of Leonardo's life. However the new impetus given by Leon Battista Alberti either was not generally understood by his contemporaries, or those who appreciated it, had no opportunity of showing that they did so. It was only when taken up by Bramante and developed by him to the highest rank of modern architecture that this new influence was generally felt. Now the peculiar feature of Leonardo's sketches is that, like the works of Bramante, they appear to be the development and continuation of Alberti's.

¹ See Pl. XCIV, No. 2. Then only in course of erection after the designs of Brunellesco, though he was already dead; finished in 1481.
² A small sketch of the tower of the Palazzo della Signoria (MS. C. A. 399) proves that he also studied mediaeval monuments.
But a question here occurs which is difficult to answer. Did Leonardo, till he quitted Florence, follow the direction given by the dominant school of Brunellesco, which would then have given rise to his "First manner", or had he, even before he left Florence, felt Alberti's influence—either through his works (Palazzo Rucellai, and the front of Santa Maria Novella) or through personal intercourse? Or was it not till he went to Milan that Alberti's work began to impress him through Bramante, who probably had known Alberti at Mantua about 1470 and who not only carried out Alberti's views and ideas, but, by his designs for St. Peter's at Rome, proved himself the greatest of modern architects. When Leonardo went to Milan Bramante had already been living there for many years. One of his earliest works in Milan was the church of Santa Maria presso San Satiro, Via del Falcone.

Now we find among Leonardo's studies of cupolas on Plates LXXXIV and LXXXV and in Pl. LXXX several sketches which seem to me to have been suggested by Bramante's dome of this church.

The MSS. B and Ash. II contain the plans of S. Sepolcro, the pavilion in the garden of the duke of Milan, and two churches, evidently inspired by the church of San Lorenzo at Milan.

MS. B contains besides two notes relating to Pavia, one of them a design for the sacristy of the Cathedral at Pavia, which cannot be supposed to be dated later than 1492, and it has probably some relation to Leonardo's call to Pavia June 21, 1490. These and other considerations justify us in concluding, that Leonardo made his studies of cupolas at Milan, probably between the years 1487 and 1492 in anticipation of the erection of one of the grandest churches of Italy, the Cathedral of Pavia. This may explain the decidedly Lombardo-Bramantesque tendency in the style of these studies, among which only a few remind us of the forms of the cupolas of S. Maria del Fiore and of the Baptistry of Florence. Thus, although when compared with Bramante's work, several of these sketches plainly reveal that master's influence, we find, among the sketches of domes, some, which show already Bramante's classic style, of which the Tempietto of San Pietro in Montorio, his first building executed at Rome, is the foremost example.

On Plate LXXXIV is a sketch of the plan of a similar circular building; and the Mausoleum on Pl. XCVIII, no less than one of the pedestals for the statue of Francesco Sforza (Pl. LXV), is of the same type.

1 Evidence of this I intend to give later on in a Life of Bramante, which I have in preparation.

2 The sketch of the plan of Brunellesco's church of Santo Spirito at Florence, which occurs in the same Manuscript, may have been done from memory.

3 It may be mentioned here, that in 1494 Bramante made a similar design for the lantern of the Cupola of the Church of Santa Maria delle Grazie.
The drawings Pl. LXXXIV No. 2, Pl. LXXXVI No. 1 and 2 and the ground floor of the building in the drawing Pl. XCI No. 2, with the interesting decoration by gigantic statues in large niches, are also, I believe, more in the style Bramante adopted at Rome, than in the Lombard style. Are we to conclude from this that Leonardo on his part influenced Bramante in the sense of simplifying his style and rendering it more congenial to antique art? The answer to this important question seems at first difficult to give, for we are here in presence of Bramante, the greatest of modern architects, and with Leonardo, the man comparable with no other. We have no knowledge of any buildings erected by Leonardo, and unless we admit personal intercourse—which seems probable, but of which there is no proof—it would be difficult to understand how Leonardo could have affected Bramante’s style. The converse is more easily to be admitted, since Bramante, as we have proved elsewhere, drew and built simultaneously in different manners, and though in Lombardy there is no building by him in his classic style, the use of brick for building, in that part of Italy, may easily account for it.

Bramante’s name is incidentally mentioned in Leonardo’s manuscripts in two passages (Nos. 1414 and 1448). On each occasion it is only a slight passing allusion, and the nature of the context gives us no due information as to any close connection between the two artists.

It might be supposed, on the ground of Leonardo’s relations with the East given in sections XVII and XXI of this volume, that some evidence of oriental influence might be detected in his architectural drawings. I do not however think that any such traces can be pointed out with certainty unless perhaps the drawing for a Mausoleum, Pl. XCVIII.

Among several studies for the construction of cupolas above a Greek cross there are some in which the forms are decidedly monotonous. These, it is clear, were not designed as models of taste; they must be regarded as the results of certain investigations into the laws of proportion, harmony and contrast.

The designs for churches, on the plan of a Latin cross are evidently intended to depart as little as possible from the form of a Greek cross; and they also show a preference for a nave surrounded with outer porticos.

The architectural forms preferred by Leonardo are pilasters coupled (Pl. LXXXII No. 1) or grouped (Pl. LXXX No. 5 and XCVI No. 4), often combined with niches. We often meet with orders superposed, one in each story, or two small orders on one story, in combination with one great order (Pl. XCVI No. 2).
The drum (tamburo) of these cupolas is generally octagonal, as in the cathedral of Florence, and with similar round windows in its sides. In Pl. LXXXVII No. 2 it is circular like the model actually carried out by Michael Angelo at St. Peter's.

The cupola itself is either hidden under a pyramidal roof, as in the Baptistery of Florence, San Lorenzo of Milan and most of the Lombard churches (Pl. XCI No. 1 and Pl. XCII No. 1); but it more generally suggests the curve of Sta Maria del Fiore (Pl. LXXXVIII No. 5; Pl. XL No. 2; Pl. LXXXIX, M; Pl. XL No. 4, Pl. XCVI No. 2). In other cases (Pl. LXXX No. 4; Pl. LXXXIX; Pl. XC No. 2) it shows the sides of the octagon crowned by semicircular pediments, as in Brundelesco's lantern of the Cathedral and in the model for the Cathedral of Pavia.

Finally, in some sketches the cupola is either semicircular, or as in Pl. LXXXVII No. 2, shows the beautiful line, adopted sixty years later by Michael Angelo for the existing dome of St. Peter's.

It is worth noticing that for all these domes Leonardo is not satisfied to decorate the exterior merely with ascending ribs or mouldings, but employs also a system of horizontal parallels to complete the architectural system. Not the least interesting are the designs for the tiburio (cupola) of the Milan Cathedral. They show some of the forms, just mentioned, adapted to the peculiar gothic style of that monument.

The few examples of interiors of churches recall the style employed in Lombardy by Bramante, for instance in S. Maria di Canepanno at Pavia, or by Dolecchnono in the Monastero Maggiore at Milan (see Pl. CI No. 1 [C. A. 181]; 546]; Pl. LXXXIV No. 10).

The few indications concerning palaces seem to prove that Leonardo followed Alberti's example of decorating the walls with pilasters and a flat rustica, either in stone or by graffiti (Pl. CII No. 1 and Pl. LXXXV No. 14).

By pointing out the analogies between Leonardo's architecture and that of other masters we in no way pretend to depreciate his individual and original inventive power. These are at all events beyond dispute. The project for the Mausoleum (Pl. XCVIII) would alone suffice to rank him among the greatest architects who ever lived. The peculiar shape of the tower (Pl. LXXX), of the churches for preaching (Pl. XCVII No. 1 and pages 56 and 57, Fig. 1—4), his curious plan for a city with high and low level streets (Pl. LXXVII and LXXVIII No. 2 and No. 3), his Loggia with fountains (Pl. LXXXII No. 4) reveal an originality, a power and facility of invention for almost any given problem, which are quite wonderful.
In addition to all these qualities he probably stood alone in his day in one department of architectural study,—his investigations, namely, as to the resistance of vaults, foundations, walls and arches.

As an application of these studies the plan of a semicircular vault (Pl. CIII No. 2) may be mentioned here, disposed so as to produce no thrust on the columns on which it rests: volta i botte e non ispignie ifori le colone. Above the geometrical patterns on the same sheet, close to a circle inscribed in a square is the note: la ragiò d’una volta cioè il terzo del diametro della sua . . . del tedesco in domo.

There are few data by which to judge of Leonardo’s style in the treatment of detail. On Pl. LXXXV No. 10 and Pl. CIII No. 3, we find some details of pillars; on Pl. CI No. 3 slender pillars designed for a fountain and on Pl. CIII No. 1 M.S. B, is a pen and ink drawing of a vase which also seems intended for a fountain. Three handles seem to have been intended to connect the upper parts with the base. There can be no doubt that Leonardo, like Bramante, but unlike Michael Angelo, brought infinite delicacy of motive and execution to bear on the details of his work.
Leonardo's eminent place in the history of medicine, as a pioneer in the sciences of Anatomy and Physiology, will never be appreciated till it is possible to publish the mass of manuscripts in which he largely treated of these two branches of learning. In the present work I must necessarily limit myself to giving the reader a general view of these labours, by publishing his introductory notes to the various books on anatomical subjects. I have added some extracts, and such observations as are scattered incidentally through these treatises, as serving to throw a light on Leonardo's scientific attitude, besides having an interest for a wider circle than that of specialists only.

VASARI expressly mentions Leonardo's anatomical studies, having had occasion to examine the manuscript books which refer to them. According to him Leonardo studied Anatomy in the companionship of Marc Antonio della Torre "aiutato e scambievolmente aiutando."—This learned Anatomist taught the science in the universities first of Padua and then of Pavia, and at Pavia he and Leonardo may have worked and studied together. We have no clue to any exact dates, but in the year 1506 Marc Antonio della Torre seems to have not yet left Padua. He was scarcely thirty years old when he died in 1512, and his writings on anatomy have not only never been published, but no manuscript copy of them is known to exist.

This is not the place to enlarge on the connection between Leonardo and Marc Antonio della Torre. I may however observe that I have not been able to discover in Leonardo's manuscripts on anatomy any mention of his younger contemporary. The few quotations which occur from writers on medicine—either of antiquity or of the middle ages are printed in Section XXII. Here and there in the manuscripts mention is made of an anonymous "adversary" (avversario) whose views are opposed and refuted by Leonardo, but there is no ground for supposing that Marc Antonio della Torre should have been this "adversary".

Only a very small selection from the mass of anatomical drawings left by Leonardo have been published here in facsimile, but to form any adequate idea of their scientific...
merit they should be compared with the coarse and inadequate figures given in the
published books of the early part of the XVI. century.

William Hunter, the great surgeon—a competent judge—who had an opportunity
in the time of George III. of seeing the originals in the King's Library, has thus
recorded his opinion: "I expected to see little more than such designs in Anatomy as
might be useful to a painter in his own profession. But I saw, and indeed with
astonishment, that Leonardo had been a general and deep student. When I consider
what pains he has taken upon every part of the body, the superiority of his universal
genius, his particular excellence in mechanics and hydraulics, and the attention with
which such a man would examine and see objects which he has to draw, I am fully
persuaded that Leonardo was the best Anatomist, at that time, in the world ... Leo-
ardo was certainly the first man, we know of, who introduced the practice of making
anatomical drawings" (Two introductory letters. London 1784, pages 37 and 39).

The illustrious German Naturalist Johan Friedrich Blumenbach esteemed them
no less highly; he was one of the privileged few who, after Hunter, had the chance
of seeing these Manuscripts. He writes: Der Scharfblick dieses grossen Forschers
und Darstellers der Natur hat schon auf Dinge geachtet, die noch Jahrhunderte nachher
unbemerkt geblieben sind" (see Blumenbach's medicinische Bibliothek, Vol. 3, St. 4.
1795, page 728).

These opinions were founded on the drawings alone. Up to the present day hardly
anything has been made known of the text, and, for the reasons I have given, it is my
intention to reproduce here no more than a selection of extracts which I have made from
the originals at Windsor Castle and elsewhere. In the Bibliography of the Manuscripts, at
the end of this volume a short review is given of the valuable contents of these Anato-
mical note books which are at present almost all in the possession of her Majesty the
Queen of England. It is, I believe, possible to assign the date with approximate accu-
rracy to almost all the fragments, and I am thus led to conclude that the greater part of
Leonardo's anatomical investigations were carried out after the death of della Torre.

Merely in reading the introductory notes to his various books on Anatomy which are
here printed it is impossible to resist the impression that the Master's anatomical studies
bear to a very great extent the stamp of originality and independent thought.
ANATOMY.

W. An. IV. 167-0]

Voglio far miracoli;—'abbi mè che li altri o'mini più quieti, e 4'quelli che vogliono ar'ricchirsi in ù'di; vivi 6'nel lungo tépo in 7'grà povertà, co'8me interviene e 9'interverrà in etter10no alli alchimisti, 11'cercatòri di cre'tare oro e argètto, 13'e alli'igegni che 14'vogliono che l'a'15qua morta dia 16'vita motiua 17'a se medesima 18'con cotinuo 19'moto, 20'e al sómo stol21to negromante 22'e icantatore.

23'E tu che dici, esser me24'glìo il uedere fare 25'l'anatomia, che uede26're tali disegni, dire27'sti bene, se fusse 28'possibile vedere tu'29'ette queste cose che 30'in tal disegni si dis13'mostrano in una 32'sola figura, nella 33'quale con tutto il tu34'no ingenio nò vedrà25'i, e non avrai la no35'titia, se nò d'alquà37'te poche vene, del38'e quali io, per aver39'ne · vera · e piena 40'no'titia, ò disfatti 41'piv di dieci co42'pi vmani, 43'di-

I wish to work miracles;—it may be A general introduction

796. Lines 1—59 and 60—89 are written in two parallel columns. When we here find Leonardo putting himself in the same category as the Alchemists and Necromancers, whom he elsewhere mocks at so bitterly, it is evidently meant ironically. In the same way Leonardo, in the introduction to the Books on Perspective sets himself with transparent satire on a level with other writers on the subject.

Line 23 and the following seem to be directed against students of painting and young artists rather than against medical men and anatomists.
struggling with many others, I must say how the minute particles of the flesh, which are surrounded without causing them to bleed, excepting the insensible bleeding of the capillary veins, and as one single body would not last so long, since it was necessary to proceed with several bodies by degrees, until I came to an end and had a complete knowledge; this I repeated twice, to learn the differences [59].

And if you should have a love for such things you might be prevented from loathing, and if that did not prevent you, you might be deterred by the fear of living in the night hours in the company of those corpses, quartered and flayed and horrible to see. And if this did not prevent you, perhaps you might not be able to draw so well as is necessary for such a demonstration; or, if you had the skill in drawing, it might not be combined with knowledge of perspective; and if it were so, you might not understand the methods of geometrical demonstration and the method of the calculation of forces and of the strength of the muscles; patience also may be wanting, so that you lack perseverance. As to whether all these things were found in me or not [84], the hundred and twenty books composed by me will give verdict Yes or No. In these I have been hindered neither by avarice nor negligence, but simply by want of time. Farewell [89].
ANATOMY.

da · uno grado d'accrescimento · a · uno altro, e che cosa lo spinga fori del corpo della madre, e per che cagione qualche volta · lui · uèga fori · dal uètro di sua madre nati al debito tépo.

7 Poi disciurai quali mebra sieno · quelle · che crescono · poi · che'l putto è nato · piv che l'altre, 8 e da la misura d'u putto · d'un anno.

9 Poi discrivi l'omo crescivo e la femina · sue · misure · e nature di complessione colore · e fisonomie.

10 Di poi descrivi com'egli è còposto · di uene · nerui · muscoli · e ossa; Questo farai nell'ultimo del libro; 11 di poi figura · in · 4 storie · quattro universali casi dell'omini · cioè lettizia · con uari atti di ridere, 11 e figura · la cagió · del riso · piàto · in vari medi colla · sua · cagione ·; còtentione con uari movi'méti · d'uccisione ·; fughe · pavre · ferocità · ardiméti · e · tutte cose appartenenti a simili casi; 12 di poi figura · vna fatica · tirare · spingnere · portare · fermare · sostenere · e simil 13 cose;

14 Di poi discrivi attitudine · e movimento;

15 di poi prospettiva · per l'offito e effetti dell'ochio · e dell' udito ·— dirai di mvschica · e descrivi dell' altri sèsi.

16 Di poi discrivi la natura · de' sensi.

17 Questa figura strumelaté dell'omo dimostreremo in · figure · delle · quali le 3 prime saranno la ramificazione delle ossa · cioè vna dinazi · che 23 dimostrì l'altitudine de' siti · e figure dell'ossi · la seconda sarà veduta in · profilò · e mostrerà la profondità · del tutto · e delle parti · e loro sito; La 3ª 18 figura fia dimostratrice delle ossa dalla parte dirieto; Di poi faremo 25 3 altre figure ne' simili aspetti · colle ossa segate · nelle quali si vedranno le lor 25 grossezze · e uacuità · 3 altre figure faremo dell'ossa inte · e de' nerui · che na 27 scono dalla nuca · e in che mebra ramificano; E 3 altre de'ossae · e que · e do 28 ve · ramificano · poi 3 con muscoli · e 3 con pelle · e figure propor · tionate · e 3 della femina per dimostrare matrice · e vene · mestrali · 30 che vanno alle poppe.

one stage of growth and another. What it is that forces it out from the body of the mother, and for what reasons it sometimes comes out of the mother's womb before the due time.

Then I will describe which are the members, which, after the boy is born, grow more than the others, and determine the proportions of a boy of one year.

Then describe the fully grown man and woman, with their proportions, and the nature of their complexions, colour, and physiognomy.

Then how they are composed of veins, tendons, muscles and bones. This I shall do at the end of the book. Then, in four drawings, represent four universal conditions of men. That is, Mirth, with various acts of laughter, and describe the cause of laughter. Weeping in various aspects with its causes. Contention, with various acts of killing; flight, fear, ferocity, boldness, murder and every thing pertaining to their case. Then represent Labour, with pulling, thrusting, carrying, stopping, supporting and such like things.

Further I would describe attitudes and movements. Then perspective, concerning the functions and effects of the eye; and of hearing—here I will speak of music—, and treat of the other senses.

And then describe the nature of the senses. This mechanism of man we will demonstrate in · figures; of which the three first will show the ramifications of the bones; that is: first one to show their height and position and shape: the second will be seen in profile and will show the depth of the whole and of the parts, and their position. The third figure will be a demonstration of the bones of the backparts. Then I will make three other figures from the same point of view, with the bones sawn across, in which will be shown their thickness and hollowness. Three other figures of the bones complete, and of the nerves which rise from the nape of the neck, and in what limbs they ramify. And three others of the bones and veins, and where they ramify. Then three figures with the muscles and three with the skin, and their proper proportions; and three of woman, to illustrate the womb and the menstrual veins which go to the breasts.
ANATOMY.

Ordine del libro.

...Questa mia figurazione del corpo umano si sarà dimostrata nelattei, che se tu vuoi bene conoscere le parti dell'omo anatomizzato, tu lo vuoi — o l'occio tuo — per diversi aspetti, quello conside-rando di sotto, e di sopra, e dalli lati, voltando—lo e cercando l'origine di ciascun membro, e i tal modo la notomia naturale à soleisfatta alla tua notitia; Ma tu aì a intedere, che tal notizia non ti lascia sad-disfatto, coosioschê la gràdissima confusione che...resulta della mistione di pausici misti cò une, arterie, nerui, corde, muscoli, ossi, sangue, il quale tigine di se ogni parte d'un medesimo colo...re, e le vene, che di tal sangue si votano non sono conosciute per la lor dim...nutione, e la integrità delle pannicoli, nel cercare le parti che dentro a loro s'includono, si viene a rompere, e la lor trasparet...tinta di sangue, ò...no ti lascia conoscere le parti coperte da loro per la similit...dine del lor color insanguinato, e nò puoi avere la notitia dell'ù che tu ò...no coconda e distrugga l'altro: adunque è necessario fare più notomie, delle quali 3 te ne bisogna per auere piena notitia delle vene e arterie, distru...gòdo con sôma diligentia tutto il rimanete, e altre 3 per auere la notitia dell'...ennicoli, e 3 per le corde e muscoli e legamenti, e 3 per li ossi e car...tilagini, e 3 per la notomia delle ossa, le quali s'anno a segare e dimo...3rare, quale è buso e quale no, quale è midoloso, quale è spugno...so, e quale è grosso dal fori al dentro, e quale è sottile, è alcuno à in al...cuna parte grà sottigliezza, e in alcuna è grosso, e in alcuna busa, o...
ANATOMY.

piena 24 d'osso, o nidollosa, o spugnosa; e così tutte queste cose saranno alcuna volta trovatate in un medesimo osso, e alcuno osso fia che non à nessuna; e 3 te ne bisogna fare per la donna, nella quale è grà mistério, mediante la matrice e suo feto; 27 adunque per il mio disegno ti fia noto ogni parte e tutto mediante la dimostrazione di 3 diversi aspetti di ciascuna parte, perché quando tu avrai veduto alcuni membri dalla parte dinanzi con qualche nervo, corda, o vena che 30 nasca dalla opposita parte, ti fia dimostro il medesimo mebro volto per lato 31 o dritto—non altermètì che se tu auessi in mano il medesimo mebro e andasì!si lo voltato di parte in parte insino a tanto che tu auessi piena notizia di quel locus che tu desideri sapere, e così similmente ti fia posto inanti in tre o 34 dimostrazioni di ciascui mebro per diversi aspetti in modo che tu resterai con 35 vera e piena notitia di quello che tu vuoi sapere della figura dell'omo.

36 Adunque qui con 12 figure intere ti sarà mostrata la cosmografia del minor 37 modo col medesimo ordine che inizi a me fu fatto da Tolomeo nella sua cosmografia, e così diudìo poi quelle in mebra, come lui diisse il tutto in provincie; 39 e poi dirò l'ufficio della parti per ciascui verso, mettedoti dinati alli ochi la notizia di tutta la figura e valutidine della omó inquiato a moto locale mediante le sue parti. 41 E così piacessi al nostro autore che io potessi dimostare la natura delli omini e loro costumi nel modo che io descrivo la sua figura.

42 E ricordati che la notomia delleri non ti darà la situazione della loro ramificazione, né in quali muscoli essi si ramificano mediante li corpi disfatti in acqua 45 corrette, o in acqua di calcina, perché, ancorché ti riga la origine de loro nascimenti senza tale acqua come coll' acqua, le ramificazioni loro pel corso dell'acqua si vengono a vire, non altermètì che si fascia il lino o canapa perennata per filare, tutto in vn fascio in modo che impossibile è a ritrovare in quali muscoli o cò quale 49 o cò quàte ramificazioni li nervi s'infondono ne' predetti muscoli. in one and the same bone, and in some bodies none of them. And three you must have for the woman, in which there is much that is mysterious by reason of the womb and the foetus. Therefore my drawings every part will be known to you, and all by means of demonstrations from three different points of view of each part; for when you have seen a limb from the front, with any muscles, sinews, or veins which take their rise from the opposite side, the same limb will be shown to you in a side view or from behind, exactly as if you had that same limb in your hand and were turning it from side to side until you had acquired a full comprehension of all you wished to know. In the same way there will be put before you three or four demonstrations of each limb, from various points of view, that you will be left with a true and complete knowledge of all you wish to learn of the human figure[35].

Thus, in twelve entire figures, you will have set before you the cosmography of this lesser world on the same plan as, before me, was adopted by Ptolemy in his cosmography; and so I will afterwards divide them into limbs as he divided the whole world into provinces; then I will speak of the function of each part in every direction, putting before your eyes a description of the whole form and substance of man, as regards his movements from place to place, by means of his different parts. And thus, if it please our great Author, I may demonstrate the nature of men, and their customs in the way I describe his figure.

And remember that the anatomy of the nerves will not give the position of their ramifications, nor show you which muscles they branch into, by means of bodies dissected in running water or in lime water; though indeed their origin and starting point may be seen without such water as well as with it. But their ramifications, when under running water, cling and unite—just like flat or hemp carded for spinning—all into a skein, in a way which makes it impossible to trace in which muscles or by what ramification the nerves are distributed among those muscles.

798. 35. Compare Pl. CVII. The original drawing at Windsor is 28½ X 19½ centimetres. The upper figures are slightly washed with Indian ink. On the back of this drawing is the text No. 1140.
The arrangement of anatomy.

First draw the bones, let us say, of the arm, and put in the motor muscle from the shoulder to the elbow with all its lines. Then proceed in the same way from the elbow to the wrist. Then from the wrist to the hand and from the hand to the fingers. 

And in the arm you will put the motors of the fingers which open, and these you will show separately in their demonstration. In the second demonstration you will clothe these muscles with the secondary motors of the fingers and so proceed by degrees to avoid confusion. But first lay on the bones those muscles which lie close to the said bones, without confusion of other muscles; and with these you may put the nerves and veins which supply their nourishment, after having first drawn the tree of veins and nerves over the simple bones.

Begin the anatomy at the head and finish at the sole of the foot.

W. An. IV. XXI]

Comincia la notomia alla testa e finisci nella piatta del piede.

W. An. IV. 396 (0)

3 uomini finiti, 3 con ossa e nerii, 3 con ossa semplici; 4. Queste sono 12 dimostrazioni di figure itere.

W. An. IV. 151 a]

Quando tu a finito di crescere l'omo, tu farai la statua, e tu tutte sue misure, semplici.

When you have finished building up the man, you will make the statue with all its superficial measurements.

800. effusiscula.

601. homini. 2. chon. 3. semplici. 6. tiere. 802. crescire... ettu. 3. lassuata. chô.

802. Crescire l'omo. The meaning of this expression appears to be different here and in the passage C.A. 157 a, 468 a (see No. 526, Note 1. 2). Here it can hardly mean anything else than modelling, since the sculptor forms the figure by degrees, by adding wet clay and the figure consequently increases or grows. Tu farai la statua would then mean, you must work out the figure in marble. If this interpretation is the correct one, this passage would have no right to find a place in the series on anatomical studies. I may say that it was originally inserted in this connection under the impression that di crescere should be read descrivere.
803. You must show all the motions of the bones with their joints to follow the demonstration of the first three figures of the bones, and this should be done in the first book.

804. Remember that to be certain of the point of origin of any muscle, you must pull the sinew from which the muscle springs in such a way as to see that muscle move, and where it is attached to the ligaments of the bones.

Note.

You will never get any thing but confusion in demonstrating the muscles and their positions, origin, and termination, unless you first make a demonstration of thin muscles after the manner of linen threads; and thus you can represent them, one over another as nature has placed them; and thus, too, you can name them according to the limb they serve; for instance the motor of the point of the great toe, of its middle bone, of its first bone, &c. And when you have the knowledge you will draw, by the side of this, the true form and size and position of each muscle. But remember to give the threads which explain the situation of the muscles in the position which corresponds to the central line of each muscle; and so these threads will demonstrate the form of the leg and their distance in a plain and clear manner.

I have removed the skin from a man who was so shrunk by illness that the muscles were worn down and remained in a state like thin membrane, in such a way that the sinews instead of merging in muscles ended in wide membrane; and where the bones were covered by the skin they very little over their natural size.

803. Anatomia. 804.
Quale nervo è cagione del moto del l'occhio a fare che 'l moto dell'uno occhio tiri l'altro.

Del chiedere le ciglia, dello alzare le ciglia, dello abbassare le ciglia, del chiedere li ochi, dello aprire li ochi, dello alzare le narici, del aprire le labra co deti serratì, dell'apputare le labra, del ridere, del maravigliarsi.

A disegnare il principio dell'omo quando elli si cava nella matrice, e perché uno putto non vive d'otto mesi; che cosa è starnuto, che cosa è sbadiglio, mal-maestro, spasmo, paralitico, tremito di freddo, sudore, stanchezza, fame, sonno, sete, lussuria.

Del neruo ch'è cagione del moto della spalla al gomito, del moto che è dal gomito alla mano, dalla givntura della mano al nascimeto de diti, dal nascimeto de diti al loro mezzo e dal mezzo all'ultimo nodo.

Del neruo che è cagione del moto della coscia, e dal ginochio al piè, e dalla givntura del piè ai diti e così ai lor mezzi, e del girare d'essa gamba.

Quali nerui over corde della mano sò quelle che accostano e discostano li diti della mano e de' piedi l'un dall'altro?

Scegli a grado a grado tutte le parti dinanti dell'omo nel fare la tua notomia, e così insino in sull'osso; descrizione de' mebra della vita e lor trauagiamèti.

Remove by degrees all the parts of the front of a man in making your dissection, till you come to the bones. Description of the parts of the bust and of their motions.

Fa la notomia della gà'ba insino al fiàco per tutti i versi e per tutti li atti e in  

Give the anatomy of the leg up to the hip, in all views and in every action and in

A straightened leg in profile is sketched by the side of this text.
tutte le spoglie, vene, arterie, nerii, corde e muscoli, pelle e ossa, e poi dell’ossa segate per vedere la grossezza dell’ossa.

809. Farai regola e misura di ciascun muscolo, e renderai ragione di tutti li loro virti, e in che modo s’adoperano e che muove ecc.

810. Describe which muscles disappear in growing fat, and which become visible in growing lean.

811. Of the human figure.

809. The two drawings given on Pl. CVIII no. 1 come between lines 3 and 4. A good and very early copy of this drawing without the written text exists in the collection of drawings belonging to Christ’s College Oxford, where it is attributed to Leonardo.
ANATOMY.

8Infra le parti che dimagrano qual'è quella che si fa più magra?
10 Degli omini poterti in forze quali muscoli son di mag'igiore grossezza e più elevati?
15 Tu aì a figurare nella tua anatomia tutti li gradi delle membra dalla creazione dell'omo insino alla sua morte, e insino alla morte dell'osso, e qual parte d'esso prima si cosoma e qual più si cossera.
20 E similmente dall'ultima magrezza all'ultima grassezza.

S. K. M. III. 66a]

NOTOMIA.

2I membri semplici sono: vn dicioccartilagine ossi nerui vene arterie pan-
nicolici legamenti e corde, cotica e carne e grasso.

DEL CAPO.

7 Le parti del uaso del capo sono: cioè 5 contenenti e 5 contenute; le conten-
tenti sono: capeci ciotic carne muscolosa panciclo gresso e l' cranere primo madre ciervello poi la rete mirabile poi è l'osso, fondamento del celebro e donde nascono li nerui.

S. K. M. III. 65a]

a capelli
n cotica
c carne muscolosa
m paranico grosso
os cranio ciocoo so
b dura madre
d pia madre
f ciervello
r pia madre di sotto
l dura madre
l rete mirabile
s osso fondameto.

812.

ANATOMY.

There are eleven elementary tissues:—
Cartilage, bones, nerves, veins, arteries, fascia, ligament and sinews, skin, muscle and fat.

OF THE HEAD.

The divisions of the head are 10, viz.
5 external and 5 internal, the external are the hair, skin, muscle, fascia and the skull; the internal are the dura mater, the pia mater, which enclose the brain. The pia mater and the dura mater come again underneath and enclose the brain; then the rete mirabile, and the occipital bone, which supports the brain from which the nerves spring.

813.

a. hair
n. skin
c. muscle
m. fascia
o. skull i. e. bone
b. dura mater
d. pia mater
f. brain
r. pia mater, below
t. dura mater
l. rete mirabile
s. the occipital bone.

S. K. M. III. 65b]

812. 3. ossi. 4. panichici. 5. codigae. 8. he 5 coteute. 9. codiga. 10. muscolosa. 14. asce ringiugano. 15. elloso. 16. mascie.

813. 2. codiga. 6. [f ciervelli].

813. See Pl. CVIII, No. 3.
Causa dell’altare, \(^2\) causa del moto del core, \(^3\) causa del umanito, \(^4\) causa del discedere il queso dallo stomaco, \(^5\) causa del vomare li itestini; \(^6\) Causa del moto delle superfluità per le intestini; \(^7\) Causa dello inghiottire, \(^8\) causa dello tollerare, \(^9\) causa dello smalire, \(^10\) causa dello starnuto, \(^11\) causa dell’adormetanümico di diverse mèbra; \(^12\) Causa del perdere il sèso \(^{13}\) ad alcù mèbro; \(^14\) Causa del solletico; \(^15\) Causa della lussuria e al`tre necessità del corpo, \(^16\) causa dell’orinare, \(^17\) e così di tutte le lotioni naturali del corpo.

Le lagrime \(^8\) vengono dal core e nò dal cereuolo. \(^5\) Definisci tutte le parti di che si composer il corpo, co’minciadosi dalla cute colla sua so’praveste, la qual \(^1\) è spessa spiccatà \(^9\) mediante il sole.

Of the cause of breathing, of the cause Physiological of the motion of the heart, of the cause of vomiting, of the cause of the descent of food from the stomach, of the cause of emptying the intestines.

Of the cause of the movement of the superfluous matter through the intestines.

Of the cause of swallowing, of the cause of coughing, of the cause of yawning, of the cause of sneezing, of the cause of limbs getting asleep.

Of the cause of losing sensibility in any limb.

Of the cause of tickling.

Of the cause of lust and other appetites of the body, of the cause of urine and also of all the natural excretions of the body.

The tears come from the heart and not from the brain.

Define all the parts, of which the body is composed, beginning with the skin with its outer cuticle which is often chapped by the influence of the sun.
II.

ZOOLOGY AND COMPARATIVE ANATOMY.

Uomo | la descrizione dell’omo, nella qual si contengono quelli che son qua’si di simile specie come babbuino, scimmia e simili che so molti.

Leone | e suoi seguaci come pantieri, leonze, tigri, liopardi, lupi, cervi’ti, gatti di Spagna, gannetti e gatti commivi e simili.

Cavallo e sua seguaci come mulo, asino e simili che anno denti sopra e di sotto.

Toro | e sua seguaci cornuti e senza denti di sopra come bufolo, ceruio, daino capriolo, pecore, capre, stambecchi, mvcheri, camozze, giraffe.

Man. The description of man, which includes that of such creatures as are of almost the same species, as Apes, Monkeys and the like, which are many, The Lion and its kindred, as Panthers. Wildcats (?), Tigers, Leopards, Wolfs, Lynxes, Spanish cats, common cats and the like, The Horse and its kindred, as Mule, Ass and the like, with incisor teeth above and below, The Bull and its allies with horns and without upper incisors as the Buffalo, Stag Fallow Deer, Wild Goat, Swine, Goat, wild Goats Muskdeers, Chamois, Giraffe.

Scrivi le varietà delle intestini della specie vma’na, scimie e simili; Di poi in che si varia la spec’tie leonina, di poi la bovina. *e* ultimo li uccelli, *e* vsa tal descritt’tione a uso di discorso.

Describe the various forms of the intestines of the human species, of apes and such like. Then, in what way the leonine species differ, and then the bovine, and finally birds; and arrange this description after the manner of a disquisition.

816. homo la . . . contiene . . . chesson. 2. essimili. 3. essa seguace . . . tigre. 4. gannetti . . . essimili. 5. chavallo . . [cerrvo] essimili cano. 6. essanta. 7. pechore . . stambbeche mvcheri

817. 2. dell’intestini. 4. essi. 7. elonina. 9. ucielli. 10. discip.

816. z. Leomez—wild cat? “Secondo alcuni, lo stesso che Leomessa; e secondo altri con più certezza, lo stesso che Pantiera.” FANFANI, Vocabolario page 858.
Procure the placenta of a calf when it is born and observe the form of the cotyledons if their cotyledons are male or female.

Describe the tongue of the woodpecker and the jaw of the crocodile.

Of the flight of the 4th kind of butterflies that consume winged ants. Of the three principal positions of the wings of birds in downward flight.

Of the way in which the tail of a fish acts in propelling the fish; as in the eel, snake and leech.

Dimostrazione secōda interposta infra l'anatomia e 'l uiuo.

A second demonstration inserted between anatomy and [the treatise on] the living being. You will represent here for a comparison, the legs of a frog, which have a great resemblance to the legs of man, both in the bones and in the muscles. Then, in continuation, the hind legs of the hare, which are very muscular, with strong active muscles, because they are not encumbered with fat.

820. 4. A passing allusion is all I can here permit myself to Leonardo's elaborate researches into the flight of birds. Compare the observations on this subject in the Introduction to section XVIII and in the Bibliography of Manuscripts at the end of the work.

821. A sketch of a fish, swimming upwards is in the original, inserted above this text.—Compare No. 1114.

823. This text is written by the side of a drawing in black chalk of a nude male figure, but there is no connection between the sketch and the text.
Qui fo ricordo di dimostrare la differenza ch'è dall'uomo al cavallo, e similmente del altri animali; e prima comincerò all'ossa, e proseghirò tutti li muscoli che senza corde nascono e finiscono nelle ossa, e poi di quelli che co' corda nascono e finiscono nell'ossa, e poi di quelle che con una sola corda da v. canto.

Nota delle piegature delle giuutre, e in che modo cresce la carne sopra di loro nelli loro piegamenti e stendimenti; e di questa portassima notitia fa uno particolare trattato [nella descrizione de movimenti dell'animali di quattro piedi, infra li quali è l'omo che ancora lui nella infanzia va co' 4 piedi.

L'andare dell'omo è sempre a uso dell'universale andare dell'animali di 4 piedi, imperocchè siccome essi movono i loro piedi in croce a vso del trotto del cavallo, così l'omo in croce si move le sue 4 mebra, cioè se caccia inanzi il piè destro per caminare, egli caccia inizi co quello il braccio sinistro, e sempre così seguita.

Note on the bendings of joints and in what way the flesh grows upon them in their flexions or extensions; and of this most important study write a separate treatise: in the description of the movements of animals with four feet; among which is man, who likewise in his infancy crawls on all fours.

The walking of man is always after the universal manner of walking in animals with 4 legs, inasmuch as just as they move their feet crosswise after the manner of a horse in trotting, so man moves his 4 limbs crosswise; that is, if he puts forward his right foot in walking he puts forward, with it, his left arm and vice versa, invariably.

824. See Pl. CVIII, No. 2.
III.

PHYSIOLOGY.

W. An. IV. 173 sq]

Ho trovato nella compositione del corpo vmano che, come in tutte le composizioni deli' animali, esso è di piov ottusi e grossi sensitiviti; così è composto di strumeto manco ingegnoso e di lochi maco capaci a ricevere la virtù de' sensi; ò veduto nella spetie leonicna il senso dell'odorato avere parte della substantia del celabro, e discer- dere li narici, capace ricettaculo contro al senso dello odorato, il quale entra infra grà numero di saccoli cartilaginosi con assai vie contro all'avvenimento del predetto celabro.

9 Li ochi della spetie leonina àno gran parte della lor testa per lor ricettacolo, e li nerui ottici immediate congiugnersi al celabro; il che al1°li omini si uede in contrario, perchè le casse deli' ochi sono vnà picco la parte del capo, e li nerui ottici sono sottili e lunghi e deboli, e per debo- le operatione si uede di loro il di, e peggio la notte, e li predetti animali vedono in nella notte che 'l giorno; e 'l segno se ne vede, perchè predano di notte dormono il giorno come fàno ancora li ucelli notturni.

I have found that in the composition of the human body as compared with the bodies of animals the organs of sense are dullest and coarser. Thus it is composed of less ingenious instruments, and of spaces less capacious for receiving the faculties of sense. I have seen in the Lion tribe that the sense of smell is connected with part of the substance of the brain which comes down the nostrils, which form a spacious receptacle for the sense of smell, which enters by a great number of cartilaginous vesicles with several passages leading up to where the brain, as before said, comes down.

The eyes in the Lion tribe have a large part of the head for their sockets and the optic nerves communicate at once with the brain; but the contrary is to be seen in man, for the sockets of the eyes are but a small part of the head, and the optic nerves are very fine and long and weak, and by the weakness of their action we see by day but badly at night, while these animals can see as well at night as by day. The proof that they can see is that they prowl for prey at night and sleep by day, as nocturnal birds do also.

827. 1. ottrovato...composizione...chove. 3. chosi e composto...manco...mancho. 4. chapaci. 5. nel senso...sustantia del celabro discé. 6. ricettaculo. 7. sacchi cartilaginosi. 9. testa. 10. ricettaculo elli...otti...congiugerisi. 11. li...chasse...picho. 12. elli...elunghi. 13. eppeggo...elli. 14. vegan inela...gorno. 15. dormano il gorno...fano...uccelli.

VOL. II.
Every object we see will appear larger at midnight than at midday, and larger in the morning than at midday.

This happens because the pupil of the eye is much smaller at midday than at any other time.

In proportion as the eye or the pupil of the owl is larger in proportion to the animal than that of man, so much the more light can it see at night than man can; hence at midday it can see nothing if its pupil does not diminish; and, in the same way, at night things look larger to it than by day.

Delli ochi dell’animali.

Li ochi di tutti li animali àno le lor popille, le quali per loro medesime crescono e diminuiscono secondo il maggiore e minore lume del sole o altro chiarore; Ma nelli ucelli fa maggìore differèntia e massima nelli notturni, come gufi, barbarigiani, e all’occhi che son di spetie di civetta; a questi cresce la popilla in modo che quasi occupa tutt’ò l’occhio, e diminuisce insino alla grà di miglio, e sempre osservàva figura circulare; Ma la spetìa, come pàtere, pardi, tigre, tigri, lupi, cimierì, gatti di Spagna e altri similì diminuiscono la luce dal perfetto circulo alla figura biagolare, cioè questa è come si dimostra in margine; Ma l’uomo per avere più debole vista che nessuno altro a rá debole, meno è offeso dalla superchia luce, e mè s’avmetà nella locli tenebrosi; ma all’ochi del fi detti animali notturni,—al gufo vecrio cornuto, il quale è l’massimo nella spetie dell’occhi a notturno: a questo s’auvéntà tanto a virtù visiva, che nel minimo...
830. a b n is the membrane which closes the eye from below, upwards, with an opaque film, c n b encloses the eye in front and behind with a transparent membrane.

It closes from below, upwards, because it [the eye] comes downwards. When the eye of a bird closes with its two lids, the first to close is the nictitating membrane which closes from the lacrimal duct over to the outer corner of the eye; and the outer lid closes from below upwards, and these two intersecting motions begin first from the lacrimal duct, because we have already seen that in front and below birds are protected and use only the upper portion of the eye from fear of birds of prey which come down from above and behind; and they uncover first the membrane from the outer corner, because if the enemy comes from behind, they have the power of escaping to the front; and again the muscle called the nictitating membrane is transparent, because, if the eye had not such a screen, they could not keep it open against the wind which strikes against the eye in the rush of their rapid flight. And the pupil of the eye dilates and contracts as it sees a less or greater light, that is to say intense brilliancy.

831.

If at night your eye is placed between the light and the eye of a cat, it will see the eye look like fire.

Br. M. 646]

a b n è il coperchio di sotto che chiude l’occhio di sotto in si con coperchio oppaco, c n b chiude l’occhio dinanzi idirieto con coperchio transparéte.

5 Chiudesi sotto in sù perché da alto discie dé.

8 Quando l’occhio dell’uelli si chiude colle sue due coperture, esso chiude prima la secondina la qual chiude dal lagrimatoio alla cò da d’esso occhio, e la prima si ch’vde da basso in alto, e que’ sti due movi intersegati occupano in prima dal lacrimateo, perché già abbiamo veduto che dinanzi e di sotto si sono assicurato, e sol serba no la parte di sopra per li pericoli de l’uelli rii paci che discendono di sopra e dirierto; e sco’ prano prima il pannicolo di verso la còda, 20 perché se ‘l nemico viene dirierto, egli a la cono dità del fuggire inná, e ancora tiene il pannicolo detto secondino e traspa rrente, perché se non avesse tale scudo, e’ no potrebbe tener lì occhi aperti cóto al vòto che percute l’occhio nel fuore di suo veloce volare; E la sua popilla cresce e discerese nel vedere minore o maggiore lume cioè splédero.

H. J. 614]

L’occhio che di notte s’interporrà in fra l’lume e l’occhio della gatta, vedrà esso occhio parere di foco.

assai chò. 29. vighore. 31. nassonti inochi... esseppur. 32. costretti vs. 33. allalla. 36. diminuisè. 38. chella. 40. diminuisier. 41. cholla. 47. muscoli. 48. aprano es.

830. 2. scoce ... oppacho. 4. choa coperchio transparéte. 6. disciè. 7. da. 8. veielli. 9. colle... coprire. 12. eila. 13. di basso... eique. 14. interneghi ochupano. 15. dalacrimateo... giau veduto. 16. as-ichurati. 17. pericholi. 18. disciendono... dirierto esco. 19. paolito... choda. 20. nemicho... dirierto. 22. trasspa. 23. auesi. 25. percoo. 26. Eila. 27. cressice e discerese. 28. magiere.

831. 1. ellochio. 2. veder... focho.
La lingua è trouata auere 24 muscoli li quali rispondono alli sei muscoli di che è composta la qualità della lingua che si move per la bocca.

3° E quando a o u si pronunziano con intelligenza e spedita pronunzia, egli è necessario che nella continua lor pronunziazione sanza intermissioni di tifo, che l'apertura de' labri si uadi al cõtinuo restrinendo, cioè larghi saranno nel dire a, piú stretti nel dire o, e assai piu stretti nel pr' onunziazione u.

11° Prouasi come tutte le uo-

cali son pronunziate colla parte ultima del palato mobile, il quale copre l'epiglotta.

Se tirerai il fiato pel na-so e lo vorrai madar fori per la bocca, tu sentirai il suono che fa il tramezzo cioè il pànicolo in...

Della natura del uedere.

2° Dico · jl uedere · essere operato da tutti li animali · mediate · la luce; e se alcuno cõtra questo 3° allegherà · jl uedere · delli animali notturni, dirò · questo · medesimamente è essere · sottoposto · a simile · natura; jpero-ché · chiaro · si cóprède · · j sensi · ricievendo · le similitudini delle cose · nò mădana · fori di loro alcuna virtù; 5° anzi mediate l'aria, che si trova ira l'obietto e l' sceso · incorpora · j se le specie delle · cose · e per lo cotatto · che à · col sèso · le porgie a quello; se li obietti o per sono · o per odore mădana le potzie spirituali all'orechio o al nasso · qui non è necessario nè si adopera la luce ·; le forme dell' obietti non

The tongue is found to have 24 muscles which correspond to the six muscles which compose the portion of the tongue which moves in the mouth.

And when a o u are spoken with a clear and rapid pronunciation, it is necessary, in order to pronounce continuously, without any pause between, that the opening of the lips should close by degrees; that is, they are wide apart in saying a, closer in saying o, and much closer still to pronounce u.

It may be shown how all the vowels are pronounced with the farthest portion of the false palate which is above the epiglottis.

Of the nature of sight.

I say that sight is exercised by all animals, by the medium of light; and if any one adduces, as against this, the sight of nocturnal animals, I must say that this in the same way is subject to the very same natural laws. For it will easily be understood that the senses which receive the images of things do not project from themselves any visual virtue. On the contrary the atmospheric medium which exists between the object and the sense incorporates in itself the figure of things, and by its contact with the sense transmits the object to it. If the object—whether by sound or by odour—presents its spiritual force to the ear or the nose, then light is not required and does not act. The forms of objects do not send their images into
étrano per similitudine jfra l'aria, 8 se quelli nò sono 1luminosi; essèdo così l'occhio no la può ricievere da quell'aria che nò l'à e che tocca la sua superficie; 9 se tu volessi dire di molti animali j quali predano di notte, dico che quando in questi manca la poca luce 10 che basta alla natura de' loro occhi, che questi s'aviano colla potètia dello udito e dello odorato, 11 i quali nò sono ipediri dalle tenebre, è de' quali avåzano de' grà lìga l'omo; Se porrai mété a una gatta 12 di giorno saltare ijfa molte vasellamèti, vedrai quelli rimanere salui, e se farai questo medesimo 13 di notte, ronperà ne' assai; li vecelli notturni no volano, se no lucè tuuta o i parte la luna, àzi si pasco 14 no jfra il coricare del sole e la lìtera oscurità della notte; — 15 Nessun corpo si può còprendere sàza lume e obra; lume e obra sono causate dalla luce.

G. 916]
Perché nell'omini attèpato 2 il vedere è meglio discosto.

Il vedere è meglio discosto che da presso in quelli omni, li quali s'attépano, perché vna medesima cosa 6 mida di se minore impressione nell'oc'chio, essendo remota che quado li è vi'cina.

C. At. 834: 2586]
Il sèso comùne è quello che givdica le cose a lui date dall'ali altri sensi; 2 Li antichi speculatori anno 1lconcluso che quella parte de' giudìcio che è data all'omo, sia causata 3 da vno strumèto, al quale referiscono li altri 5 mediata la ipressiva e a detto strumèto àno posto nome sèso comùne, 4 e dicono questo sèso essere situato in mezzo il capo jfra la ipresiva e la memoria; È questo nome di sèso 5 comùne dicono solamete, perché è

835.

WHY MEN ADVANCED IN AGE SEE BETTER AT A DISTANCE.

Sight is better from a distance than near in those men who are advancing in age, because the same object transmits a smaller impression of itself to the eye when it is distant than when it is near.

836.

The Common Sense, is that which judges of things offered to it by the other senses. The ancient speculators have concluded that that part of man which constitutes his judgment is caused by a central organ to which the other five senses refer everything by means of impressibility; and to this centre they have given the name Common Sense. And they say that this Sense is situated in the centre of the head between Sensation and Memory. And this name of Common Sense
comune. Vedere, udire, toccare, gustare e odorare.
Il senso comune si move mediato la pressiva ch'è posta in mezzo jfra lui e i sensi; la pressiva si move 7 mediato le similitudini delle cose a lei date dalli strumenti superflui cioè sensi, i quali sono posti in mezzo jfria le cose esteriori e la pressiva, e simili mette i sensi si movono mediato li obietti; 9 le circostanti cose, madano le loro similitudini ai sensi; e i sensi le trasferiscono alla pressiva; 10 la pressiva le manda al sens comune, e da quello sono stabilite nella memoria, e li sono o privo meno 11 retente secondo la importàtia o potetia della cosa data: Quello senso è piv veloce nel suo 12 fictio, il quale è piv uicino alla pressiva, e l'occhio superiore è pricipe dei altri, 13 del quale solo trattenero lì altri lascieremo per nò ci allígare dalla nostra materia; dice la sperienza 14 che l'occhio s'astède j 10 varie nature d'obietti cioè lucre e tenebre, la una-cagione dell'altre 9, e l'altra privazione: 15 colore e corpo figura e sito, remotione e propìquità, moto e quiete.

W. An. IV. 18 11. (9)

Ancorachè lo ingiugno 2vmano faccia intenzioni variac, risponderò co' uari strumenti a un medesimo 3 fine, mai esso troverà intenzione più 7 bella, nè più facile, nè 8 più brieve della natura, perché nelle sue intenzioni nulla mai 10 ca e nullo è superfluo 10, e non va co contra 13 pes, quado essa fa le 14 mebra atti al moto nel 15 li corpi dell' animali; 16 Ma un mette dentro l'anima d'essi corpo còpito 19 nitore, cioè l'anima dell' la madre che prima 20 compose nella maestica la figura dell' omo, e al tempo debito 21 desta l'anima, che di quel deve essere abitatore, 22 la qual prima restaua dormetata e in tutela 27 dell' anima della

is given to it solely because it is the common judge of all the other five senses i.e. Seeing, Hearing, Touch, Taste and Smell. This Common Sense is acted upon by means of Sensation which is placed as a medium between it and the senses. Sensation is acted upon by means of the images of things presented to it by the external instruments, that is to say the senses which are the medium between external things and Sensation. In the same way the senses are acted upon by objects. Surrounding things transmit their images to the senses and the senses transfer them to the Sensation. Sensation sends them to the Common Sense, and by it they are stamped upon the memory and are there more or less retained according to the importance or force of the impression. That sense is most rapid in its function which is nearest to the sensitive medium and the eye, being the highest is the chief of the others. Of this then only we will speak, and the others we will leave in order not to make our matter too long. Experience tells us that the eye apprehends ten different natures of things, that is: Light and Darkness, one being the cause of the perception of the nine others, and the other its absence:— Colour and substance, form and place, distance and nearness, motion and stillness[15].

though human ingenuity may make various inventions which, by the help of various machines answering the same end, it will never devise any inventions more beautiful, nor more simple, nor more to the purpose than Nature does; because in her inventions nothing is wanting, and nothing is superluous, and she needs no counterpoise when she makes limbs proper for motion in the bodies of animals. But she puts into them the soul of the body, which forms them that is the soul of the mother which first constructs in the womb the form of the man and in due time awakens the soul that is to inhabit it. And this at first lies dormant

chose...dali...sòiggugali...mezo. 8. Infrale...interiori ella pressiva esistimète...movano...obietti le similitudine. 9. delle circumstanti chose...similitudine a sè solo sensi...trasferischano...ipressi. 10. Ipressi la...disquello...elli. 11. sechìo. 12. usano...als pressiva...deli. 13. trattenero e lalti lascieremo...dala. 14. chagne...ellaltra. 15. chorno...essito...ecuette. 837. 1. chello. 2. vmano intenzioni. 5. trover. 11. cha e nulla. 13. fa il. 14. mebr. 16. coe. 23. dessta. 24. debbe. 25. rest[ui].

836. 15. Compare No. 23.
madre. 28 la quale la nutrisce e vivifi 29 ca per la vena ombelicca 30 le, con tutti li sua mè 31 bri spirituali, e così segu 32 irà insino che tale ombe 33 lico li è giusto colla se 34 condina e li cotidido 35 ni per la quale il figlio 36 lo si unisce colla madre; 37 e questi son causa che v 38 ha volontà, vn sommo desì 39 derio, vna paura che 40 abbia la madre, o altro 41 dolor metalà à pote 42 ti più nel figliolo che nel e 33 la madre, perché spesse sono 44 le volte, che il figlio ne per 45 de la vita ecc.

46 Questo discor 47 so nò ua qui, 48 ma si r 49 ichiede 50 nella co 51 se posidio 52 dell cor 53 ipa anima 54 ti; — E il resto della difinitione dell' anima lascio nel e 55 meti de' frati, padri de' popoli, li quali per insp 56 tione sanno tutti li segreti.

57 Lascio star le lettere incoronate, perché sò sòma verità.

W. An. H. 202 a (19')

838. How the five senses are the ministers of the soul.

The soul seems to reside in the judgment, and the judgment would seem to be seated in that part where all the senses meet; and this is called the Common Sense and is not all-pervading throughout the body, as many have thought. Rather is it entirely in one part. Because, if it were all-pervading and the same in every part, there would have been no need to make the instruments of the senses meet in one centre and in one single spot; on the contrary it would have sufficed that the eye should fulfil the function of its sensation on its surface only, and not transmit the image of the things seen, to the sense, by means of the optic nerves, so that the soul—for the reason given above—may perceive it in the surface of the eye. In the same way as to the sense of hearing, it would have sufficed if the voice had mere-
CHIO; 10 E similmente al sèso · dell’ udito · bastaua solamèto · la voce · risonasse nelle cocaue porosità 11 dell’ osso · petroso · che sta · dentro · all’orecchio · e non fare da esso · osso al sèso comune altro 12 trásto · dove · essa s’abbaoca · e abbia a discorrere · al comune givdito; 13 Il senso dell’ odorato · ancora lui si uede · essere di nella necesià · costretto · a còcorrere a detto 14 judito; 15 Il tutto passa · per le corde forate · ed è portato · a esso sèso · ; le quali corde si uano 15 spargièdo · con infinita · ramificazione · in nella pelle · che ciruida · le corporee mèbra 17 e visiere · ; 18 Le corde perforate portano il comadàmeto · e sentimèto · alli mèbri ofitali · 19 le quali · corde e nerui · infra · i muscoli · e lascierì 20 comàdano · a quelli · il mouïmiento · ; quelli ubidisco · e tale; obediècia si 23mette in atto · collo sgoïfére · imperché l’ gòfìare · raccorta · le loro · lunghesse · e tirasi dirieto · i nerui · 22 i quali · si tesson per le particule de’ mèbri; esso · sendo infuso nelle · stremi de’ dirit · 23 portano · al sèso · la cagione del loro · còtatto; 24 I nerui · coi loro · muscoli · servono · alle corde · come · i soldati · a codottieri · e le corde 25 servono · al senso comune · come i codottieri al capitano; 25 adunque la givnatura · delle ossi · obbedisce · al nero · · e il neruo · al muscolo · e l’ muscolo alla corda · 27 e la corda al senso comune · e’l sèso · comune · è sedia · dell’ anima · e la · memoria · è sua 28 munione · e la · impressiva · è sua · refercandaria; 28 come · il senso · serve · all’anima · e non · l’anima al senso · , e dove · màca · il senso ofital · dell’ anima 30 · del · anima · màca · in questa vita · la totalità del · l’udito · d’esso · sèso · come appare nel 29 movo e 1’ orbo nato.

W. An. II. 202· [28]

COME · I NERUI OPERANO QUALCHE VOLTA PER LORO 2 SANZA COMÀDAMÈTO DELL’ALTRI OFITALI DEL L’ANIMA.

3 Questo · chiamamèto · apparisce · imperchò · tv · vedrai · movere · ai paraleti · e a

ly sounded in the porous cavity of the indurated portion of the temporal bone which lies within the ear, without making any farther transit from this bone to the common sense, where the voice confers with and discourses to the common judgment. The sense of smell, again, is compelled by necessity to refer itself to that same judgment. Feeling passes through the perforated cords and is conveyed to this common sense. These cords diverge with infinite ramifications into the skin which encloses the members of the body and the viscera. The perforated cords convey volition and sensation to the subordinate limbs. These cords and the nerves direct the motions of the muscles and sinews, between which they are placed; these obey, and this obedience takes effect by reducing their thickness; for in swelling, their length is reduced, and the nerves shrink which are interwoven among the particles of the limbs; being extended to the tips of the fingers, they transmit to the sense the object which they touch.

The nerves with their muscles obey the tendons as soldiers obey the officers, and the tendons obey the Common [central] Sense as the officers obey the general. [27] Thus the joint of the bones obeys the nerve, and the nerve the muscle, and the muscle the tendon and the tendon the Common Sense. And the Common Sense is the seat of the soul[28], and memory is its ammunition, and the impressibility is its referendary since the sense waits on the soul and not the soul on the sense. And where the sense that ministers to the soul is not at the service of the soul, all the functions of that sense are also wanting in that man’s life, as is seen in those born mute and blind.

839. HOW THE NERVES SOMETIMES ACT OF THEMSELVES WITHOUT ANY COMMANDS FROM THE OTHER FUNCTIONS OF THE SOUL.

This is most plainly seen; for you will see palsied and shivering persons move,

838. The peculiar use of the words nervo, muscolo, corda, senso comune, which are here literally rendered by nerve, muscle cord or tendon and Common Sense may be understood from lines 27 and 28.
and their trembling limbs, as their head and hands, quake without leave from their soul and their soul with all its power cannot prevent their members from trembling. The same thing happens in falling sickness, or in parts that have been cut off, as in the tails of lizards. The idea or imagination is the helm and guiding-rein of the senses, because the thing conceived of moves the sense. Pre-imagining, is imagining the things that are to be. Post-imagination, is imagining the things that are past.

There are four Powers: memory and intellect, desire and covetousness. The two first are mental and the others sensual. The three senses: sight, hearing and smell cannot well be prevented; touch and taste not at all. Smell is connected with taste in dogs and other gluttonous animals.

I reveal to men the origin of the first, or perhaps second cause of their existence.

Lust is the cause of generation.

Appetite is the support of life. Fear or timidity is the prolongation of life and preservation of its instruments.

The body of any thing whatever that takes nourishment constantly dies and is constantly renewed; because nourishment can only enter into places where the former nourishment has expired, and if it has expired it no longer has life. And if you do not supply nourishment equal to the nourishment

W. A. IV. 1515v]

Jo scopro alli omini l’origine della prima forse secòda cagione del loro essere.

W. An. II. 43β (8]

COME IL CORPO DELL’ANIMALE AL CONTINUO MORE E RINASCIE.

Il corpo di qualunque cosa la qual si nutriva, al continuo muore e al continuo rinascia, perché entrate non può nutrimento se non in quelli lochi, dove il passato nutrimento è spirato, e s’elli è spirato e li più nò a vita, e se tu nò li rendi nutrimento equale al nutrimento partito, allora

W. An. II. 43β (8)

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843. HOW THE BODY OF ANIMALS IS CONSTANTLY DYING AND BEING RENEWED.

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la vita manca di sua valetudine, e se tu lei esso nutrimento, la uita in tutto resta distrutta; Ma se tu ne reci tanto quanto si ne distruggi alla giornata, allora tanto rinasce di uita, quanto se ne consuma a similitudine del lume. della candela col nutrineto datoli dall’omone d’essa candela, il quale lume ancora lui al conista con veloceissimo socorso restaura di sotto, quato di sopra se ne consuma morendo, e di splendida luce si converte morendo in tenebroso fumo, la quale morte è continua, siccome è cotino esso fumo, e la còtinuità di tal fumo è equale al cotino nutrinetto, e in istante tutto il lume è morto e tutto rigenerato insieme col moto del nutrimento suo.

844. King of the animals—as thou hast described him—I should rather say king of the beasts, thou being the greatest—because thou hast spared slaying them, in order that they may give thee their children for the benefit of the gullet, of which thou hast attempted to make a sepulchre for all animals; and I would say still more, if it were allowed me to speak the entire truth[5]. But we do not go outside human matters in telling of one supreme wickedness, which does not happen among the animals of the earth, inasmuch as among them are found none who eat their own kind, unless through want of sense (few indeed among them, and those being mothers, as with men, albeit they be not many in number); and this happens only among the rapacious animals, as with the leonine species, and leo-

844. We are led to believe that Leonardo himself was a vegetarian from the following interesting passage in the first of Andrea Corsali’s letters to Giuliano de’ Medici: Alcuni gentili chiamati Guasarti non si ritrova di cosa alcuna che tenga sangue, nè fra essi loro conducono che si noterà ad alcuna cosa animata, come il nostro Leonardo da Vinci.

5—18. Amerigo Vespucci, with whom Leonardo was personally acquainted, writes in his second letter to Pietro Soderini, about the inhabitants of the Canary Islands after having stayed there in 1503: "Hanno una seduta libertà di vivere; si chiamà di carne humana, di minuta che il padre magia il figliolo, e all’ incontro il figliolo il padre secondo che a caso e per sorte avvene. Io vidi un certo lui sedutissima che si vantava, e si tenea a non piccola gloria di haver mangiato più di tre o quatro uomini. Vidi anche una certa città, nella quale io dissiare fiors venti钵ti giornoi, dove le carni humane, benianole sale, eran affatici all’ ali, si come noi alth altrì di cucina
PHYSIOLOGY.

animals rapaci, come nella specie leonina\textsuperscript{51} e pardi, pardere, cervieri, gatte e simili,\textsuperscript{54} il quali alcuna volta si magniano i figlioli; ma tu oltre\textsuperscript{15} alli figlioli ti magi il padre, madre, fratelli e amici, e nò\textsuperscript{16} ti basta questo, chè tu vai a caccia per le altrui isole, pi\textsuperscript{17} gliando li altri omiui e questi mezzo nudi il mebro e li testi\textsuperscript{18} colui fai ingrascare e te li cacci più per la tua gola; or\textsuperscript{19} non produce la natura tati semplici, che tu ti possa sati\textsuperscript{20} re e se nò ti còteni de' semplici, non puoi tu có la mistiò\textsuperscript{21} di quelli fare infiniti composti, come scrisse il Platina\textsuperscript{22} e li altri autori di gola?\textsuperscript{23}

H. 41 6]

Facciamo nostra vita coll' altrui morte.\textsuperscript{31} In nella cosa morta rimà vi'ta dissensata, la quale ricòguita alli stomachi de' v' uii ripiglia uita scisitiva e itellettiva.

S. K. M. III, 749]

La natura pare qui in molti\textsuperscript{2} o di molti animali stata più pre' sto crudele matrignia che mãdre, e d' alcuni nò matrignia ma pietosa madre.

C. A. 756; 219 6]

L'omo e li animali sono propi trásito e condotto di cibo, sceloplueta d'animali albergo de' morti, facièdo a se vna del altrui morte guaina di corruzione!

845.

Our life is made by the death of others. In dead matter insensible life remains, which, reunited to the stomachs of living beings, resumes life, both sensual and intellectual.

846.

Here nature appears with many animals to have been rather a cruel stepmother than a mother, and with others not a stepmother, but a most tender mother.

847.

Man and animals are really the passage and the conduit of food, the sepulchre of animals and resting place of the dead, one causing the death of the other, making themselves the covering for the corruption of other dead [bodies].

appasschiamo le carni di cinghiali secche al sole o al fiumo, et massimamente salacie, et altre simil cose: anzi si murauglianzano graèdenète che noi non màggiamo della carne de nemici, le quali dicono muovere appetito, et essere di murauglianzo supere, et le lodano come cibi suavi et delizati (Lettere due di Amerigo Vespucci Fiorentino drissate al magnifico Pietro Soderini, Gonfaloniere della eccelsa Rep\textsuperscript{2} publica di Firen\textsuperscript{1} e; various editions).

21. Come scrisse il Platina (Bartolomeo Sacchi, a famous humanist). The Italian edition of his treatise De arte coquinaria, was published under the title De la nostra voluptè, e valetudine, Veneti\textsuperscript{2} a 1487.
La morte ne’ vecchi senza febre si causa dalle 2 uene che v’ha dalla milza alla porta del fegato e s’ingrossan tanto di pelle ch’elle si richiudono e non danno più transito al sangue che li nutricia.

6Il continuo corso che fa il sangue per le sue 7 uene fa che tali uene s’ingrossano e fanno’si callose in tal modo che al fine si riserrano e proibiscono il corso al sangue.

Leonardo’s conosciute modo. sangue uede. is the general as sangue. diseases [848—851. lochi echicore riapre, may. corso pelle s’

On the circulation of the blood (848—850).

The waters return with constant motion from the lowest depths of the sea to the utmost height of the mountains, not obeying the nature of heavier bodies; and in this they resemble the blood of animated beings which always moves from the sea of the heart and flows towards the top of the head; and here it may burst a vein, as may be seen when a vein bursts in the nose; all the blood rises from below to the level of the burst vein. When the water rushes out from the burst vein in the earth, it obeys the law of other bodies that are heavier than the air since it always seeks low places.

The blood which returns when the heart opens again is not the same as that which closes the valves of the heart.

Make them give you the definition and remedies for the case . . . and you will see that men are selected to be doctors for diseases they do not know.

From this passage it is quite plain that Leonardo had not merely a general suspicion of the circulation of the blood but a very clear conception of it. Leonardo’s studies on the muscles of the heart are to be found in the MS. W. An. III. but no information about them has hitherto been made public. The limits of my plan in this work exclude all purely anatomical writings, therefore only a very brief excerpt from this note book can be given here. William Harvey (born 1578 and Professor of Anatomy at Cambridge from 1615) is always considered to have been the discoverer of the circulation of the blood. He studied medicine at Padua in 1598, and in 1628 brought out his memorable and important work: De motu cordis et sanguinis.
852. Medicina da grattature insegnoniema
l'araldo del re di Fràcia: oricé 4 ciera nova, òcie 4, òcie greca, òcie 2 incíeso
e ogni cosa 4 stia separata, e fondi la ciera, e poi vi metti denstro l'incíeso, e poi la
pece; fa ne pe'verada e metti sopra al male.

853. Medicine is the restoration of discordant
elements; sickness is the discord of the ele-
ments infused into the living body.

854. Those who are annoyed by sickness at
sea should drink extract of wormwood.

855. To keep in health, this rule is wise:
Eat only when you want and relish food.
Chew thoroughly that it may do you good.
Have it well cooked, unspiced and undis-
guised. He who takes medicine is ill advised.

856. I teach you to preserve your health; and
in this you will succeed better in proportion as
you shun physicians, because their medicines
are the work of alchemists.
Ever since the publication by Venturi in 1797 and Libri in 1840 of some few passages of Leonardo’s astronomical notes, scientific astronomers have frequently expressed the opinion, that they must have been based on very important discoveries, and that the great painter also deserved a conspicuous place in the history of this science. In the passages here printed, a connected view is given of his astronomical studies as they lie scattered through the manuscripts, which have come down to us. Unlike his other purely scientific labours, Leonardo devotes here a good deal of attention to the opinions of the ancients, though he does not follow the practice universal in his day of relying on them as authorities; he only quotes them, as we shall see, in order to refute their arguments. His researches throughout have the stamp of independent thought. There is nothing in these writings to lead us to suppose that they were merely an epitome of the general learning common to the astronomers of the period. As early as in the XIVth century there were chairs of astronomy in the universities of Padua and Bologna, but so late as during the entire XVIth century Astronomy and Astrology were still closely allied.

It is impossible now to decide whether Leonardo, when living in Florence, became acquainted in his youth with the doctrines of Paolo Toscanelli the great astronomer and mathematician (died 1482), of whose influence and teaching but little is now known, beyond the fact that he advised and encouraged Columbus to carry out his project of sailing round the world. His name is nowhere mentioned by Leonardo, and from the dates of the manuscripts from which the texts on astronomy are taken, it seems highly probable that Leonardo devoted his attention to astronomical studies less in his youth than in his later years. It was evidently his purpose to treat of Astronomy in a connected form and in a separate work (see the beginning of Nos. 866 and 892; compare also No. 1167). It is quite in accordance with his general scientific thoroughness that he should propose to write a special treatise on Optics as an introduction to Astronomy (see Nos. 867 and 877). Some of the chapters belonging to this Section bear the title...
"Prospettiva" (see Nos. 865 and 879), this being the term universally applied at the time to Optics as well as Perspective (see Vol. I, p. 10, note to No. 13, l. 10).

At the beginning of the XVIth century the Ptolemaic theory of the universe was still universally accepted as the true one, and Leonardo conceives of the earth as fixed, with the moon and sun revolving round it, as they are represented in the diagram to No. 897. He does not go into any theory of the motions of the planets; with regard to these and the fixed stars he only investigates the phenomena of their luminosity. The spherical form of the earth he takes for granted as an axiom from the first, and he anticipates Newton by pointing out the universality of Gravitation not merely in the earth, but even in the moon. Although his acute research into the nature of the moon’s light and the spots on the moon did not bring to light many results of lasting importance beyond making it evident that they were a refutation of the errors of his contemporaries, they contain various explanations of facts which modern science need not modify in any essential point, and discoveries which history has hitherto assigned to a very much later date.

The ingenious theory by which he tries to explain the nature of what is known as earth shine, the reflection of the sun’s rays by the earth towards the moon, saying that it is a peculiar refraction, originating in the innumerable curved surfaces of the waves of the sea may be regarded as absurd; but it must not be forgotten that he had no means of detecting the fundamental error on which he based it, namely: the assumption that the moon was at a relatively short distance from the earth. So long as the motion of the earth round the sun remained unknown, it was of course impossible to form any estimate of the moon’s distance from the earth by a calculation of its parallax.

Before the discovery of the telescope accurate astronomical observations were only possible to a very limited extent. It would appear however from certain passages in the notes here printed for the first time, that Leonardo was in a position to study the spots in the moon more closely than he could have done with the unaided eye. So far as can be gathered from the mysterious language in which the description of his instrument is wrapped, he made use of magnifying glasses; these do not however seem to have been constructed like a telescope—telescopes were first made about 1600. As LIBRI pointed out (Histoire des Sciences mathématiques III, 101) Fracastoro of Verona (1473—1553) succeeded in magnifying the moon’s face by an arrangement of lenses (compare No. 910, note), and this gives probability to Leonardo’s invention at a not much earlier date.
I.

THE EARTH AS A PLANET.

Linia d'equalità, linia dell'orizzóte, linia giacète, linia equigiacète;
5 Queste line sò quelle che con sua stremi sò equidistanti al cètro del mondo.

The equator, the line of the horizon, the earth's ecliptic, the meridian:
These lines are those which in all their parts are equidistant from the centre of the globe.

Come la terra non è nel mezzo del cerchio del sole, né nel mezzo del mòdo, ma è ben nel mezzo de' sua eleméti, compagni e vni in alto, e chi s'tesse nella luna, qu'ella insieme col sole sò sotto a noi, questa nostra terra coll'ele'mento dell'acqua parrebbe e farebbe ofitio tal qual fa la luna a noi.

The earth is not in the centre of the Sun's orbit nor at the centre of the universe, but in the centre of its companion elements, and united with them. And any one standing on the moon, when it and the sun are both beneath us, would see this our earth and the element of water upon it just as we see the moon, and the earth would light it as it lights us.

La forza da carestia o douitia è gien-nerata; questa è figliola del moto materiale e nepote del moto spirituale, e madre e origine del peso; e esso peso è finito nell'ele'mento dell'acqua e terra, e essa.

Force arises from dearth or abundance; it is the child of physical motion, and the grand-child of spiritual motion, and the mother and origin of gravity. Gravity is limited to the elements of water and...
Il peso \( o \) perché non resta nel suo sito? \( \text{non resta perché non à resistentia; e dòde se moverà? Moverassi \_\_verso il centro; e perché no per altre linee? perché } 5^\text{il peso, che non à resistentia, discenderà } 6^\text{in basso per la uia pive breve, e l'1 più basso sito } 7^\text{è il cìetor del mondo; e perché lo sa } 8^\text{così tal peso trovarlo con tanta breuit? perché non va come insensibile prima 9^\text{vagando per diverse linei.}

Movasi la terra da che parte voglia, 10^\text{mai la superfitie dell'acqua uscirà fori della sua spera, ma senpre sarà equidistante al centro del mondo;}

5^\text{Dato che la terra si rimovessi dall centro 6 del mondo, che farebbe l'acqua?}

7^\text{Resterebbe intorno a esso centro 8 con equal grossezza, ma minore diametro, che quando ella avea la terra in corpo.}

... potessi. 9. quatro. 10. ellor. 12. scorcèdo. 13. muscoli di quelle .. muscoli. 14. gano raccortare. 15. ecquisita
... homo. 18. magiore. 19. luna collatera.

860. 4. cìeuro bce. 8. chon. 9. perche nova come [in gl] insensibile prima. 10. vagando per diverse linei.

860. This text and the sketch belonging to it, are reproduced on Pl. CXXI.

861. Compare No. 896, lines 48-64; and No. 936.

861. Let the earth turn on which side it may

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861. Compare No. 896, lines 48-64; and No. 936.

861. Let the earth turn on which side it may
862. Supposing the earth at our antipodes which supports the ocean were to rise and stand uncovered, far out of the sea, but remaining almost level, by what means afterwards, in the course of time, would mountains and vallies be formed?

And the rocks with their various strata?

863. Each man is always in the middle of the surface of the earth and under the zenith of his own hemisphere, and over the centre of the earth.

864. Mem.: That I must first show the distance of the sun from the earth; and, by means of a ray passing through a small hole into a dark chamber, detect its real size; and besides this, by means of the aqueous sphere calculate the size of the globe . . .

Here it will be shown, that when the sun is in the meridian of our hemisphere\(^{10}\), the antipodes to the East and to the West, alike, and at the same time, see the sun mirrored in their waters; and the same is equally true of the arctic and antarctic poles, if indeed they are inhabited.

865. That the earth is a star.

866. In your discourse you must prove that the earth is a star much like the moon, and the glory of our universe; and then you must treat of the size of various stars, according to the authors.

The word *Antipodi orientali coi li occidentali* does not here bear its literal sense, but—as we may infer from the simultaneous reference to inhabitants of the North and South—is used as meaning men living at a distance of 90 degrees from the zenith of the rational horizon of each observer.
867. THE METHOD OF PROVING THAT THE EARTH IS A STAR.

First describe the eye; then show how the twinkling of a star is really in the eye and why one star should twinkle more than another, and how the rays from the stars originate in the eye; and add, that if the twinkling of the stars were really in the stars—as it seems to be—that this twinkling appears to be an extension as great as the diameter of the body of the star; therefore, the star being larger than the earth, this motion effected in an instant would be a rapid doubling of the size of the star. Then prove that the surface of the air where it lies contiguous to fire, and the surface of the fire where it ends are those into which the solar rays penetrate, and transmit the images of the heavenly bodies, large when they rise, and small, when they are on the meridian. Let a be the earth and n d m the surface of the air in contact with the sphere of fire; h f g is the orbit of the moon or, if you please, of the sun; then I say that when the sun appears on the horizon g, its rays are seen passing through the surface of the air at a slanting angle, that is o m; this is not the case at d k. And so it passes through a greater mass of air; all of e m is a denser atmosphere.

868. Beyond the sun and us there is darkness and so the air appears blue.

869. Perspective.

It is possible to find means by which the eye shall not see remote objects as much

Infra 'l sole e noi è tenebre, e però l'aria pare azzurra.

The principles of astronomical perspective (868–873).

F. 256

ORDINE DEL PROVARE LA TERRA ESSERE VNA STELLA.

3 In prima definisc i' ochio, poi mostra come il battere d'alcuna stella viene dal-l'occhio, e perché il battere d'esse stelle è più nell'una che nell'altra, e come li 6 razzi delle stelle nascono dall'occhio, e di, che se l'attere delle stelle fusesse come pare nelle stelle, che tal bat'timeto mostra d'esser di tanta dilatatione, quàt'è il corpo di tale stella; essendo adique maggiore della ter'ra che tal moto fatto in istante sarebbe troppo veloce 11 a raddoppiare la grædezze di tale stella; Di poi pro'va come la superfitie dell'aria nei cofini del foco, e 13 la superfitie del foco nel suo termine è quella, nella qual penetrado li razzi solari portano la 15 similitudine di corpi celesti grade nel lor leua're, e però è piccola, essendo esse nel mezzo del celo; 17 sia la terra a § 11 d m sia 15 la superfitie dell'aria che 17 confina colla spera del 20 foco; h f g sia il corso 17 della luna o vuoi del sole; 28 dico che quàdo il sole appare25 see al'orizzóte g, che li sono ueduti 18 li sua razzi passare per la superfitie 15 dell'aria infra agli in equiplanes cioè o m, il che non è in d'k, e acora 25 passa per maggiore grossesse d'aria; tutto e m è aria più spessa.
Dell’occhio.

Infra li corpi minori della popilla dell’occhio, 29 quella fa manco nota a essa popilla, 30 la quale le sarà più vicina. E con questa 31 sperietta ci si è fatto noto che la virtù visiva non si riduce in piutto perché se la ecc.

Leggi i margini.

Quella cosa si 35 dimostra maggiore, che viene 37 all’occhio ci più 38 grosso angolo.

Ma le specie delle obolietti, che corrono alla popilla dell’occhio, si paralizzano sopra tal popilla nella medesimo modo, ch’elle son cogli’infra l’aria; 47 e la prova di quest’ultima è in seguito; quando noi ritagrams 48 il cielo stellato senza por la visittà più a una stella, che all’altra, 55 che allora ci si mostravano il cielo semina 57 di stelle, e sò prospettionate nell’occhio 59 siccome lo sono in 60 cielo, e così li loro 61 spati fanno il simile.

6. chosette attagialle. 7. piramide . . . specie viene. 8. lochio . . . angoli . . . 10. lìa [de] esse piramide chon angoli . . .


30. chon questa [no]. 31. ci se . . . chella. 32. silla. 33. [Quella u]. 34. chosa. 35. dimosra magi. 37. chò. 38. grosse anghole . . .

39. Malle sete. 40. biechina ci chichon. 41. no. 42. chon cossa quido. 50. riguardiam.

869. 9. 32. in margin: lines 34–61 are, in the original, written on the margin and above them is the diagram to which Leonardo seems to refer here.

20 and fol. Telescopes were not in use till a century later. Compare No. 910 and page 136. diminished as in natural perspective, which diminishes them by reason of the convexity of the eye which necessarily intersects, at its surface, the pyramid of every image conveyed to the eye at a right angle on its spherical surface. But by the method I here teach in the margin 9 these pyramids are intersected at right angles close to the surface of the pupil. The convex pupil of the eye can take in the whole of our hemisphere, while this will show only a single star; but where many small stars transmit their images to the surface of the pupil those stars are extremely small; here only one star is seen but it will be large. And so the moon will be seen larger and its spots of a more defined form 26. You must place close to the eye a glass filled with the water of which mention is made in number 4 of the Book 113 “On natural substances” 123; for this water makes objects which are enclosed in balls of crystalline glass appear free from the glass.

Of the eye.

Among the smaller objects presented to the pupil of the eye, that which is closest to it, will be least appreciable to the eye. And at the same time, the experiments here made with the power of sight, show that it is not reduced to speck if the &c. [32].

Read in the margin.

[34] Those objects are seen largest which come to the eye at the largest angles.

But the images of the objects conveyed to the pupil of the eye are distributed to the pupil exactly as they are distributed in the air: and the proof of this is in what follows; that when we look at the starry sky, without gazing more fixedly at one star than another, the sky appears all strewn with stars; and their proportions to the eye are the same as in the sky and likewise the spaces between them 161.
870.

PROSPETTIVA.

Delle cose messe dall’occhio con eguale distanza, quella allora esser me diminuita che prima era più.

Delle cose messe dall’occhio con eguale distanza dal loro primo sito quella me diminuisce che prima era più distante da esso occhio; E tal cosa la proporzione della diminuitione, qual fu la proporzione delle distanze ch’esse avea da dell’occhio avanti il loro moto.

Come dire il corpo \( t \) e l’occhio \( e \) e che la proporzio delle lor distanze dall’occhio \( a \) è quitupla; io rimovo ciascuno dal suo sito \( e \) le so più distante dal-}

\[
\begin{array}{cccc}
\text{b} & \text{o} & \text{e} & \text{o} \\
\text{k} & \text{f} & \text{g} & \text{j} \\
\end{array}
\]

l’occhio ven d’essi \( 5 \) in che è diuisa la proposizione; accade duce che il più vicino \( 16 \) all’occhio avrà doppiata la distanza, e per la penultima di questo esso è diminuto la metà del suo tutto, \( 18 \) e l’occhio \( e \) per lo medesimo moto è diminuito \( \frac{1}{5} \) \( 19 \) d’esso suo tutto; adunque per la detta penultima \( 20 \) è vero quel che in questa ultima s’é proposto; \( 21 \) e questo dico per li moti de’ corpi celesti \( 22 \) in \( 3500 \) miglia di distanza che pivi esso \( 23 \) do in orice che sopra di noi, non crescono o diminuiscono \( 24 \) con sensibile dimostrazione.

871.

Perspective.

Among objects moved from the eye at equal distance, that undergoes least diminution which at first was most remote.

When various objects are removed at equal distances farther from their original position, that which was at first the farthest from the eye will diminish least. And the proportion of the diminution will be in proportion to the relative distance of the objects from the eye before they were removed.

That is to say in the object \( t \) and the object \( e \) the proportion of their distances from the eye \( a \) is quintuple. I remove each from its place and set it farther from the eye by one of the 5 parts into which the proposition is divided. Hence it happens that the nearest to the eye has doubled the distance and according to the last proposition but one of this, is diminished by the half of its whole size; and the body \( e \), by the same motion, is diminished \( \frac{1}{5} \) of its whole size. Therefore, by that same last proposition but one, that which is said in this last proposition is true; and this I say of the motions of the celestial bodies which are more distant by \( 3500 \) miles when setting than when overhead, and yet do not increase or diminish in any sensible degree.

\( a \ b \) è lo spiraculo donde \( 2 \) passa il sole, e se tu poiesi misurare la grossezza de’ razi solari in \( n \ m \), tu poiesi dunque per bene le ucre linee del concorso d’essi razi solari, stante lo spechio in \( a \ b \), e \( 8 \) poi fare i
razzi riflessi infra 59goli equali
inverso ∙ n m ∙ ma poi che tu
vuoi torre in 11 n m ∙ togli
dentro allo spiracul0 in c d che
si possan misurare nella per-
cussione del razzo solare, 14 e
poi poni il tuo specchio nella
distà 12stia a b ∙ e li fa cadere i
razzi d b ∙ c a ∙ poi 10 risaltare
infra angoli equali in ucr17so
e d ∙ c questo è il ucro modo;
18 ma ti bisogna operare tale
spe10chio nel medesimo mese
e medesi20mo di e ora e pito,
e farà meglio 21 che di nessu
tempo, perchè in tal distària
22 di sole si causò tal pi-
ramide.

872.
a parte del corpo o-1broso n vede tutta
la parte dell'emisferio b c d e f ∙ e nò ui
vede parte alcuna ∙ della oscurità della
terra; 5 e 'l simile accade nel
punto o; adunque lo spatio a
o ∙ è 7 tutto d'una medesima
chiarezza, in s vede sol 4 gra-
8 di dell'emisferio d e f g h ∙
e vi vede tutta la terra ∙ s h ∙
che la fa più oscura quato
dà la calculatione.

A. 64[8]
Prueba dell'accrescimento del sole 9 in nel
occident.
3 Alcuni · matematici · dimostrano · il sole·
cresciere nel ponente · perché l'occhio · sèpre
lo vede per aria di maggiore grossezza,
4 allegato che le · cose uiste nella · nebbia e
nel acqua pajono maggiori · ai quali · io
rispodo di no · inperchè le cose viste ifra la
equal angles to u m ∙ but · as
you want to have them at n m · take
them at the inner side of the
aperture at cd · where they may
be measured at the spot where the
solar rays fall. Then place your
mirror at the distance a b · making
the rays d b ∙ c a fall and then
be reflected at equal angles to-
wards c d ∙ and this is the best
method · but you must use this
mirror always in the same
month · and the same day · and
hour and instant · and this will
be better than at no fixed time
because when the sun is at a
certain distance it produces a
certain pyramid of rays.

872. This passage · which has perhaps a dou-
ful right to its place in this connection · stands in
the Manuscript between those given in Vol. I as
No. 117 and No. 427.
nebbia sò simili per colore alle lótane; e non essendo simili per diminuizione appariscono di maggiore grandezza; Ancora nessuna cosa crescere in acqua piana, e la prova ne farai a lucidure vn asse mezze sotto l’acqua; Ma la ragione che l sol crescere si è che ogni corpo luminoso quato piv s’allotana, piv par grado.

874.

Il libro mio s’aste a mostrare, e come l’occa colli altri mari fa mediate il sole spledere il nostro modo a modo di luna e a più remoti parre stella e questo provo;

Dimostra prima come ogni lume remoto da l’occhio fa rassi, li quali pare che accrescino la figura di tal corpo luminoso e di questo ne seguita che 2. . . .

11 L’unica frigide e vmida.

12 L’acqua è frigida e vmida; 15 tale influenzi a da il nostro 17 marc alla luna 19 a noi.

875.

The waves in water magnify the image of an object reflected in it.

The first diagram, is written Sole (sun), and to the right of it luna (moon). Thus either of these heavenly bodies may be supposed to fill that space. Within the lower circle is written simulacro (image). In the two next diagrams at the spot here marked L the word Luna is written, and in the last sole is written in the top circle at a.
della mia prosptiva), e tanto più occuperebbe d'acqua quanto esso simulacro fusse più distante dall'occhio.

16. Il simulacro del sole si dimostrerà più lucido nell'onde militate che nelle onde grandi; e questo accade perché le similitudini over simulacri del sole sono più spesse nell'onde minute che nelle grandi, e li più spessi splendori rendono maggiore l'occhio che li splendori più rari.

17. L'onde interscenate a uso di scora di pigna rendono il simulacro del sole di grandissimo splendore, ed questo accade perché tanto sono li simulacri quanto sono li gio'ghi del'onde vedute dal sole, e "Perspective") [9] and it will cover more of the water in proportion as the reflected image is remote from the eye[10].

The image of the sun will be more brightly shown in small waves than in large ones—and this is because the reflections or images of the sun are more numerous in the small waves than in large ones, and the more numerous reflections of its radiance give a larger light than the fewer.

Waves which intersect like the scales of a fish cone reflect the image of the sun with the greatest splendour; and this is the case because the images are as many as the ridges of the waves on which the sun shines, and the shadows between these waves are small and not very dark; and the radiance of so many reflections together becomes united in the image which is transmitted to the eye, so that these shadows are imperceptible.

That reflection of the sun will cover most space on the surface of the water which is most remote from the eye which sees it.

Let a be the sun, pq the reflection of the sun; a b is the surface of the water, in which the sun is mirrored, and r the eye which sees this reflection on the surface of the water occupying the space om. c is the eye at a greater distance from the surface of the water and also from the reflection; hence this reflection covers a larger space of water, by the distance between n and o.

l'ombre che infra esse onde s'interpongono sono piccole e di poca oscurità, e li splendori di tanti simulacri insieme s'infondono nelle similitudini che di lor viene all'occhio, in modo tale che esse ore sono insensibili;'

23. Quel simulacro del sole occuperà più lochi nella superficie dell'acqua, che sarà più distante dall'occhio che lo uede; 26. a sia il sole, pq è il simulacro d'esso 27. sole, ab è la superficie dell'acqua doue el sol si spechia, r sia l'occhio che uede esso simulacro nella superficie dell'acqua occupare lo spatio om. c è l'occhio più remoto da essa superficie dell'acqua, e così dal simulacro, onde esso simulacro occupa maggiore spatio d'acqua,—quanto è lo spatio on.

8. ochupe. 9. prospecura) ettanto... ochupe. 10. daq'a... fusì. 11. dimostrea. 12. acheade chelle. 13. tudine. 14. ell... rendan magore. 15. celi. 16. discorsa di pigna rendano [loss] 17. di. 17. plendore [e chiarazz]. 18. ecuesta achade. 19. ellombre. 20. pongono... picole... pocha oscurita eli. 21. sinfandono... simulatline. 23. sole [bol] ochupara. 25. che uede. 27. ell. 28. siaspechia. 29. acq'a' ocupare. 30. Lossiato... elbocci. 32. ochupa magore... ello.

9. Nel quarto della mia prospecura. If this reference is to the diagrams accompanying the text—as is usual with Leonardo—and not to some particular work, the largest of the diagrams here given must be meant. It is the lowest and actually the fifth, but he would have called it the fourth, for the text here given is preceded on the same page of the manuscript by a passage on whirlpools, with...
It is impossible that the side of a spherical mirror, illuminated by the sun, should reflect its radiance unless this mirror were undulating or filled with bubbles.

You see here the sun which lights up the moon, a spherical mirror, and all of its surface, which faces the sun is rendered radiant.

Whence it may be concluded that what shines in the moon is water like that of our seas, and in waves as that is; and that portion which does not shine consists of islands and terra firma.

This diagram, of several spherical bodies interposed between the eye and the sun, is given to show that, just as the reflection of the sun is seen in each of these bodies, in the same way that image may be seen in each curve of the waves of the sea; and as in these many spheres many reflections of the sun are seen, so in many waves there are many images, each of which at a great distance is much magnified to the eye. And, as this happens with each wave, the spaces

\[876.\]

\[146.\]

Br. M. 2811

\[876.\]

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the diagram belonging to it also reproduced here.

The words della mia prospettiva may therefore indicate that the diagram to the preceding chapter treating on a heterogeneous subject is to be excluded.

It is a further difficulty that this diagram belongs properly to lines 9–10 and not to the preceding sentence. The reflection of the sun in water is also discussed in the Theoretical part of the Book on Painting; see Vol. I, No. 206, 207.

876. In the original, at letter \(A\) in the diagram "Sole" (the sun) is written, and at \(o\) "occhio" (the eye).
sumare gli spati interposti infra l'onde, \textsuperscript{33}e per questa tal cagione e' pare tutto vn sole continuato nelle molti soli \textsuperscript{35}specchiati nelle molte onde, e le parti onbrose miste colle specie luminose \textsuperscript{33}fan che tale splendore non è lucido come quel del sole in esse òde spechiat\textsuperscript{35}to.

This will have before it the treatise on light and shade.

Il sole parirà maggiore nell'acqua movente e òdeggiate \textsuperscript{33}che nella ferma: esempio del lume visto sopra le corde \textsuperscript{3}del monocordo.

The sun will appear larger in moving water or on waves than in still water; an example is the light reflected on the strings of a monochord.

\textsuperscript{33}sumare gli spati interposti infra l'onde, \textsuperscript{33}e per questa tal cagione e' pare tutto vn sole continuato nelle molti soli \textsuperscript{35}specchiati nelle molte onde, e le parti onbrose miste colle specie luminose \textsuperscript{33}fan che tale splendore non è lucido come quel del sole in esse òde spechiat\textsuperscript{35}to.

877. 878. I have thought it unnecessary to reproduce the detailed explanation of the theory of reflection on waves contained in the passage which follows this.
II.

THE SUN.

F. 50]

LAUDE DEL SOLE.

If you look at the stars, cutting off the rays (as may be done by looking through a very small hole made with the extreme point of a very fine needle, placed so as almost to touch the eye), you will see those stars so minute that it would seem as though nothing could be smaller; it is in fact their great distance which is the reason of their diminution, for many of them are very many times larger than the star which is the earth with water. Now reflect what this our star must look like at such a distance, and then consider how many stars might be added—both in longitude and latitude—between those stars which are scattered over the darkened sky. But I cannot forbear to condemn many of the ancients, who said that the sun was no larger than it appears; among these was Epicurus, and I believe that he founded his reason on the effects of a light placed in our atmosphere equidistant from the centre of the earth. Any one looking at it never sees it diminished in size at whatever distance; and the rea-
on the sun's size and power I shall reserve
for Book 4. But I wonder greatly that Socrates
should have depreciated that solar body,
saying that it was of the nature of incan-
descent stone, and the one who opposed him
as to that error was not far wrong. But I only
wish I had words to serve me to blame those
who are far to extol the worship of men more
than that of the sun; for in the whole universe
there is nowhere to be seen a body of greater
magnitude and power than the sun. Its light
gives light to all the celestial bodies which
are distributed throughout the universe; and
it descends all vital force, for the heat that is
in living beings comes from the soul [vital spark];
and there is no other centre of heat and light
in the universe as will be shown in Book 4; and
certainly those who have chosen to worship
men as gods—as Jove, Saturn, Mars and the
like—have fallen into the gravest error, seeing
that even if a man were as large as our earth,
he would look no bigger than a little star
which appears but as a speck in the universe;
and seeing again that these men are mortal,
and putrid and corrupt in their sepulchres.
Marcellus[23] and many others praise
the sun.

Forse Epicuro vide le obre delle colonne
ripercosse nelle antiposti muri essere equali
do diametro della colonna? donde si partì a

Epicurus perhaps saw the shadows cast by
columns on the walls in front of them equal
in diameter to the columns from which the

Aristotle who goes very fully into the subject
days the same. A complete edition of Aristotelic's
works was first printed in Venice 1495-98, but a
Latin version of the Books De Coelo et Mundo and
De Physica had been printed in Venice as early as
in 1483 (H. Müller-Strübing)

There is but one passage in Plato, Epinomis
(p. 983) where he speaks of the physical properties
of the sun and says that it is larger than the earth.

880. [44]

880. Socrates; I have little light to throw on
this reference. Plato's Socrates himself declares on
more than one occasion that in his youth he had
turned his mind to the study of celestial pheno-
mena (Μετέωρα) but not in his later years (see G.
C. Lewis, The Astronomy of the ancients, page 109;
Mädler, Geschichte der Himmelskunde, page 41).
Here and there in Plato's writings we find incidental
notes on the sun and other heavenly bodies.
Leonardo may very well have known of these, since
the Latin version by Cicinus was printed as early
as 1491; indeed an undated edition exists which
may very likely have appeared between 1480-90.

There is but one passage in Plato, Epinomis
(p. 983) where he speaks of the physical properties
of the sun and says that it is larger than the earth.
tale óbra; essendo adunque il cóco'tro del-
l'óbre paralello dall' suo nacimiento al suo
fine, 5 li parue da giudicare che l' sole an-
cora lui fussè frôte di tal paralello, e per
consegüeza non essere pív gros'so di tal
colonna, e nò s'avvide che tal diminutione
shadows were cast; and the breadth of the
shadows being parallel from beginning to
end, he thought he might infer that the sun
also was directly opposite to this parallel
and that consequently its breadth was not
greater than that of the column; not perceiv-
ing that the diminution in the shadow was
d'óbra era insësibile 10 per la lunga distan-
tia del sole; 11 se l' sole fuše minore della
terra, le stelle 12 di grà parte del nostro
e miserio sarebbe sa13za lume; cótro a
Epicuro che dice, tato è gràde il sole,
quato e'pare.

F. 88

Dice Epicuro il sole essere tato quàto
esso si dimostra; a'dunque e'pare essere
vu piè, e così l'abbiamo a tenere; 3 segui-
rebbe che la luna quàd'ella fa oscurare il
sole, il so'le non l'avàzerebbe di gràdeza
come e'fa, onde, sendo 5 la luna minor del
sole, essa luna sarebbe meno d'un piede,
6 e per consegüeza quando il nostro módo
fa oscurare la lu'na, sarebbe minore a un
dito del piedi, concio sia se l' so'le è un
piede, e la nostra terra fa onbra piramidale
inverso la luna, egli è necessario che sia
maggiore il lumi'noso, causa della pira-
mide óbrosa, che l'opaco, causa d'essa 11 pi-
ramide.

Epicurus says the sun is the size it looks.
Hence as it looks about a foot across we
must consider that to be its size; it would
follow that when the moon eclipses the sun,
the sun ought not to appear the larger, as
it does. Then, the moon being smaller than
the sun, the moon must be less than a foot,
and consequently when our world eclipses
the moon, it must be less than a foot by a
finger's breadth; inasmuch as if the sun is a foot
across, and our earth casts a conical shadow
on the moon, it is inevitable that the lumi-
nous cause of the cone of shadow must be
larger than the opaque body which casts the
cone of shadow.

882. 2. l'iba no attenere. 3. seguebbe chella. 4. nollauzerebbe . gràdeza chome. 5. medun piedi. 6. chonsequeza . osscarsar.
7. concosia. 8. piedi ella. 9. luna "la" egli . . magore. 10. casa della.
Misura quatri soli si metterebbbero nel corso suo di 24 ore.

1° Fa vn circulo e voltalo a mezzodi, come sò li orologi da sole, e metti vn'bacchetta in mezzo, in modo che la sua lìghiezza si d'irizzi al centro di tal cerchio, e nota l'ombra che fa il sole d'essa bacchetta sopra la circufereñia di tale cerchio, che sarà l'ombra larga, diciamo tutto a n; ora misura quante volte tale obra entra in tale circufereñia di cerchio, e tante volte fà il numero che l'corpo solare entrerà nel corso suo in 24 ore; e qui si potrà vedere, se Epicuro disse, che l' sole era tanto grande quanto esso parea, che, parendo il diametro del sole vna misura pedale, e che esso sole entrasse mille volte nel suo corso di 24 ore, egli avrebbe corso mille piedi, cioè 300 braccia che è vn sesto di miglio; ora ecco che l'corso del sole infra di e notte sarebbe la sesta parte d'un miglio, e questa venerabile lumaca del sole avrebbe caminato 25 braccia per ora.

To measure how many times the diameter of the sun will go into its course in 24 hours.

Make a circle and place it to face the south, after the manner of a sundial, and place a rod in the middle in such a way as that its length points to the centre of this circle, and mark the shadow cast in the sunshine by this rod on the circumference of the circle, and this shadow will be—let us say—as broad as from a to n. Now measure how many times this shadow will go into this circumference of a circle, and that will give you the number of times that the solar body will go into its orbit in 24 hours. Thus you may see whether Epicurus was right in saying that the sun was only as large as it looked; for, as the apparent diameter of the sun is about a foot, and as that sun would go a thousand times into the length of its course in 24 hours, it would have gone a thousand feet, that is 300 braccia, which is the sixth of a mile. Whence it would follow that the course of the sun during the day would be the sixth part of a mile and that this venerable snail, the sun will have travelled 25 braccia an hour.

Poseidonius composed books on the size of the sun.

Of the nature of Sunlight.

W. L. 1324]

Il sole nò si move.

Ash. l. 194]

PRUVUA. - COME QUATO PIÒ SARAI PRESSO ALLA CAGIONE DE’RAZZI DEL SOLE, PIÒ TI PARRÀ MAGGIORIL SOLE SPECHIATO SUL MARE.

4 Se il sole adopera il suo splendore col suo cietro 5a fortificare la potèzia di tutto il corpo, è ne’ciascorno che i suoi razzi, quato piò s’alontanano da lui, piò si uadinò 7 aprèdo: se così è, tu che sei col ochio presso all’acqua che spechta il sole, vedì una minima parte de’ razzi del sole portare sulla superfìcie dell’acqua la forma d’esso sole spechiatò, e se tu sari presso al sole, come sarebbe quâdo il sole sia per ponète, vedrai il sole spechiaris ò detto mare di gràdissima action] is abundantly proved by the radiance of the solar body on which the human eye cannot dwell and besides this no less manifestly by the rays reflected from a concave mirror, which—when they strike the eye with such splendour that the eye cannot bear them—have a brilliancy equal to the sun in its own place. And that this is true I prove by the fact that if the mirror has its concavity formed exactly as is requisite for the collecting and reflecting of these rays, no created being could endure the heat that strikes from the reflected rays of such a mirror. And if you argue that the mirror itself is cold and yet send forth hot rays, I should reply that those rays come really from the sun and that it is the ray of the concave mirror after having passed through the window.

886. The sun does not move.

887. PROOF THAT THE NEARER YOU ARE TO THE SOURCE OF THE SOLAR RAYS, THE LARGER WILL THE REFLECTION OF THE SUN FROM THE SEA APPEAR TO YOU.

[4] If it is from the centre that the sun employs its radiance to intensify the power of its whole mass, it is evident that the further its rays extend, the more widely they will be divided; and this being so, you, whose eye is near the water that mirrors the sun, see but a small portion of the rays of the sun strike the surface of the water, and reflecting the form of the sun. But if you were near to the sun—as would be the case when the sun is on the meridian and the sea to the westward—you would see the sun, mirrored in the

sop. 12. percussione ar. 13. arx. 15. va chesse tale . alla. 17. razo. 18. regieria. 20. refresso. 21. essute . chello. 22. freno . razi. 23. razo. 24. razo. 28. to [per il fô]. Lines 32—47 are much effaced and some words remain doubtful: * 32. delle stan (û). 33. cedove. 34. sò tundu (û). 35. ni[3]ni[n]. 36. non nur (— aquistèr). 37. caldezna ne. 38. ancora in[n]. 39. passòto per la. 40. spera del co. 41. simulacrum. 42. alla su. 43. a cayex e. 44. passi per e. 45. mito (û) pa. 46. sar si vo. 47. glia.

886. Eis sol.

887. 3, razi . para magiore. 4. splendere. 5. a forzificato dala . chorpo. 6. razi. 7. che se chol . preso. 8. vedì l. parte [del sole] de razi . subs. 9. esse tussarsi. 10. sarebe . mezodi . vedie. 12. razi. 13. perco . magiore

886. This sentence occurs incidentally among mathematical notes, and is written in unusually large letters.

sima forma, perché, 1° essendo tu più presso 
al sole, l’occhio tuo, pigliando i raggi presso 
 al pioto, 2° ne piglia piov, e persci ne resulta 
maggiore splendore, e per questa ca\'gione 
si potrebbe provare la luna essere mare 
che specchia il sole, e quello che nò ri- 
piède fia terra.

\[\text{888.} \quad \text{Togli la misura del sole in solstizio a mezzo giugno.}\]

\[\text{889.} \quad \text{Take the measure of the sun at the sol-} \]

\[\text{stice in mid-June.}\]

\[\text{890.} \quad \text{Perché il sole pare maggiore nel tra\'mô-} \]

\[\text{tare, che di mezzo giorno che ci è presso.}\]

\[\text{891.} \quad \text{A method of seeing the sun eclipsed without} \]

\[\text{pain to the eye.}\]

\[\text{888—891.} \quad \text{THE SUN.}\]

\[\text{Why the sun appears larger when setting} \]

\[\text{than at noon, when it is near to us.}\]

\[\text{Because the eye is small it can only see} \]

\[\text{the image of the sun as of a small size. If} \]

\[\text{the eye were as large as the sun it would} \]

\[\text{see the image of the sun in water of the} \]

\[\text{same size as the real body of the sun, so} \]

\[\text{long as the water is smooth.}\]

\[\text{889.} \quad \text{At A is written sole (the sun), at} \]

\[\text{B terra (the earth).}\]
III.

THE MOON.

Br. M. 948]

Della luna.

\[892.\]

On the luminosity of the moon (892–901).

Volendo io trattare della essentia della luna è necessario in prima descrivere la prospettiva delle spechi piani, cócavi e cócaviti; e prima che cosa è razzo luminoso, e come si piega per varie nature di mezzi; Dipoi dove il razzo riflesso è più potente,

O nell’esser l’angolo della incidentia acuto retto o ottuso, o nelle cócaviti o piano o cócaviti, o da corpo desso e trasparete;

Oltre a questo, è come li razzi solari, che percuotono l’onde marine, si dimostrano al

when the angle of incidence is acute, right, or obtuse, or from a convex, a plane, or a concave surface; or from an opaque or a transparent body. Besides this, how it is that the solar rays which fall on the waves of the sea, are seen by the eye of the same

892. In the diagram Leonardo wrote sole at the place marked A.
THE MOON.

893.

DELLA LUNA E SE ELLA È PULITA E SPERICA.

Il simulacro del sole in lei è potetemente luminoso ed è in piccola parte della suà superficie; e la prova vedrai a torsre una palla d'oro brunito, posta nell'el tenebre, con vn lume da lei remoto, il quale ancorcò esso alluminii circa la metà d'essa palla, l'ochio non lo uede, se non in piccola parte della sua superficie, e tuttò il resto di tal superficie spechia le tenebre, che la circudano, e per questo in lei solo appa-risce il simulacro del lume e tutto il re-sto rimane invisibile, stando l'ochio remoto da tal palla; Questo medesimo interue-rebbe nella superficie della luna, essendo poi\*\*lita, lustra e densa, come son corpi che spe\*\*chiano;

Oppaco. 28. sella ... asilo. 26. onno. 21. essella. 22. particulari cho. 24. cha. 25. nostri. 27. essella. 28. imézso. 29. discéide. 30. eppiu. 33. essella ... eppiu. 35. solita ... traspare. 36. delle chose ... gràdezze [chessendo] posto. 37. distàcia adìstanta.

893. 1. esselle. 2. liél. 3. pichola. 4. autore. 6. dallei. 8. nudea. 9. pichola ... etum. 11. chetta circidia ... illei ... apa. 12. etutto. 14. dattal. 15. rebe. 16. lustra ... chesape. 19. settu. 21. ind. 24. pa. 27. chella. 30. odi inel si. 34. po.

26. The problem here propounded by Leonardo was not satisfactorily answered till Newton in 1682 formulated the law of universal attraction and gravitation. Compare No. 902, lines 5—15.
Show how, if you were standing on the moon or on a star, our earth would seem to reflect the sun as the moon does.

And show that the image of the sun in the sea cannot appear one and undivided, as it appears in a perfectly plane mirror.

Ash. I. 19a]

Come l'ombre si confondono per lunga distanza, sì si prova nell'ob'ra della luna che mai si vede.

Br. M. 28a]

O la luna à lume da se sì no; s'ell'à lume da se, perchè non risplende sanza l'aiuto del sole? e s'ella non à lume da se, nè cie'ssità la fa specchio sperico; e se ella è specchio, non è prova'to in prospettuà che 'l simulacro d'uno obbietto lumi'no'so nò sarà mai equale alla ì parte di quello specchio che da esso luminoso è illuminato? ne se così è, come mostra qui la figura in V s.  do'sde uiè tanta quantità di splendo're che à il plenilunio, che noi vediamo nella quinta decima della 17 luna?

Either the moon has intrinsic luminosity or not. If it has, why does it not shine without the aid of the sun? But if it has not any light in itself it must of necessity be a spherical mirror; and if it is a mirror, is it not proved in Perspective that the image of a luminous object will never be equal to the extent of surface of the reflecting body that it illuminates? And if it be thus[13], as is here shown at r s in the figure, whence comes so great an extent of radiance as that of the full moon as we see it, at the fifteenth day of the moon?


895. 13. At A, in the diagram, Leonardo wrote "sole" (the sun), and at B "luna o noi terra" (the moon or our earth). Compare also the text of No. 876.
Della luna.

La luna non a lume da se, se nò quìto ne vede il sole tanto l'allumina, 3della qual luminosità tanto ne vediamo quìto è quella che vede noi. 4E la sua notte riceve tanto di splendore, quìto è quello che li preñ-stando le nostre acque nel refletterì si il simulacro del sole, che in 6tutte quelle che vedono il sole e la luna, si spechìa; 7La pelle over superfìcie del-

acqua, di che si copòne il mare della luna e il 8mare della nostra terra, è sempre rughoso, 9o poco o assai, o più, o meno, e tale rughosità è causa di dilàtare l'innumerabili simulaci del sole, che nei collì e còcaviàtì e fròti delle innumera-
rughe si spechiàno, cioè in tati vari siti di ciascuna 22ruga quìto son vari li siti che ànno li ochi che le vedono, jì che accepìere nò potrebbe, se la spera dell' acqua, che i grà parte de se veste la 21luna fisse d'uniforme sphericità, perché allora il simulac-
lo del 22sole sarebbe uno a ciascuno occhio, e la sua reflessione sarebbe particu-
10lare e sempre sarebbe spéldore sperico, come manifestàte ci assegnàno le palle dorate, poste nelle sommità delli alti edifi-
fì; Ma 12se tali palle dorate fussìno rughose o globulèti come son le mó15re, frutti neri composti di minute globosità rotonde, allora ciascuna delle parti d'essa 20globosità, ve-
dute dal sole e dall'ochio, mostrerà a esso ochio il lustro 21gìnerato dal simulacro d'esso sole, e così in ui medesimo corpo si creebbero molti minimi soli, li quali spesse sò le volte che per lunga distàtia 23si uniscono e paiono còtìmati; E l' lustro della luna nuova è più lucido e più 24potète che quàdo è in plèmilunio, e questo si ca-
25vsa perché l'angolo della incidètia è molto più ottuso nella luna nuo26va che nella vecchia, doue tali angoli sono acutissimi; e l'onde della 27luna spechiàno il sole così nelle lor uali come nelle collì, e li latì 28restano oscuri; ma ne' latì della luna li fondì dell'onde non 29vedono il sole, ma

The moon has no light in itself; but so much of it as faces the sun is illuminated, and of that illuminated portion we see so much as faces the earth. And the moon's night receives just as much light as is lent it by our waters as they reflect the image of the sun, which is mirrored in all those waters which are on the side towards the sun. The outside or surface of the waters forming the seas of the moon and of the seas of our globe is always ruffled little or much, or more or less—and this roughness causes an extension of the numberless images of the sun which are repeated in the ridges and hollows, the sides and fronts of the innume-

rable waves; that is to say as in many different spots on each wave as our eyes find different positions to view them from. This could not happen, if the aequous sphere which covers a great part of the moon were uniformly spherical, for then the images of the sun would be one to each spectator, and its reflections would be separate and independent and its radiance would always appear circular; as is plainly to be seen in the gîl balls placed on the tops of high buildings. But if those gîl balls were rugged or composed of several little balls, like mulberries, which are a black fruit composed of minute round globules, then each portion of these little balls, when seen in the sun, would display to the eye the lustre resulting from the reflection of the sun, and thus, in one and the same body many tiny suns would be seen; and these often combine at a long distance and appear as one. The lustre of the new moon is brighter and stronger, than when the moon is full; and the reason of this is that the angle of incidence is more obtuse in the new than in the full moon, in which the angles [of incidence and reflection] are highly acute. The waves of the moon therefore mirror the sun in the hollows of the waves as well as on the ridges, and the sides remain in shadow. But at the sides
solo uedono le cime d’esse ōde, e per questo li simu36lacrì son più rari e più misti coll’onbrelle delle valli, e tal mistione 34delle spetie 5brose e luminose, così insieme infuse, vengono all’ō3chio có poco splendore, e nelli stremi sarà pìv oscure per essere 33la curiult de’ lati di tale ōde insuffìties e riflettere all’ōchio li r34cievuti razzi; La luna nova per natura riflette li 35razzi solari più inverso l’ōchio per tali

ōde streme, 36che per nessuno altro loco, come mostra la figura della luna che 37percùotèdò con razzi a nell’onda b riflette in b d, dou’è situa8to l’ōchio d; E questo accadere nò può nel plenilunio dove 39il razzo solare, stando all’occiède, percuote l’onde streme della 40luna all’ōriète dal n in m, e non riflette inverso l’oc41chio occièdèale, ma risalta all’ōriète, poco pégådò la rettitudìnine d’esso razzo solare, e così l’angelo della incidètia è grossissimo.

42La luna è corpo opà6co e solido, e se per lo a15versario ella fusse traspa10rente, ella nò ricieverebbe 47il lume del sole.

48Il rossume over tu59orlo dell’o46vo sta 59in mezzo al suo al51bume sanza discèdere 52d’alcuna parte, ed è pì53v lieve o più grave o equale d’esso 51albumìe; e s’elli è piu lì55ve egli dovrebbe surgìre sopra tutto l’albumìe e 57fermarsì in cotatto del-

crests of the waves do not catch the sunlight, but only their crests; and thus the images are fewer and more mixed up with the shadows in the hollows; and this intermingling of the shaded and illuminated spots comes to the eye with a mitigated splendour, so that the edges will be darker, because the curves of the sides of the waves are insufficient to reflect to the eye the rays that fall upon them. Now the new moon naturally reflects the solar rays more directly towards the eye from the

of the moon the hollows of the waves do not catch the sunlight, but only their crests; and thus the images are fewer and more mixed up with the shadows in the hollows; and this intermingling of the shaded and illuminated spots comes to the eye with a mitigated splendour, so that the edges will be darker, because the curves of the sides of the waves are insufficient to reflect to the eye the rays that fall upon them. Now the new moon naturally reflects the solar rays more directly towards the eye from the

The moon is an opaque and solid body and if, on the contrary, it were transparent, it would not receive the light of the sun.

The yellow or yolk of an egg remains in the middle of the albumen, without moving on either side; now it is either lighter or heavier than this albumen, or equal to it; if it is lighter, it ought to rise above all the albumen and stop in contact with the shell

32. chë pocho ... osschure. 31. churzia ... arefrottere. 34. raza da quel chosa la luna ... refrette. 35. razi ... tale. 36. locho ... mostra la fighura. 37. percho tendo cho razi b e refrette. 38. Equesto achadere ... dove / a. 39. razo solare [que] percehendo stando allociède percehote fonte. 40. refrette. 41. pocho pieghádo. 42. chois longholo. 43. chorpa. 44. cho essoldo esse. 45. e fassi. 46. end. 49. sta [rin in al pia delle]. 50. [vote] in. 51. discèdere. 52. dalchana. 53. greve “o equale” disso. 54. esselii. 55. eve edovere vesurgie. 57. chùtratto. 58. la [l preschool] schorra. 59. hovo
897. 

THE MOON.

of the egg; and if it is heavier, it ought to sink, and if it is equal, it might just as well be at one of the ends, as in the middle or below[54].

The innumerable images of the solar rays reflected from the innumerable waves of the sea, as they fall upon those waves, are what cause us to see the very broad and continuous radiance on the surface of the sea.

897. 

That the sun could not be mirrored in the body of the moon, which is a convex mirror,
in modo that tanto quanto esso sol ne illuminà, tanto essa luna ne specchìa, se già tal luna non avesse la superficie alta a specchiar, che fusse rugosa, a vso di superficie di mare, quando in parte è messa dal vento.

[L'onde dell'acqua crescono il simulacro della cosa in lei specchiata].

Quest'onde fanno per ogn'ìna linea a similitudine della spoglia del la pina.

Questa son 2 figure sicch'è farà l'una diversa dall'altra, coll'acqua ondeggianti e coll'acqua piana.

In possibil'è che per alcuna distanza il simulacro del sole, fatto nella superficie del corpo sferico, occupi metà d'esso sferico;

Qui tu à a provare, come la terra fa tutti questi medesimi ofiti inverso la luna che la luna inverso la terra;

Nò luce la luna col suo lume riflesso come il sole, perché il lume della luna non piglia il lume del sole continuo in nell'acqua, ma in sù colmi e cavi delle onde delle acque, e per esser tal sole nella luna cófusamente spechiato per le misurazioni delle onbre, che sono infra l'onde che lustrano, perciò non è il suo lume lucido e chiaro contro il sole.

Terra infra la luna in quita decima e il sole; Qui il sole è nel levante e la luna in ponente in quita decima; luna infra la terra in quita decima e il sole; Qui è la luna che a il sole per ponète e la terra per levète.

A. 614]

CHE COSA É LA LUNA.

La luna non é luminosa per se, ma bene è atta a ricevere la natura della luce e similitudine dello specchio e del l'acqua, o altro corpo lucido, e cresce nel l'orìe e occidète come il sole e gli altri pianeti; E la ragione si è che ogni corpo

in such a way as that so much of its surface as is illuminated by the sun, should reflect the sun unless the moon had a surface adapted to reflect it—in waves and ridges, like the surface of the sea when its surface is moved by the wind.

The waves in water multiply the image of the object reflected in it. These waves reflect light, each by its own line, as the surface of the fir cone does. These are 2 figures one different from the other; one with undulating water and the other with smooth water.

It is impossible that at any distance the image of the sun cast on the surface of a spherical body should occupy the half of the sphere.

Here you must prove that the earth produces all the same effects with regard to the moon, as the moon with regard to the earth.

The moon, with its reflected light, does not shine like the sun, because the light of the moon is not a continuous reflection of that of the sun on its whole surface, but only on the crests and hollows of the waves of its waters; and thus the sun being confusedly reflected, from the admixture of the shadows that lie between the luminous waves, its light is not pure and clear as the sun is.

The earth between the moon on the fifteenth day and the sun. Here the sun is in the East and the moon on the fifteenth day in the West. The moon on the fifteenth day between the earth and the sun. Here it is the moon which has the sun to the West and the earth to the East.

WHAT SORT OF THING THE MOON IS.

The moon is not of itself luminous, but is highly fitted to assimilate the character of light after the manner of a mirror, or of water, or of any other reflecting body; and it grows larger in the East and in the West, like the sun and the other planets. And the reason is that every luminous body looks

40. 41. Refers to the diagram below the others.

898. This text has already been published by LIBRI: Histoire des Sciences, III, pp. 224, 225.
larger in proportion as it is remote. It is easy to understand that every planet and star is farther from us when in the West than when it is overhead, by about 3500 miles, as is proved on the margin[7], and if you see the sun or moon mirrored in the water near to you, it looks to you of the same size in the water as in the sky. But if you recede to the distance of a mile, it will look 100 times larger; and if you see the sun reflected in the sea at sunset, its image would look to you more than 10 miles long; because that reflected image extends over more than 10 miles of sea. And if you could stand where the moon is, the sun would look to you, as if it were reflected from all the sea that it illuminates by day; and the land amid the water would appear just like the dark spots that are on the moon, which, when looked at from our earth, appears to men the same as our earth would appear to any men who might dwell in the moon.

899. 

Of the nature of the moon.

When the moon is entirely lighted up to our sight, we see its full daylight; and at that time, owing to the reflection of the solar rays which fall on it and are thrown off towards us, its ocean casts off less moisture towards us; and the less light it gives the more injurious it is.
Leisc.[900—902.]

Della luna.

Tutte le contraddizioni dell’ auersario a dir che nella luna non è acqua.

Leisc. 16]

Risposta a maestro Andrea da Imola, che disse come li razi solari riflesi dal corpo dello specchio convesso si confondono e si consumano in brieve spazio, e che per questo si negava al tutto la parte luminosa della luna non esser di natur’a di specchio, e per conseguenza non essere nato tale lume dalla innumerable moltitudine del l’onde di quel mare, il quale io proponeo essere quella parte della luna che s’alluminava per li razi solari;

se sia il corpo del sole, e n s sia la luna, b sia l’occhio, che in il basa c n del cateto c n m vede specchiare il corpo del sole infra li equali angoli c e n, e ’l simile fo remuovendosi l’occhio da b in a.

Leisc. 20]

Della luna.

Nessun denso è pivo lieue che l’aria.

Avendo noi provato come la parte della luna che risplende è acqua, che spechta il corpo del sole, la quale ci riflette lo splendore da lui ricevuta; E come, se tale acqua fusse sanza ode, che ella piccola si dimostrerebbe, ma di splendore quasi simile al sole; Al presente bisognia provare, se essa l’acqua è corpus grave o lieue, imperòché se fusse grave, — confessando che dalla terra in su in ogni grado d’altezza s’acqua gradi di letità, occiosiachè l’acqua è più lieue che la terra, e l’aria che l’acqua, c’è foco che l’aria, e così segueando successuamète,—e parrebbe che, se la luna auessi densità com’ ella a, ch’ella auessi gravità, e avvedò gravità che lo

900. Of the moon.

All my opponent’s arguments to say that there is no water in the moon.

Answer to Maestro Andrea da Imola, who said that the solar rays reflected from a convex mirror are mingled and lost at a short distance; whereby it is altogether denied that the luminous side of the moon is of the nature of a mirror, and that consequently the light is not produced by the innumerable multitude of the waves of that sea, which I declared to be the portion of the moon which is illuminated by the solar rays.

Let o p be the body of the sun, c n s the moon, and b the eye which, above the base c n of the cathetus c n m, sees the body of the sun reflected at equal angles c n; and the same again on moving the eye from b to a.

902. Of the moon.

No solid body is less heavy than the atmosphere.

Having proved that the part of the moon that shines consists of water, which mirrors the body of the sun and reflects the radiance it receives from it; and that, if these waters were devoid of waves, it would appear small, but of a radiance almost like the sun;—[5] It must now be shown whether the moon is a heavy or a light body: for, if it were a heavy body—admitting that at every grade of distance from the earth greater levity must prevail, so that water is lighter than the earth, and air than water, and fire than air and so on successively—it would seem that if the moon had density as it really has, it would have weight, and having weight, that it could not be sustained in the space

900. The objections are very minutely noted down in the manuscript, but they hardly seem to have a place here.

901. The large diagram on the margin of page 161 belongs to this chapter.
spazio, ove essa si trova, non la potesse sostenere, e per conseguenza avesse a descendere inverso il centro dell' universo, e congiungersi colla terra, e se no lei, al miao le sue acque acque uscì sino a cadere e spogliarla di sé e cadere inverso il ceto e lasciar di sé la luna spogliata e senza lumanzonti; ohe, nò seguitando quel che di lei la ragione ci promette, egli è manifesto segno che tale luna è vestita de'sua 13 elemèti, cioè acqua, aria e foco, e così in se, per se si sostenga in quello spazio come fa la nostra ter'ira coi suoi elemèti in quest' altro spazio, e che tale ofizio faccino le cose gravi ne' suoi elemèti, qual fanno l' altre cose gravi nellaellemèti nostri.

16 Quando l'occhio in oriète vede la luna in occidente vicina al tramòtato sole, esso la vede 17 colla sua parte onbrosa circundata da parte luminosa, del quale lume la parte laterale e superiore deriva dal sole, e la parte inferiore deriva dallo oceano occidentale, il qual 19 ancora lui riceve li razi solari e li riflette nelle inferiori mari della luna, e ancora per tutta la parte obrosa della luna dà tanto di splendore, qual'è quel che dà la luna alla terra nella mezzanotte, e perciò nò resta integralmente scura, e di qui è alcuno creduto, che la lunaa abbia in parte lume da se oltre a quel che gli è dato dal sole, il quale lume diria dalla àti detta causa delle nostri mari alluminati del sole.

24 Ancora si potrebbe dire che'1 cerchio dello splendore where it is, and consequently that it would fall towards the centre of the universe and come united to the earth; or if not the moon itself, at least its waters would fall away and be lost from it, and descend towards the centre, leaving the moon without any and so devoid of lustre. But as this does not happen, as might in reason be expected, it is a manifest sign that the moon is surrounded by its own elements: that is to say water, air and fire; and thus is, of itself and by itself, suspended in that part of space, as our earth with its element is in this part of space; and that heavy bodies act in the midst of its elements just as other heavy bodies do in ours 15.

When the eye is in the East and sees the moon in the West near to the setting sun, it sees it with its shaded portion surrounded by luminous portions; and the lateral and upper portion of this light is derived from the sun, and the lower portion from the ocean in the West, which receives the solar rays and reflects them on the lower waters of the moon, and indeed affords the part of the moon that is in shadow as much radiance as the moon gives the earth at midnight. Therefore it is not totally dark, and hence some have believed that the moon must in parts have a light of its own besides that which is given it by the sun; and this light is due, as has been said, to the above-mentioned cause,—that our seas are illuminated by the sun.

Again, it might be said that the circle of radiance


15. This passage would certainly seem to establish Leonardo's claim to be regarded as the original discoverer of the cause of the ashy colour of the new moon (lumin cinereum). His observations
ASTRONOMY.

that the moon when it and the sun are both in the West is wholly borrowed from the sun, when it, and the sun, and the eye are situated as is shown above.

Some might say that the air surrounding the moon as an element, catches the light of the sun as our atmosphere does, and that it is this which completes the luminous circle on the body of the moon.

Some have thought that the moon has a light of its own, but this opinion is false, because they have found it on that dim light seen between the horns of the new moon, which looks dark where it is close to the bright part, while against the darkness of the background it looks so light that many have taken it to be a ring of new radiance completing the circle where the tips of the horns illuminated by the sun cease to shine. [34. And this difference of background arises from the fact that the portion of that background which is conterminous with the bright part of the moon, by comparison with that brightness looks darker than it is; while at the upper part, where a portion of the luminous circle is to be seen of uniform width, the result is that the moon, being brighter there than the medium or background on which it is seen by comparison with that darkness it looks more luminous at that edge than it is. And that brightness at such a time itself is derived from our ocean and other inland-seas. These are, at that time, illuminated by the sun which is already setting in such a way as that the sea then fulfills the same function to the dark side of the moon as the moon at its fifteenth day does to us when the

however, having hitherto remained unknown to astronomers, Moestlin and Kepler have been credited with the discoveries which they made independently a century later.

Some disconnected notes treat of the same subject in Ms. C. A. 239b; 718b and 719b: "Perché la luna cinta della parte illuminata dal sole in ronante, tra maggior splendore in mezzo a tal cerchio, che quando essa ellissare il sole. Questo accade perché nell'ellissare il sole ella ombra il nostro oceano, il quale caso non accade essendo in ronante, quando il sole allume esso oceano." The editors of the "Saggio" who first published this passage (page 12) add another short

one about the seasons in the moon which I confess not to have seen in the original manuscript: "La luna ha ogni mese un vero e una state, e ha maggiori freddi e maggiori caldi, e i suoi equinoci sui freddi de' nostri." 23. 24. The larger of the two diagrams reproduced above stands between these two lines, and the smaller one is sketched in the margin. At the spot marked A Leonardo wrote corpo solare (solar body) in the larger diagram and Sole (sun) in the smaller one. At C luna (moon) is written and at B terra (the earth).

34. See Pl. CVIII, No. 5.
THE MOON.

903.

quando il sol'è tramontato, e tal proporzione è da quel poco lume che à la parte oscura della luna alla chiarezza della parte illuminata, qual è dalla...

43 Se voi vedete quanto la parte onbrosa della luna sia più chiara che'1 campo, ove tal luna si trova, occupa col la mano, o con altro obietto più distante all'occhio, la parte luinososa della luna.

904.

Some have said that vapours rise from the moon, after the manner of clouds and are interposed between the moon and our eyes. But, if this were the case, these spots would never be permanent, either as to position or form; and, seeing the moon from various aspects, even if these spots did not move they would change in form, as objects do which are seen from different sides.

903.

MACULE DELLA LUNA.

2 Alcuni dissero leuarsi da essa vapori a modo di tugoli e interporrsi infra la luna e li ochi no' strì; il che, se così fusse, mai tali macule sarebbero stabili nè di siti ne di figura, e vedendo la luna in diversi aspetti, ancor che tal macule fossero variate, esse muterebbero figura come fa quella cosa che si vede per piú versi.

904.

DELLE MACCHIE DELLA LUNA.

2 Altri dissero che la luna era composta di parti più o meno transparenti, come se una parte fusse a modo d'alabastro, e alcuna altra a modo di cristallo o vetro, che ne seguirebbe che l' sole, ferendo colli sua razzi nella parte mé transparète, il lume rimarrebbe in superfitie, e così la parte piú densa resterebbe alluminata, e la parte transparète mostrerebbe la 9 onbre della profondità sue oscuré, e così si copo ne la qualità della luna; e questa opinione è piacuta a molti filosofi, e massime a Aristotele, e pure ella è falsa opinione, perché ne di versi aspetti, che si trovano spesso la luna e il sole alli nostri ochi, noi vedremmo variare tal ma cule, e quando

sun is set. And the small amount of light which the dark side of the moon receives bears the same proportion to the light of that side which is illuminated, as that...[42].

If you want to see how much brighter the shaded portion of the moon is than the background on which it is seen, conceal the luminous portion of the moon with your hand or with some other more distant object.

42. Here the text breaks off; lines 43—52 are written on the margin.
si farebbono oscure, e qui ad chi\textsuperscript{8}are; scure si farebbono, quìdo il sole è in oc\textsuperscript{8}cident e la luna nel mezzo del celo, ch'è allora le cocauti\textsuperscript{8} transparèti piglierebbono l'ombre insi\textsuperscript{8}no all'ommità de' labibri di tal cocauti\textsuperscript{8} tras\textsuperscript{8}parèti, perché il sole nò potrebbe penetrare li sa razzi dentro alle boche di tali cocauti, le quali parrebbono chiare nel pleniluno, e la luna in orie\textsuperscript{8} te guardà il sole all'occidè\textsuperscript{8} te; allora il sole alluminerebbe insino ne' folg\textsuperscript{8} di tali transparèti, e così, nò generadosi n\textsuperscript{8} ore, la luna non ci mostrerebbe in tal tempo le predette machie, e così ora piv ora meno, secondo le mutati del sol dalla luna e della lurna dai lochi nostri, come di sopra dissi.

905.

**Delle macule della luna.**

\textsuperscript{2}Si è detto che le macule della luna sono create in essa luna, da essere in se di varia rarità e dicità, il che se così fusse, nell'ecissi della luna i razi solari pene-
trebbono per alcuna parte della predetta rarità, e, nò si uend\textsuperscript{8}endo tale effetto, detta opinione è falsa;

\textsuperscript{7}Altri dicono che la superficie della luna, essendo tersa e pulita, che essa, a similitudine di specchio, riceve in se la similitudine della terra; Questa opinione è falsa, conciosiachè la terra, scoperta dal-l'acqua, per diuer\textsuperscript{8}si aspetti a diuerse figure; adunque, quando la luna è al-l'orietà, essa specchierebbe altrè machie, che quà\textsuperscript{8}do essa ci è di sopra, o quà\textsuperscript{8}do essa è in occidè\textsuperscript{8}te; però le machie della luna, come si uede nel pleni-
lumo, nò è mai si uarìano nel moto da lei fatto nel nostro emis\textsuperscript{8} sperio; \textsuperscript{2} \textsuperscript{8}ragione è che la cosa specchiat\textsuperscript{8}ta nella conven-
vessità piglia piccola parte del'es\textsuperscript{8} so specchio, com'è provato in prospettua; 3\textsuperscript{8} \textsuperscript{8}ragione è che nel pleniluno la luna vede solo il mezzo della

moon in the middle of the sky; for then the transparent hollows would be in shadow as far as the tops of the edges of those transparent hollows, because the sun could not then fling his rays into the mouth of the hollows, which however, at full moon, would be seen in bright light, at which time the moon is in the East and faces the sun in the West; then the sun would illuminate even the lowest depths of these transparent places and thus, as there would be no shadows cast, the moon at these times would not show us the spots in question; and so it would be, now more and now less, according to the changes in the position of the sun to the moon, and of the moon to our eyes, as I have said above.

**Of the spots on the moon.**

It has been asserted, that the spots on the moon result from the moon being of varying thinness or density; but if this were so, when there is an eclipse of the moon the solar rays would pierce through the portions which were thin as is alleged\textsuperscript{[5]}. But as we do not see this effect the opinion must be false.

Others say that the surface of the moon is smooth and polished and that, like a mirror, it reflects in itself the image of our earth. This view is also false, inasmuch as the land, where it is not covered with water, presents various aspects and forms. Hence when the moon is in the East it would reflect different spots from those it would show when it is above us or in the West, now the spots on the moon, as they are seen at full moon, never vary in the course of its motion over our hemisphere. A second reason is that an object reflected in a convex body takes up but a small portion of that body, as is proved in perspective\textsuperscript{[18]}. The third reason is that when the moon is full, it only faces half the hemisphere of the
THE MOON.

906—908]

spera della terra illuminata, nella quale l'oceano colle altre acque risplendono, e la terra fa macule in esso splendore, e così si vedrebbe la metà della nostra terra cinta dallo splendoare del mare illuminato dal sole, e nella luna tal similitudine sarebbe minima parte d'essa luna; è che la cosa splendida non si spechia nell'altra splendida; adunque il mare, pigliando splendoare dal sole, siccome fa la luna, e' non si potrebbe in lei spechiare tal terra, che ancora specchiar non vi si vedesse particolarmente il corpo del sole e di ciascuna stella a lei opposta.

If you keep the details of the spots of the moon under observation you will often find great variation in them, and this I myself have proved by drawing them. And this is caused by the clouds that rise from the waters in the moon, which come between the sun and those waters, and by their shadow deprive these waters of the sun's rays. Thus those waters remain dark, not being able to reflect the solar body.

Se terrai osservate le particelle delle macchie della luna, tu troverai in quelle spese volte gran varietà, e di questo è fatto pruova io medesimo disegnandole; E questo nasce da nuvole che si leuano dal l'acque d'essa luna, li quali s'interpongono infra 'l sole e essa acqua, e colla loro onbra tolgo no i razi del sole a tale acqua, onde essa acqua viene a rimanere oscura, per non potere spechiare il corpo solare.

How the spots on the moon must have varied from what they formerly were, by reason of the course of its waters.

Come le mac'chie della luna son variate da quel che già fusro, per causa del corso delle sue acqua.

De' circhi della luna.

21. l'aluminato. 22. luna c. 26. 4 ehe chella . . splendita no si . . 27. splendita . . pigliando. 28. s come fa la luna e no . . libri. 29. speciar . . vedesi. 30. sole di ciascuna. 31. alle opposta.

Noi. 1. Settemari. 2. troverai. 3. effato . . "disegnandole" l'acque nasse da nuggho. 4. chessi . . sinterponga. 5. cholla . . tolgho. 6. rasi . . antale . . arri. 7. oscura.

907. 4. 28.

908. Of halos round the moon.

I have found, that the circles which at night seem to surround the moon, of various sizes, and degrees of density are caused by various gradations in the densities of the vapours which exist at different altitudes between the moon and our eyes. And of these halos the largest and least red is caused by the lowest of these vapours; the second, smaller one, is higher up, and looks redder because it is
2 umori; e così quanto più alti sieno, minori e più rossi appariranno, perché infra l’occhio e quello sia più solidi umori, 7 e per questo si prova che dove apparisce maggiore rossore li è più somma d’umori.

If you want to prove why the moon appears larger than it is, when it reaches the horizon; take a lens which is highly convex on one surface and concave on the opposite, and place the concave side next the eye, and look at the object beyond the convex surface; by this means you will have produced an exact imitation of the atmosphere included beneath the sphere of fire and outside that of water; for this atmosphere is concave on the side next the earth, and convex towards the fire.

910. See the Introduction, p. 136, Fracastoro says in his work Homocentres; “Per dua specilla ocularia si quis perspicet, altero altero superposito, majora multo et propequina videsit omnin. Quin uto quae dam specilla ocularia sunt tantae densitate, ut si per ea quis aut lunam, aut alium siderum spectet, adeo propequina ilia indicat, ut ne turres ipsas exceedat” (sect. II c. S and sect. III, c. 23).
VI.

THE STARS.

912.

The stars are visible by night and not by day, because we are beneath the dense atmosphere, which is full of innumerable particles of moisture, each of which independently, when the rays of the sun fall upon it, reflects a radiance, and so these numberless bright particles conceal the stars; and if it were not for this atmosphere the sky would always display the stars against its darkness.

911.

Whether the stars have their light from the sun or in themselves.

Some say that they shine of themselves, alleging that if Venus and Mercury had not a light of their own, when they come between our eye and the sun they would darken so much of the sun as they could cover from our eye. But this is false, for it is proved that a dark object against a luminous body is enveloped and entirely concealed by the lateral rays of the rest of that luminous body and so remains invisible. As may be seen from this and other remarks (see No. 902, Vol. II.), it is clear that Leonardo was familiar with the phenomena of irradiation.
Astronomy.

When the sun is seen through the boughs of trees bare of their leaves, at some distance the branches do not conceal any portion of the sun from our eye. The same thing happens with the above mentioned planets which, though they have no light of their own, do not—as has been said—conceal any part of the sun from our eye[18].

Second argument.

Some say that the stars appear most brilliant at night in proportion as they are higher up; and that if they had no light of their own, the shadow of the earth which comes between them and the sun, would darken them, since they would not face nor be faced by the solar body. But those persons have not considered that the conical shadow of the earth cannot reach many of the stars; and even as to those it does reach, the cone is so much diminished that it covers very little of the star’s mass, and all the rest is illuminated by the sun.

F. 60a]

Perché le pianeti appaiono maggiorn 2 in oriethe che sopra di noi, che dovrebbe essere il contrario, essendo 4 3500 miglia più vicini a noi, essendo 5 nel mezzo del celo, che essendo al-l’o6rizzote.

7 Tutti li gradi deli’elementi, dove passa-8 no le spetie de’ corpi celesti, 9 che vengono all’ochio, sono 10 equali, e li angoli, 11 donde li penetra 12 la linia cè-13 trale di tali spetie, sono 11inequali, e la di-14 stantia è 14maggiore, come mostra l’eccesso a b se 15spra a d, e per la 6 16 del 7 17 la gran-18 dezza 18d’essi corpi celesti nell’orizzonte è 19celestial bodies on the horizon is shown by the 9th of the 7th.

Why the planets appear larger in the East than they do overhead, whereas the contrary should be the case, as they are 3500 miles nearer to us when in mid sky than when on the horizon.

All the degrees of the elements, through which the images of the celestial bodies pass to reach the eye, are equal curves and the angles by which the central line of those images passes through them, are unequal angles [13]; and the distance is greater, as is shown by the excess of a b beyond a d; and the enlargement of these celestial bodies on the horizon is shown by the 9th of the 7th.


913. l. 13. inequali, here and elsewhere does not mean unequal in the sense of not being equal to each other, but angles which are not right angles.
To see the real nature of the planets open the covering and note at the base[4] one single planet, and the reflected movement of this base will show the nature of the said planet; but arrange that the base may face only one at the time.

E. v]

Tullius de Divinatione 2'ait Astrologiam fuisse 3'adunentà ante trojanum 4'bellù Quingentis septua3'ginta milibus anorum. 57000.

Cicero says in [his book] De Divinatione that Astrology has been practised five hundred seventy thousand years before the Trojan war. 57000.

Although time is included in the class of Of time and Continuous Quantities, being indivisible and immaterial, it does not come entirely under the head of Geometry, which represents its divisions by means of figures and bodies of infinite variety, such as are seen to be continuous in their visible and material properties. But only with its first principles does it agree, that is with the Point and the Line; the point may be compared to an instant of time, and the line may be likened to the length of a certain quantity of time, and just as a line begins and terminates in a point, so such a space of time.

914 i. refresso. 5. compless. 8. duna.

914. 4. basa. This probably alludes to some instrument, perhaps the Camera obscura.

915. The statement that Cicero, De Divin., ascribes the discovery of astrology to a period 57000 years before the Trojan war I believe to be quite erroneous. According to Ernesti, Classic Ciceniusian, Ch. G. Schultz (Lexic. Cicero) and the edition of De Divin. by Giese the word Astrologia occurs only twice in Cicero: De Divin. II, 42. Ad Chaldæorum monstrum veniamus, de quibus Eudoxus, Platonis auditor, in astrologia judicio doctissimarum hominum facile princeps, sic opinatur (ad quod scriptum reliqui) Chaldæis in predictione et in notitioe ejusque vitae ex naturali die minime esse credendum." He then quotes the condemnatory verdict of other philosophers as to the teaching of the Chaldæans but says nothing as to the antiquity and origin of astronomy. Cicero further notes De oratore I, 16 that Aratus was "ignarus astrologie" but that is all. So far as I know the word occurs nowhere else in Cicero; and the word Astronomia he does not seem to have used at all. (H. Müller-Strübing.)

916. This passage is repeated word for word on page 190 of the same manuscript and this is accounted for by the text in Vol. I, No. 4. Compare also No. 1216.
sō termine e principio di qualùche dato spatio di tenpo;—e se 9la linia è divisibile in infinito, lo spatio d'ù tenpo di tal divisione non è alieno, 10e se le parti diuise della linia sono proporcionabili infra se, ancora le parti del tenpo 11saranno proporcionabili infra loro.

Describe the nature of Time as distinguished from the Geometrical definitions.

Br. M. 176a]

Scruii la qualità del 2tenpo, separata dalla 3geometrica.

Br. M. 194a]

Fa che vn ora sia diui'sa in 3000 partì, e 3questo farai coll'oriolo 4alleggerèdo o aggravàdo 5il cotrapeso.

Divide an hour into 3000 parts, and this you can do with a clock by making the pendulum lighter or heavier.

10. esselle parte. 11. infralloro. 917. 2. separata. 3. geometrica. 918. 3. questo. 4. alleggerèdo o aggravàdo.
Leonardo's researches as to the structure of the earth and sea were made at a time, when the extended voyages of the Spaniards and Portuguese had also excited a special interest in geographical questions in Italy, and particularly in Tuscany. Still, it need scarcely surprise us to find that in deeper questions, as to the structure of the globe, the primitive state of the earth's surface, and the like, he was far in advance of his time.

The number of passages which treat of such matters is relatively considerable; like almost all Leonardo's scientific notes they deal partly with theoretical and partly with practical questions. Some of his theoretical views of the motion of water were collected in a copied manuscript volume by an early transcriber, but without any acknowledgment of the source whence they were derived. This copy is now in the Library of the Barberini palace at Rome and was published under the title: "De moto e misura dell'acqua," by Francesco Cardinali, Bologna 1828. In this work the texts are arranged under the following titles: Libr. I. Della spera dell'acqua; Libr. II. Del moto dell'acqua; Libr. III. Dell'onda dell'acqua; Libr. IV. Dei retrosi d'acqua; Libr. V. Dell'acqua cadente; Libr. VI. Delle rotture fatte dall'acqua; Libr. VII Delle cose portate dall'acqua; Libr. VIII. Dell'ancia dell'acqua e delle canne; Libr. IX. De molini e d' altri ordigni d'acqua.

The large number of isolated observations scattered through the manuscripts, accounts for our so frequently finding notes of new schemes for the arrangement of those relating to water and its motions, particularly in the Codex Atlanticus: I have printed several of these plans as an introduction to the Physical Geography, and I have actually arranged the texts in accordance with the clue afforded by one of them which is undoubtedly one of the latest notes referring to the subject (No. 920). The text given as No. 930 which is also taken from a late note-book of Leonardo's, served as a basis for the arrangement of the first of the seven books—or sections—, bearing the title: Of the Nature of Water (Dell'acque in se).
PHYSICAL GEOGRAPHY.

As I have not made it any part of this undertaking to print the passages which refer to purely physical principles, it has also been necessary to exclude those practical researches which, in accordance with indications given in No. 920, ought to come in as Books 13, 14 and 15. I can only incidentally mention here that Leonardo—as it seems to me, especially in his youth—devoted a great deal of attention to the construction of mills. This is proved by a number of drawings of very careful and minute execution, which are to be found in the Codex Atlanticus. Nor was it possible to include his considerations on the regulation of rivers, the making of canals and so forth (No. 920, Books 10, 11 and 12); but those passages in which the structure of a canal is directly connected with notices of particular places will be found duly inserted under section XVII (Topographical notes). In Vol. I, No. 5 the text refers to canal-making in general.

On one point only can the collection of passages included under the general heading of Physical Geography claim to be complete. When comparing and sorting the materials for this work I took particular care not to exclude or omit any text in which a geographical name was mentioned even incidentally, since in all such researches the chief interest, as it appeared to me, attached to the question whether these acute observations on the various local characteristics of mountains, rivers or seas, had been made by Leonardo himself, and on the spot. It is self-evident that the few general and somewhat superficial observations on the Rhine and the Danube, on England and Flanders, must have been obtained from maps or from some informants, and in the case of Flanders Leonardo himself acknowledges this (see No. 1068). But that most of the other and more exact observations were made, on the spot, by Leonardo himself, may be safely assumed from their method and the style in which he writes of them; and we should bear it in mind that in all investigations, of whatever kind, experience is always spoken of as the only basis on which he relies. Incidentally, as in No. 984, he thinks it necessary to allude to the total absence of all recorded observations.
Questi libri contengono in ne' primi 3 della natura dell'acqua in se ne' 3 sua moti, li altri contengono delle 3 cose fatte dai sua corsi, 3 che mvìtano il mondo di centro e di figura.

These books contain in the beginning: Schemes for Of the nature of water itself in its motions; the arrange- ment of the materials which change the world in its centre and its shape.

DINOSO DEL LIBRO.

Libro 1° dell'acque in se,
libro 2° del mare,
libro 3° delle vene,
 libro 4° delle nature de' fòdi,
libro 5° delle ghiàje,
libro 6° delle superfitie dell'acqua,
libro 9 delle cose che in quella son messe;
libro 10° de' ripari de' fiumi,
libro 11° delle condotti,
 libro 12 de' canali,
libro 13 delle strumèti volti dall'acqua,
 libro 14 del far mòtare l'acque,
libro 15 delle cose còsumate dall'acque.

DIVISIONS OF THE BOOK.

Book 1 of water in itself.
Book 2 of the sea.
Book 3 of subterranean rivers.
Book 4 of rivers.
Book 5 of the nature of the abyss.
Book 6 of the obstacles.
Book 7 of gravels.
Book 8 of the surface of water.
Book 9 of the things placed therein.
Book 10 of the repairing of rivers.
Book 11 of conduits.
Book 12 of canals.
Book 13 of machines turned by water.
Book 14 of raising water.
Book 15 of matters worn away by water.
PHYSICAL GEOGRAPHY.

Leic. 90a]

Farai prima un libro che tratti de' lochi occupati dall'acque dolci, e '1 2° dal'acque salse, e '1 5° come, per la partita di quelle, queste nostre parti son fatte piov lieu, e per conseguenza piov remosse dal centro del modo.

921. First you shall make a book treating of places occupied by fresh waters, and the second by salt waters, and the third, how by the disappearance of these, our parts of the world were made lighter and in consequence more remote from the centre of the world.

F. 87a]

Descriui in prima tutta l'acqua in ciascuno suo moto, di poi descriui tutti li sua fondi e le lor materie, sempre allegando le proposizioni delle predette acque, e fia bu'ono ordine, che altrimeti l'opera sarebbe cófusa.

Descriui tutte le figure che fa l'acqua dalla sua maggiore alla sua minore onda e le lor cause.

922. First write of all water, in each of its motions; then describe all its bottoms and their various materials, always referring to the propositions concerning the said waters; and let the order be good, for otherwise the work will be confused.

Descriui all the forms taken by water from its greatest to its smallest wave, and their causes.

F. 88a]

Libro 9 de' surgimenti accidentalì dell'acqua.

923. Book 9, of accidental risings of water.

F. 90a]

ORDINE DEL LIBRO.

3 Poni nel principio ciò che può fare vn fiume.

924. Place at the beginning what a river can effect.

Br. M. 35a]

Libro d'abbattere li eserciti col'impeto de' diluvi fatti dall'acque disgorgate,

2 Libro che l'acque còducino a saluamento li legniami tagliati ne' mòti,

3 Libro delle barche condotte contro all'impeto de' fiumi,

4 Libro dell'alzare li gran ponti col semplice accrescimeto dell'acque,

5 Libro del riparare all'impeto de' fiumi che le città da quelli no siè percosse.

925. A book of driving back armies by the force of a flood made by releasing waters.

Book showing how the waters safely bring down timber cut in the mountains.

A book of boats driven against the impetus of rivers.

A book of raising large bridges higher. Simply by the swelling of the waters.

A book of guarding against the impetus of rivers so that towns may not be damaged by them.

921. 1. p'ta' vn libr. 3. ochupati. 7. quelle. 8. parte.
922. 1. scriui in p'ta' . lacq'ta' . ciascuno. 2. descriui . elle. 4. altramèti. 5. cheffa lacq'ta'. 6. magore . elle.
923. acq'a'.
924. 2. co che po.
925. The head of each line is marked by the letter a which is crossed out. 1. dissatter . chel ispito . dilumi . dellacq'ta'

discorghate. 2. chellacque . assaluuamento. 4. accrescimeto. 5. chelle cita dacquelli . percosi.
INTRODUCTION.

926. A book of the ordering of rivers so as to preserve their banks.
A book of the mountains, which would stand forth and become land, if our hemisphere were to be uncovered by the water.
A book of the earth carried down by the waters to fill up the great abyss of the seas.
A book of the ways in which a tempest may of itself clear out filled up sea-ports.
A book of the shores of rivers and of their permanency.
A book of how to deal with rivers, so that they may keep their bottom scoured by their own flow near the cities they pass.
A book of how to make or to repair the foundations for bridges over the rivers.
A book of the repairs which ought to be made in walls and banks of rivers where the water strikes them.
A book of the formation of hills of sand or gravel at great depths in water.

927. Water gives the first impetus to its motion.
A book of the levelling of waters by various means.
A book of diverting rivers from places where they do mischief.
A book of guiding rivers which occupy too much ground.
A book of parting rivers into several branches and making them fordable.
A book of the waters which with various currents pass through seas.
A book of deepening the beds of rivers by means of currents of water.
A book of controlling rivers so that the little beginnings of mischief, caused by them, may not increase.
A book of the various movements of waters passing through channels of different forms.
A book of preventing small rivers from diverting the larger one into which their waters run.
A book of the lowest level which can be found in the current of the surface of rivers.

926. 2. chissì spiccheràno, e fià la terra sotto il nostro emisperio scoperta dall'acqua.
927. 9. Libro della dispostiö de' fiumi a còseruatiö dell'argine sue.

Br. M. 322 e]

L'acqua dà principio al moto suo,

BR. M. 356]

Libro della dispostiö de' fiumi a còseruatiö dell'argine sue,

2. Libro della monti, che si spiccheràno, e fià la terra sotto il nostro emisperio scoperta dall'acqua,

3. Libro del terreno portato dall'acqua a riépiuti la grà profundità de' pelaghi,

4. Libro de' modi che la fortuna per se netti li riépiuti porti del mare,

5. Libro dell'argine de' fiumi e lor permanetia,

6. Libro del fare che li fiumi con lor corso tégì netti li fondi loro per le città dòde passano,

7. Libro del fare o rifondare li ponti sopra li fiumi,

8. Libro di ripari che farsi debbò alli muri e argini de' fiumi percossi dall'acqua,

9. Libro del generare li colli dall'arena o ghiàja sopra le gran profundità dell'acque.

10. Libro dell'acqua che ò diversi moti passà pe' pelaghi loro,

11. Libro del profondare li letti alli fiumi có uari corsi d'acque,

12. Libro di disporre li fiumi ò modo che li piccoli pricipj de' sua danni non accercino,

13. Libro de' uari moti dell'acque che passan per diverser figure di canali,

14. Libro del fare che li piccoli fiumi non pieghino il maggiore percosso dalle loro acque,

15. Libro della maggior bazzessa che trouar si possa nella corrésche della superfitie de' fiumi,

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12 Libro dell’origine de’ fiumi che versà per l’alte cime de’ monti,
13 Libro della varietà de’ moti dell’acque, ne’ lor fiumi.

A book of the origin of rivers which flow from the high tops of mountains.
A book of the various motions of waters in their rivers.

[1] Della inequalità della concavità del nauilio,
2[1] Libro della inequalità della curvità de’ lati de’ nauili,
3[1] Libro della inequalità del sito del timone,
4[1] Libro della inequalità della carena de’ nauili,
5[2] Libro della varietà dello spiraculi donde l’acqua si uersa,
6[3] Libro dell’acqua inclusa ne’ vasi insieme coll’aria e sua moti,
7[4] Libro del moto dell’acqua per le ciegnole,
8[5] Libro de’ scontri e concorsi del l’acque venute da diversi aspetti,
9[6] Libro delle varie figure degli argini traversati dalli fiumi,
10[7] Libro delle varie seconde generate sotto le chiuse de’ fiumi,
11[8] Libro delle tortue e pieghemèti delle corretà de’ fiumi,
12[9] Libro de’ vari siti dove si de’ trar l’acqua de’ fiumi,
13[10] Libro delle figure degli argini de’ fiumi e lor permanètia,
14[11] Libro dell’acqua cadente perpendicolare sopra diversi obbietti,
15[12] Libro del curso de’ fiumi impe- dito in diversi siti,
16[12] Libro delle varie figure de’ obbietti che impediscono il corso del acque,
17[13] Libro delle concavità e globosità fatte dal fondo itorno a vari obbietti,
18[14] Libro del condurre li canali navigabili sopra o sotto li fiumi che l’itterse- gano,
19[15] Libro de’ terreni che beono le acque de’ canali e lor ripari,
20[16] Libro della creazion de’ corsi de’ fiumi che votano li letto de’ fiumi riempiti di terreno.

[9] A book of the various places whence the waters of rivers are derived.
[12] A book of the course of water when it is impeded in various places.
[12] A book of the various forms of the obstacles which impede the course of waters.
[14] A book of conducting navigable canals above or beneath the rivers which intersect them.
[16] A book of creating currents for rivers, which quit their beds, [and] for rivers choked with soil.

928. 4. charena. 5. spirachuli . . lacq“u”. 6. essus. 7. ciegnole. 8. acq“e” . . di . . aspetti. 9. delle . . traversate alli.
10. secce [fatte sotto] generate. 11. chorrèti. 12. lacque. 13. fighure dell’argine . . ellor permanètia. 14. chadende per-
pèdichuare. 15. acq“u”. 16. chenpedisscano . . acq“e” . . 17. globosità. 18. condure . . navichabili . . ossotto . .
chell’ittersegano. 19. beano . . canali ellor.

928. 1. The first line of this passage was added subsequently, evidently as a correction of the follow-
ing line. 7. ciegnole, see No. 966, 11, 17.
INTRODUCTION.

A. 558]

Comiciaméto del trattato dell'acqua.

L'omo è detto da li antiqui modo minore; e, cierto la ditione d'esso nome è bene collocata, 3'impero ch'è, sicchome l'omo è corp'osto di terra, acqua, aria e foco, questo corpo della terra è il simigliante; se l'omo à in se ossi, sostento ri e armadura della carne, il modo à i sassi, 5'sostenitori della terra; se l'omo à in se il lago del sangue, doue crescie e discrescie il polmone nello alitare, il corpo della terra à il suo oceano mare, il quale ancora lui crescie 7'e discrescie ogni sei ore per lo alitare del modo; se dal detto lago di sangue diriuano vene, che si vanno ramificádo per lo corpo vmano, similméte il mare oceano enpie 9'il corpo della terra d'infinite vene d'acqua, mancano al corpo della terra i nerui, i quali no ui 10'sono, perché i nervi sono fatti al proposito del moviméto, e il modo sendo di perpetua stabilità, 11'non accade moviméto e, nò accadédo moviméto, i nervi nò ui sono necessari; Ma i tutte 11'altre cose sono molto simil.

929. THE BEGINNING OF THE TREATISE ON WATER.

By the ancients man has been called the General introduction.

world in miniature; and certainly this name is well bestowed, because, inasmuch as man is composed of earth, water, air and fire, his body resembles that of the earth; and as man has in him bones the supports and framework of his flesh, the world has its rocks the supports of the earth; as man has in him a pool of blood in which the lungs rise and fall in breathing, so the body of the earth has its ocean tide which likewise rises and falls every six hours, as if the world breathed; as in that pool of blood veins have their origin, which ramify all over the human body, so likewise the ocean sea fills the body of the earth with infinite springs of water. The body of the earth lacks sinews and this is, because the sinews are made expressly for movements and, the world being perpetually stable, no movement takes place, and no movement taking place, muscles are not necessary.—But in all other points they are much alike.

OF THE NATURE OF WATER.

I.

The order of the first book on water.

Define first what is meant by height and depth; also how the elements are situated one inside another. Then, what is meant by solid weight and by liquid weight; but first what weight and lightness are in themselves. Then describe why water moves, and why its motion ceases; then why it becomes slower or more rapid; besides this, how it always falls, being in contact with the air but lower than the air. And how water rises in the air by means of the heat of the sun, and then falls again in rain; again, why water springs forth from the tops of mountains; and if the water of any spring higher than the ocean can pour forth water higher than the surface of that ocean. And how all the water that returns to the ocean is higher than the sphere of waters. And how the waters of the equatorial seas are higher than the waters of the North, and higher beneath the body of the sun than in any part of the equatorial circle; for experiment shows that under the heat of a burning brand the water near the brand boils, and the water surrounding this ebullition always sinks with
OF THE NATURE OF WATER.

Among the four elements water is the second both in weight and in instability.

The centres of the sphere of water are of the surface of the globe that which is common to all waters not in motion, which exist in great quantities. As canals, ditches, ponds, fountains, wells, dead rivers, lakes, stagnant pools and seas, which, although they are at various levels, have each in itself the limits of their superfi
cies equally distant from the centre of the earth, such as lakes placed at the tops of high mountains; as the lake near Pietra Pana and the lake of the Sybil near Norcia; and all the lakes that give rise to great rivers, as the Ticino from Lago Maggiore, the Adda from the lake of Como, the Mincio from the lake of Garda, the Rhine from the lakes of Constance and of Chur, and from the lake of Lucerne, like the Tigris which passes through Asia Minor carrying with it the waters of three lakes, one above the other at different heights of which the highest is Munace, the middle one Pallas, and the lowest Triton; the Nile again flows from three very high lakes in Ethiopia.

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Del ciëtò dell'ocieano - mare.


Del mare che muta 7 il peso della terra.

Di richi, ostriège e altri simili animali, che nascono nelle fanghi marini, ci testifi- scano la mutatiò della terra intorno al 6 ciëtò de' nostri eleméti; pruvosasi così: 7 Li fiumi reali sempre corrono con tòrbidùme, tinto per lor si leuà mediàtè la coòregàlio delle sue acque sopra il fondo e nelle sue 10 riiue, et tal cosumati- one scopre le fronti de' gradi 11 fatti a' suolì di quegli richi, che stàn nella superficie 12 del fango marino, li quali in tal sito na- scirono, quà 13 do l'acque si lòcpìvano, e questi tali gradi eran ri 14 coperti di tempo in tempo dal fanghi de' varie gòrsse 15 e o condotti al mare dallì fiumi co' diluivi di di- verse grà 16 dezè; e così tali faghi furono composti in tâta altezza, che dal fondo si 17 scopriua all'aria: Ora questi tali fondi sono in tâta 18 altezza che son fatti collì, o alti motì, e li fiumi, 19 consumàtori de' latì 21 d'essì montì, 22 scoprono 23 li gradi d'es 24 si richi, e co 25 si il leni 26 ficato lato 27 della terra 28 al côtùno 29 sinalza, e 30 li antìpi 31 di s'accosta 32 più al 33 ciëtò del 34 mondo, 35 e li anti 36 richi fondi del 37 mare son fatti 38 gioghi di monti.

Of the centre of the ocean.

The centre of the sphere of waters is the true centre of the globe of our world, which is composed of water and earth, having the shape of a sphere. But, if you want to find the centre of the element of the earth, this is placed at a point equidistant from the surface of the ocean, and not equidistant from the surface of the earth; for it is evident that this globe of earth has nowhere any perfect roundity, excepting in places where the sea is, or marshes or other still waters. And every part of the earth that rises above the water is farther from the centre.

Of the sea which changes the weight of the earth.

The shells, oysters, and other similar animales, which originate in sea-mud, bear witness to the changes of the earth round the centre of our elements. This is proved thus: Great rivers always run turbid, being coloured by the earth, which is stirred by the friction of their waters at the bottom and on their shores; and this wearing disturbs the face of the strata made by the layers of shells, which lie on the surface of the marine mud, and which were produced there when the salt waters covered them; and these strata were covered over again from time to time, with mud of various thickness, or carried down to the sea by the rivers and floods of more or less extent; and thus these layers of mud became raised to such a height, that they came up from the bottom to the air. At the present time these bottoms are so high that they form hills or high mountains, and the rivers, which wear away the sides of these mountains, uncover the strata of these shells, and thus the softened side of the earth continually rises and the antipodes sink closer to the centre of the earth, and the ancient bottoms of the seas have become mountain ridges.
OF THE NATURE OF WATER.

936.

Let the earth make whatever changes it may in its weight, the surface of the sphere of waters can never vary in its equal distance from the centre of the world.

937.

Whether the earth is less than the water.

Some assert that it is true that the earth, which is not covered by water is much less than that covered by water. But considering the size of 7000 miles in diameter which is that of this earth, we may conclude the water to be of small depth.

938.

Of the earth.

The great elevations of the peaks of the mountains above the sphere of the water may have resulted from this that: a very large portion of the earth which was filled with water that is to say the vast cavern inside the earth may have fallen in a vast part of its vault towards the centre of the earth, being pierced by means of the course of the springs which continually wear away the place where they pass. Sinking in of countries like the Dead Sea in Syria, that is Sodom and Gomorrah.

It is of necessity that there should be more water than land, and the visible portion of

936. 1. facia . . . gravessa. 2. dellaq"a".

937. 1. Sella . . . chellaq"a". 2. dicano . . . chella. 3. grosseza . . . diametro . . . po con chilidure lacqua per essere. 4. pocha.

938. 2. lasspera . . . illoco. 3. coe. 4. ispicchata. 5. illoco. 6. coe sodomma e gamora. g. chellaq"a" . . . chella terra ella . . . dell . . . dimostra.

938. The small sketch below on the left, is placed in the original close to the text referring to the Dead Sea.
lo dimostra, onde bisogna che multa acqua sia dentro alla terra, senza quella ch’è infusa nella bassa aria e che scorre per li fiumi e uene.

939.

**FIGURA D’ELEMÉTI.**

Della figura dell’elemèti, e prima contro a chi nega l’opinione di Platone, che dicono che se essi elemèti vestisìsero l’un l’altro, colle figure che mette Platone, che si causerebbe vacuo infra l’uno e l’altro; e non è vero, e ‘qui lo provo, ma prima bisogna proporre alcuna còclusione: Non è necessario che nessuno elemento, che veste l’u l’altro, sia d’equi grossezza in tu’tta la sua quantità infra la parte che questo e quel10 la ch’è uestita; Noi vediamo la spera dell’acqua mantefamète essere di varie grossezze dalla sua superficie al fondo, e che, nò che essa vestisse la terra quando fusse di figura cuba cioè di 8 angoli come vole Platone, essa veste la terra che a innumerali angoli di scogli coperti dall’acqua e varie globosità e còcavità, e non si genera vacuo infra l’acqua e la terra; Ancora l’aria veste la spera dell’acqua insieme colli monti e valli che superano essa spera, e nò riamane vacuo infra la terra e l’aria, sicché, chì disse generarsi vacuo, ebbe tristo discorso.

A Platò si rispòde che la superficie delle figure che avrebbero li elemèti, che lui pone, non potrebbero sta2re.

940. PROVA COME LA TERRA NON È TÔDA, E, NON ESSENDÒ TÔDA, NÔ PUÒ AVER COMUNE CETRO.

Noi vediamo il Nilo partirsi dalle meridiane regioni e rigare diverse province, corrédo inverso settentrione per

the sea does not show this; so that there must be a great deal of water inside the earth, besides that which rises into the lower air and which flows through rivers and springs.

We see the Nile come from Southern regions and traverse various provinces, running towards the North for a distance of
ispazio di 3000 miglia e versare nelle mediterranee odi ai liti d'Egitto; e se noi vogliamo dare a questo di calo quelle
5 dicci braccia per miglio; le quali convan-
nalmente si concede alla universalità del corso de' fiumi, 6 noi troveremo il Nilo avere il suo fine piovoso che l'principio
miglia dieci; 7 Ancora vediamo il Reno, Rodano e Danubio partisarsi dalle germani-
che parti, quasi cietro 8 d'Europa; e l'uno a Oriente, l'altro a settentrione, e l'ultimo a meridiani mari fa suo corso; 9 se tu consideri bello, vedrai lo pianviero d'Europa fare vno corso molto 10 riv elevato, che non sono l'alte cime de' maritimi moti; or pèsa, quito le loro cime 11 si trovano riv alte, che siti marini.

941. Del caldo che nel modo è.

Dov'è vita li è calore e dov'è calore vitale, qui è munnìo 1, d'umori; 3 questo si prova, imperocché si uede per effetto che il caldo dello elemeto del foco sempre tira a se 4 li umidi vapori e folte nebbie e spessi nuvoli i quali spiccano da' mari e onrii paduli e fiumi e vmanii 5 valli e quelle tirade a poco a poco insino alla fredda regione, quella prima parte si ferma, 6 perché il caldo e vmano nò si affà col freddo e secoonde, onde ferma la prima parte li assetta l'altrè parti e così aggiugnèiési parte có parte, si fa spessee e oscure nvbole; e spesso sono remosse e portate da vèti d'una in altra regione; dove per la densità loro fanno spessa graveda, 9 che cadono có spessa pioggia e se l'caldo del sole s'aggivnie alla poticia dello elemeto del foco, i nuvoli fiemo tiradi riv alti e trovano riv freddo, in nel quale gli acciacciano e causarvi 'tpestosa gradine Ora quel medesimo caldo e che tiene si grà peso d'acqua, come si uede che piovere de' rivoli, svolge l'acque di basso in alto dalle base delle montagnie, e coduciele e tiene 11 detro alle cime delle montagnie le quali trovado qualche fessura al continuo cescio ci 14 causà i fiumi.

3000 miles e flou into the Mediterranean by the shores of Egypt; and if we will give to this a fall of ten braccia a mile, as is usually allowed to the course of rivers in general, we shall find that the Nile must have its mouth ten miles lower than its source. Again, we see the Rhine, the Rhone and the Danube starting from the German parts, almost the centre of Europe, and having a course one to the East, the other to the North, and the last to Southern seas. And if you consider all this you will see that the plains of Europe in their aggregate are much higher than the highest peaks of the maritime mountains; think then how much their tops must be above the sea shores.

941. Of the heat that is in the world.

Where there is life there is heat, and where vital heat is, there is movement of vapour. This is proved, inasmuch as we see that the element of fire by its heat always draws to itself damp vapours and thick mists as opaque clouds, which it raises from seas as well as lakes and rivers and damp valleys; and these being drawn by degrees as far as the cold region, the first portion stops, because heat and moisture cannot exist with cold and dryness; and where the first portion stops the rest, and thus one portion after another being added, thick and dark clouds are formed. They are often wafted about and borne by the winds from one region to another, where by their density they become so heavy that they fall in thick rain; and if the heat of the sun is added to the power of the element of fire, the clouds are drawn up higher still and find a greater degree of cold, in which they form ice and fall in storms of hail. Now the same heat which holds up so great a weight of water as is seen to rain from the clouds, draws them below upwards, from the feet of the mountains, and leads and holds them within the summits of the mountains, and these, finding some fissure, issue continously and cause rivers.

nelle mediterrane 4de a liti e se dettiseguesto di chio quale, 5 dicci br 6 quale chommmene 7 chouchiedele. 6 no
rovvremmo preciçio dieci. 7 vedemo delle 8 el Io 9 assettazione 10 1. 9 se tu consideri be
veri [llev] le deropa chouchorro. 10. cione.

941. 1. chalo. 2. vita [""] e chalo. quie domori [Esse i chalo move luminio "il fredo lo ferma". 3. chalo. focho 4. asse. 4. effebe nebbie espressi nuboli spaha de e. effnum. 5. soneapo apocho. 6. fredo regione i 10. 6. chalo do. cholo essecho li assetta talte. 7. chos agiuangi 8. chos ossure e spessi sono [portale]. 8. fano graneua. 9. chadano chiusspe piogia esschelado sagivnie. 10. focho. 11. fredo inel diaciano e chousses. 11. chalo chettine crome. 12. nuboli [tienfe divuelle delle motagnie e chouldie le etelie. 13. motagnie le quali 

VOL. II.
DEl mare che a molti ^sendìcì par più alto ^che la terra che gli fa liti.

4 b d è vna pianvra, donde corre ^vne fiume al mare, la qual pianu'ra à per terri
esso mare; e per'chè in vero essa terra scoperta no è nel sito dell'equalità,—perché, seco
tissime, il fiume non avrebbe mòto—, onde, movendo, questo sito ^à piuttosto da essere
detto spiagg'ia che pianvra; e così essa pià\'nura d b termina in tal modo ^colla spera dell'acqua che,
chi la producisse in continua rettitudine in b a, ^essa entrerebbe sotto il mare, e ^di qui nasce che l' mar a c b pare più alto che la terra discoperta.

15 Naturalmente nes^suna parte della terra discoperta da ^l'acqua sia mai ^più bassa che la superfitie della spera d'essa acqua.

OF THE SEA, WHICH TO MANY FOOLS APPEARS TO BE HIGHER THAN THE EARTH WHICH FORMS ITS SHORE.

b d is a plain through which a river flows to the sea; this plain ends at the sea, and since in fact the dry land that is uncovered is not perfectly level—for, if it were, the river would have no motion—as the river does move, this place is a slope rather than a plain; hence this plain d b so ends where the sphere of water begins that if it were extended in a continuous line to b a it would go down beneath the sea, whence it follows that the sea a c b looks higher than the dry land.

Obviously no portions of dry land left uncovered by water can ever be lower than the surface of the watery sphere.

D'ALCUNI CHE DICONO L'ACQUA ESSERE PIV 'ALTA 'CHE LA TERRA 'SCOPERTA.

3 Cierto ^non poca ^ammirazione ^mi da^la convvne^opinione fatta cotro al uero
dallo universale ^coronoro ^de' giviti ^delli omini, e questo ^è che tutti ^s'accordano
^che la superfitie ^del mare ^sia ^piv 'alta, ^che l'altissime cime delle montagne ^alleg^gado molte ^vane e puerili ^ragioni, ^cotro ai quali io n'alleghero solo vna ^senplice e breve ragione; ^Noi vediamo chiare, che ^se si toglie via ^l'argine al mare, che lui vestìra la terra e faralla di perfetta rotolità; ^or cosi^dera quanta ^terra si leuerebbe a fare che l'ode marine coprisso ^il mòdo; aduque ciò, che si leuasse, sarebbe piv ^alto ^che la riuà del mare.

OF CERTAIN PERSONS WHO SAY THE WATERS WERE HIGHER THAN THE DRY LAND.

Certainly I wonder not a little at the common opinion which is contrary to truth, but held by the universal consent of the judgment of men. And this is that all are agreed that the surface of the sea is higher than the highest peaks of the mountains; and they allege many vain and childish reasons, against which I will allege only one simple and short reason: We see plainly that if we could remove the shores of the sea, it would invest the whole earth and make it a perfect sphere. Now, consider how much earth would be carried away to enable the waves of the sea to cover the world; therefore that which would be carried away must be higher than the sea-shore.

942. 2. sensici par pu. 3. chella. 4 a d e vna. 5. laqual. 6. essesso. 9. fissi, alrebe. 14. dellacq"a", 15. cessi.
16. entrerbe. 17. nasse. On the margin is written: cella terra di scoperta.

Lines 15—24 are also written on the margin. 18. ne.
22. chella. 24. acq"a".

943. 1. dichano laq"a". 2. chella. 2. pocha ammirazione. 3. chnelloro estesse. 6. essamone fatto ch"ola. 7. cohorsino. 8. coeesto e chettutti sicchordano chella. 9. chelliissime ragione. 10. nallegero vedemo. 14. toglie. 15. chellei xessora efaralla. 16. retolità. 7. cosidera [in p. ch.] affare chellide. 17. choprisso. 8. chessi lenasi, chella.
The opinion of some persons who say that the water of some seas is higher than the highest summits of mountains; and nevertheless the water was forced up to these summits.

Water would not move from place to place if it were not that it seeks the lowest level and by a natural consequence it never can return to a height like that of the place where it first on issuing from the mountain came to light. And that portion of the sea which, in your vain imagining, you say was so high that it flowed over the summits of the high mountains, for so many centuries would be swallowed up and poured out again through the issue from these mountains. You can well imagine that all the time that Tigris and Euphrates have flowed from the summits of the mountains of Armenia, it must be believed that all the water of the ocean has passed very many times through these mouths. And do you not believe that the Nile must have sent more water into the sea than at present exists of all the element of water? Undoubtedly, yes. And if all this water had fallen away from this body of the earth, this terrestrial machine would long since have been without water. Whence we may conclude that the water goes from the rivers to the sea, and from the sea to the rivers, thus constantly circulating and returning, and that all the sea and the rivers have passed through the mouth of the Nile an infinite number of times.
ON THE OCEAN.

946.

Perché l’acqua è salata.

Pliny says in his second book, chapter 103, that the water of the sea is salt because the heat of the sun dries up the moisture and drinks it up; and this gives to the wide stretching sea the savour of salt. But this cannot be admitted, because if the saltiness of the sea were caused by the heat of the sun, there can be no doubt that lakes, pools and marshes would be so much the more salt, as their waters have less motion and are of less depth; but experience shows us, on the contrary, that these lakes have their waters quite free from salt. Again it is stated by Pliny in the same chapter that this saltiness might originate,

II.

Why water is salt.

946. See Pliny, Hist. Nat. II, CHI [C]. Nuque Solis ardore siccatur liquor: et hoc esse maximum subis asceptimus, torrens eurita sordensque. (cp. CIV.) Sic mari late patenti saeorem iniqui salis, aut quin exauituro inde dulci tonisque, quod facillime trobat vis ignis, omne asperius crassusque linguat: ido summa aquorum aqua dulcorem profundum; haene esse veritatem causam, quam quod mare terrae subor sit actemus: aut quia pluremum ex arido miscatur illi saeore: aut quia terrae natura sint medicatas aquas inficiat . . (cp. CV): alti-

simum mare XV, studiorum Fabianus tradit. Alii n Ponto coadverso Conaxorum gentis (secunt Bâliae Pont) trecentis fere a continenti statidem immensum altituidinem maris tradunt, sodisquinam reportis. (cp. CVI [CHI]) Mirabilium id faciunt aquae dulces, justa mare, ut fi-

stilis emicant. Nam nee aquarum natura a mirabilis easur. Dulces mari incredunt, leviores haurd dulce, Ideo et marina, quarum natura gnovior, magis in-

veta sustinent. Quaedam vero et dulces inter se super-

meant alias.
17 potrebbe nascere, perché, leuatone ogni 
18 dolce e sottile 19 parte, la qual facilmente il caldo a se ti sprò, rimane la parte più aspra e più 21 grossa, e per questo l'acqua, che è nella sua perfezione, è più dolce che nel focolo; 22 a questa si costradice colle mes- 
23 desimo 24 sopradette ragioni, cioè che il medesimo ac“caderebbe tutti paduli e altre acque che per il caldo s'asciugano; Acora fu detto che 22 la saldine del mare è sudore della terra; 22 a questo si risponde che tutte le une dell'acqua 29 che penetrano la terra, sarebbero insalate; Ma 30 si conclude la saldine del mare esser nata 31 dalle molte vene d'acqua le quali nel 31 penetrare la ter‘era trovano 30 le mini-
32 ore del sale, e 30 quelle in parte 30 si solu-
33 rono e port‘a seco all' oceano e li altri 32 mari, d' ò‘ li nuvo“li, senatori 34 d'elli fiumi lo leuano; ed e sarebbe 36 più salato il ma‘re alli nostri tè“pi che mai per 39 alcun altro tè“ po fusse, e se e per 37 l'acqua cosìette che, il tempo 38 infinito secererèbbe ove coglierèbbe 39 be il mare in sa‘le, a questo 38 si risponde, che 39 tal sale si re‘ de alla terra 41 colla 
42 loro sale; e li fiumi lo rendo no alla somersa terra.
43 Ma a dire meglio, essendo dato il modo eterno, egli è necessario 2 che li suoi popoli sieno acà loro eterni; 0 de
45 eterno‘me fu e sarebbe la spiete vmana cosu 26 matrice del sale; e se tutta la massa 
46 because all the sweet and subtle portions which the heat attracts easily being taken away, the more bitter and coarser part will remain, and thus the water on the surface is fresher than at the bottom[22]; but this is contradicted by the same reason given above, which is, that the same thing would happen in marshes and other waters, which are dried up by the heat. Again, it has been said that the saltiness of the sea is the sweat of the earth; to this it may be answered that all the springs of water which penetrate through the earth, would then be salt. But the conclusion is, that the saltiness of the sea must proceed from the many springs of water which, as they penetrate into the earth, find mines of salt and these they dissolve in part, and carry with them to the ocean and the other seas, whence the clouds, the begetters of rivers, never carry it up. And the sea would be saltier in our times than ever it was at any time; and if the adversary were to say that in infinite time the sea would dry up or congeal into salt, to this I answer that this salt is restored to the earth by the setting free of that part of the earth which rises out of the sea with the salt it has acquired, and the rivers return it to the earth under the sea.

947. For the third and last reason we will say that salt is in all created things; and this we learn from water passed over the ashes and cinders of burnt things; and the urine of every animal, and the superfluities issuing from their bodies, and the earth into which all things are converted by corruption. 

But,—to put it better,—given that the world is everlasting, it must be admitted that its population will also be eternal; hence the human species has eternally been and would be consumers of salt; and if all the mass of the earth were to be turned into salt, it
della terra fas\textsuperscript{27}si sale, non basterebbe alli cibi umani, per la qual \textsuperscript{28}cosa ci bisogna confessare, o che la specie del sale \textsuperscript{29}sia eterna \textsuperscript{30}esieme col modo, o che quella \textsuperscript{31}mora e ripone insieme cogli omini d’essa di\textsuperscript{32}voratori; Ma se la esperienza c’insignia quel \textsuperscript{33}non avere morte come per il foco si manifesta, il qual non la còssma, e per l’acqua che di tato si \textsuperscript{34}sala di quato ella in se ne risolse, evaporando l’a\textsuperscript{35}qua, sempre il sale resta nella prima qualità, \textsuperscript{36} deve passare per li corpi umani che in orina, \textsuperscript{37}o sudore, o altre superfìlià fà ritrovato, e quest’\textsuperscript{38}to è il sale che ogni anno si porta alle città; adunque \textsuperscript{39}cavasi il sale de’ lochi, dov’è piscia;—li porci e li vèti marini só salati;—

\textsuperscript{40}Diremo che la \textsuperscript{41}pioggia penetra
crittare della \textsuperscript{42}terra sia quest’alla, ch’è sotto \textsuperscript{43}al li fonde\textsuperscript{44}mèti delle cità e popoli, e \textsuperscript{45}e sia quella che \textsuperscript{46}per li meati dello\textsuperscript{47}la terra r\textsuperscript{48}sta la salzed\textsuperscript{49}leuata dal \textsuperscript{50}mare, e che \textsuperscript{51}la mutati \textsuperscript{52}del mare, sta\textsuperscript{53}to sopra tutti \textsuperscript{54}li monti, lo la\textsuperscript{55}sci per le minime\textsuperscript{56}re ritrovate \textsuperscript{57}in essi monti ecc.

Leic. 21f]
The character-istics of sea water
(\textsuperscript{948}–\textsuperscript{949}).

G. \textsuperscript{38}e]

Come l’oceano \textsuperscript{58}no pene-trà infra la
terra.

\textsuperscript{5} L’oceano \textsuperscript{59}no penetra infra la terra, e
questo c’insigniano le molte e varie vene d’acque dolci, le quali in diversi lochi d’esso oceano penetran dal fondo alla sua superfìcie; Ancora il me\textsuperscript{60}desimo dimostrano li pozzi fatti dopo lo spàtio d’\textsuperscript{61}un miglio remoti dal detto oceano, le quali s’enpiano d’acqua dolcic, e questo acc\textsuperscript{62}còde perchè l’acqua dolcic è più sottile che l’acqua salata, e per conseguenza più penetra-
tiva.

\textsuperscript{11}Qual pesa più, \textsuperscript{14} o l’acqua ghiaiac\textsuperscript{15}ciata o la nò \textsuperscript{16}ghiaicciata?

\textsuperscript{948}.

The waters of the salt sea are fresh at the greatest depths.

\textsuperscript{949}.

That the ocean does not penetrate \under-\textsuperscript{95}the earth.

The ocean does not penetrate under the earth, and this we learn from the many and various springs of fresh water which, in many parts of the ocean make their way up from the bottom to the surface. The same thing is further proved by wells dug beyond the distance of a mile from the said ocean, which fill with fresh water; and this happens because the fresh water is lighter than salt water and consequently more penetrating.

Which weighs most, water when frozen or when not frozen?
Può penetrare l’acqua dolce còtro al-
la salsa, che la salsa còtro alla
dolce.

20 Che l’acqua dolce penetra più còtro all’acqua salsa, che essa salsa còtro alla
dolce, ci manifesta una sottile asciutta e vecchia, pendente con equal bassezza
coli sua oppositi stremi nelle due
varie acque, delle quali le lor superficie
d’equal bassezza, e allor si vedrà elevarsì in alto infra essa pezza tanto più
l’acqua dolce, che la salsa, quanto la
dolce è più lieve che essa salsa.

C. A. 157 b 1 466 a

Tutti li mari mediterrani e li golfi d’essi marì so fatti da fiàmi che versano in
mare.

C. A. 83 b 2 240 a

Qui si rende ragione delli effetti fatti
dalle acque nel prospetto sito.

2 Tutti li laghi e tutti li golfi del mare
e tutti li mari mediterrani nascono dalli
fiumi, che in quelli spàr­dono le loro acque, e
dallli impedimenti della loro declinazione nel Mare Mediterrano, diusore d’Africa
dell’Europa, e dell’Europa dall’Asia, me-
diante il Nilo e Tanai che in li versano le loro acque; Si domàda, quale impedimento è maggiore a proibire il corso delle sue acque, che no si renda all’oceano.

950.

All inland seas and the gulf of those seas, are made by rivers which flow into
the sea.

951.

Here the reason is given of the effects
produced by the waters in the above men-
tioned place.

All the lakes and all the gulf of the sea
and all inland seas are due to rivers which
distribute their waters into them, and from
impediments in their downfall into the Medi-
erranean—which divides Africa from Europe
and Europe from Asia by means of the Nile and
the Don which pour their waters into it.
It is asked what impediment is great
enough to stop the course of the waters
which do not reach the ocean.

952.

De onda.

2 L’onda del mare
sempre ruina il
imman-
ti alla sua basa, e
quella parte del col-
mo si troverà più
bassa che prima era
più alta.

950. 1. ellì. 2. gholì.
951. 1. effetti... delle. 2. etàntili gholì... eti tutti... naschiano. 3. Dano le... ed dalli la pedimèti. 4. mediterrano... ettanai che il. 5. domàde... oceano.
952. 1. Londa [delle] del. 3. ecquella. 4. cholmo. 5. alta sara poi più bas.

952. The page of Francesco di Giorgio’s Trattati, on which Leonardo has written this remark, contains some notes on the construction of dams, harbours &c.
953. That the shores of the sea constantly acquire more soil towards the middle of the sea; that the rocks and promontories of the sea are constantly being ruined and worn away; that the Mediterranean seas will in time discover their bottom to the air, and all that will be left will be the channel of the greatest river that enters it; and this will run to the ocean and pour its waters into that with those of all the rivers that are its tributaries.

954. How the river Po, in a short time might dry up the Adriatic sea in the same way as it has dried up a large part of Lombardy.

955. Where there is a larger quantity of water, there is a greater flow and ebb, but the contrary in narrow waters.

956. Whether the flow and ebb are caused by the moon or the sun, or are the breathing of this terrestrial machine. That the flow and ebb are different in different countries and seas.

957. Book 9 of the meeting of rivers and their flow and ebb. The cause is the same in the sea, where it is caused by the straits of Gibraltar. And again it is caused by whirlpools.

953. 1. acquistano . . . mezo . . . liscagli. 2. essi chosumano Come e . . . scopiranno . . essol. 4. magor. 5. escoce saccopagnano.
954. 1. secha. 2. secho.
955. 1. be maggior. 2. frusso e refiniss. 4. gharda. 5. mezo.
956. 1. frusso e refiniss nasce. 2. tereste . . frusso e refiniss. 957. 1. iscontro . . eilor frusso e refiniss ella. 2. chausa . . stret[t]i di gibilar . . . achade . . . voragine.

956. 1. Allusion may here be made to the mythological explanation of the ebb and flow given in the Edda. Útgardloki says to Thor (Gylfaginning 48): "When thou wert drinking out of the horn, and it seemed to thee that it was slow in emptying a wonder befell, which I should not have believed possible: the other end of the horn lay in the sea, which thou sawest not; but when thou shalt go to the sea, thou shalt see how much thou hast drunk out of it. And that men now call the ebb tide." Several passages in various manuscripts treat of the ebb and flow. In collecting them I have been guided by the rule only to transcribe those which named some particular spot.
Del flusso e riflusso.

2 Tutti li mari àno il lor flusso e riflusso in v medesimo tempo, ma pare variarsi, perché li giorni no co'minciano in vn medesimo tempo in tutto l'universo, cóciosaché, quàdo nel nostro emisperio è mezzo 4 giorno, nell'opposto emisperio è mezzanotte, e nelle congiuntioni oricitali dell'uno e dell'altro emisperio comincia la notte che corre dirieto al giorno, e nelle congiuntioni occidentali d'essi emisperi comincia il giorno che seguita la notte dalla sua opposita parte; adunque è conchio che, ancora che l'1' detto accrescimento e diminuzione delle altezze de' mari sien fatte in vn 8 medesimo tempo, essi mostrano variarsi per le già dette cagioni; sono adunque somerse le acque nelle tene partite dai fondi de' mari, le quali ramificano dentro al corpo della terra, e rispondono 10 al nascimento de' fiumi, i quali al continuo tolgono dal fondo il mare al mare andato; e tolto innve' è volte nella superficie un mare al mare; E se tu volessi, che la luna, apparendo all'orientale parte 12 del Mare Mediterrano, comiciasde ad attrarre a se l'acque del mare, ne seguirebbe che immediata 13 se ne vedrebbe la speriëza al fine oricital de tal mare predetto; Ancora essendo il Mar Mediàtterrano circa alla ottava parte della circonferenza della spera dell'acqua, per essere lui 14 lungo 3 mila miglia, e l'flusso e riflusso no fa se no 4 volte in 24 ore, e' no s'accorderedere tale 16 effetto col tempo d'esse 24 ore, se esso Mare Mediterrá no fusse lungo semila miglia, perché 17 se lo spogliameto di tanto mare avesse a passare per lo stretto di Gibbitar nel correr diaetro 18 alla luna, e' sarebbe si grade il corso delle acque per tale stretto, e s'alzerverebbe in tatta altezza, 19 che dopo esso stretto farebbe tal corso, che per molte miglia infra l'oceano farebbe inondatione e bolliamenti grandissimi, per la qual cosa sarebbe impossibile passarui, e dopo questo subito l'oceano non rederebbe colla medesima furia l'acque ricevute, donde esso le riceve;

OF THE FLOW AND EBB.

All seas have their flow and ebb in the same period, but they seem to vary because the days do not begin at the same time throughout the universe; in such wise as that when it is midday in our hemisphere, it is midnight in the opposite hemisphere; and at the Eastern boundary of the two hemispheres the night begins which follows on the day, and at the Western boundary of these hemispheres begins the day, which follows the night from the opposite side. Hence it is to be inferred that the above mentioned swelling and diminution in the height of the seas, although they take place in one and the same space of time, are seen to vary from the above mentioned causes. The waters are then withdrawn into the fissures which start from the depths of the sea and which ramify inside the body of the earth, corresponding to the sources of rivers, which are constantly taking from the bottom of the sea the water which has flowed into it. A sea of water is incessantly being drawn off from the surface of the sea. And if you should think that the moon, rising at the Eastern end of the Mediterranean sea must there begin to attract to herself the waters of the sea, it would follow that we must at once see the effect of it at the Eastern end of that sea. Again, as the Mediterranean sea is about the eighth part of the circumference of the aqueous sphere, being 3000 miles long, while the flow and ebb only occur 4 times in 24 hours, these results would not agree with the time of 24 hours, unless this Mediterranean sea were six thousand miles in length; because if such a superabundance of water had to pass through the straits of Gibraltar in running behind the moon, the rush of the water through that Strait would be so great, and would rise to such a height, that beyond the straits it would for many miles rush so violently into the ocean as to cause floods and tremendous seething, so that it would be impossible to pass through. This agitated ocean would afterwards return the waters it.
ecco che adunque mai si i passerebbe per tale stretto, e la sperienza mostra che d’ogni ora vi si passa, salvo che quando il vento vic per la linea della corrente, allora il rifulso forte s’umetta; il mare non alza l’acqua nelli stretti che anno scita ma ben s’inorga e si ritarda dinati a quelli, onde con furioso moto poi ristora il tempo del suo rittardamento insino al fin del suo moto riflesso.

Leic. 15a

Come il flusso e rifulso non è generale, perché in riviera di Genova non fa niète, a Vinegia due braccia, tra la Inghilterra e Fiandra fa 18 braccia; 3 Come per lo stretto di Sicilia la corrente è gradissima, perché di li passa tutte l’acque de’ fiumi che uersa nel Mare Adriatico.

959.

That the flow and ebb are not general; for on the shore at Genoa there is none, at Venice two braccia, between England and Flanders 18 braccia. That in the straits of Sicily the current is very strong because all the waters from the rivers that flow into the Adriatic pass there.

Leic. 35a

Nelle parti occidentali, appresso alla Fiandra, il mare cresce e màca ogni 6 ore circa 20 braccia, e 22 quando la luna è in suo favore, ma le 20 braccia è il suo ordinario, il quale ordinario manifestamente si uede non essere per cava della luna; Questa varietà del crescere e discrescere del mare ogni 6 ore può l’accadere per le ringorazioni delle acque, le quali son condotte nel Mare Mediterrano da quella quantità de’ fiumi dell’Africa Ed Evropa, che in esso mare versano le loro acque, le quali per lo stretto di Gibilter infra Abila had received with equal fury to the place they had come from, so that no one ever could pass through those straits. Now experience shows that at every hour they are passed in safety, but when the wind sets in the same direction as the current, the strong ebb increases[23]. The sea does not raise the water that has issued from the straits, but it checks them and this retards the tide; then it makes up with furious haste for the time it has lost until the end of the ebb movement.

960.

In the West, near to Flanders, the sea rises and decreases every 6 hours about 20 braccia, and 22 when the moon is in its favour; but 20 braccia is the general rule, and this rule, as it is evident, cannot have the moon for its cause. This variation in the increase and decrease of the sea every 6 hours may arise from the damming up of the waters, which are poured into the Mediterranean by the quantity of rivers from Africa, Asia and Europe, which flow into that sea, and the waters which are given to it by those rivers; it pours them to the ocean

958. 23. In attempting to get out of the Mediterranean, vessels are sometimes detained for a considerable time; not merely by the causes mentioned by Leonardo but by the constant current flowing eastwards through the middle of the straits of Gibraltar.

959. A few more recent data may be given here to facilitate comparison. In the Adriatic the tide rises 2 and ½ feet, at Terracina 1½. In the English channel between Calais and Kent it rises from 1½ to 20 feet. In the straits of Messina it rises no more than 2½ feet, and that only in stormy weather, but the current is all the stronger. When Leo-

960. 5. Abila, Lat. Abila, Gr. Ἀβίλη, now Sierra Ximiero near Ceuta; Calpe, Lat. Calpe, Gr. Καλπῆ, now Gibraltar. Leonardo here uses the ancient names of the rocks, which were known as the Pil-lars of Heracles.
ON THE OCEAN.

Through the straits of Gibraltar, between Abila and Calpe[5]. That ocean extends to the island of England and others farther North, and it becomes dammed up and kept high in various gulfs. These, being seas of which the surface is remote from the centre of the earth, have acquired a weight, which as it is greater than the force of the incoming waters which cause it, gives this water an impetus in the contrary direction to that in which it came and is borne back to meet the waters coming out of the straits; and this it does most against the straits of Gibraltar; these, so long as this goes on, remain dammed up and all the water which is poured out meanwhile by the aforementioned rivers, is pent up [in the Mediterranean]; and this might be assigned as the cause of its flow and ebb, as is shown in the 21st of the 4th of my theory.

III.

SUBTERRANEAN WATER COURSES.

C. A. 1576; 456a]

Theory of the circulation of the waters. (961. 962.)

Gradissimi fiumi corrono sotto terra. Very large rivers flow under ground.

Leic. 31a

Qui s'À a imaginarre la terra segata pel mez'zo, e vedrannosi le profondità del mare e della terra; le uene si partono da' fondi de' mari e tessono la terra, e si leuano alla sommità de'moti, e riverisano per i fiumi e ritornano al mare.

This is meant to represent the earth cut through in the middle, showing the depths of the sea and of the earth; the waters start from the bottom of the seas, and ramifying through the earth they rise to the summits of the mountains, flowing back by the rivers and returning to the sea.

Leic. 21a

Raggirasi l'acqua con cótinvo moto dalle infinite profondità de' mari alle altissime sommità de'moti, non osservando la natura delle cose gravi, e in questo caso fanno come il sangue dell'animali, che sempre si muove dal mare del core e scorre alla sommità delle loro teste, e quiui ròponsi le uene, come si uede una vena rota nel naso, che tutto il sangue da basso si leua

The waters circulate with constant motion from the utmost depths of the sea to the highest summits of the mountains, not obeying the nature of heavy matter; and in this case it acts as does the blood of animals which is always moving from the sea of the heart and flows to the top of their heads; and here it is that veins burst—as one may see when a vein bursts in the nose, that all the blood

961. 1. corr. 962. 4. vedrassi. 7. [e come]. 8. partì. 10. etessano. 11. essi.
963. 1. Raggirasi. 2. fa . . animati. 3. move [dal lago] "dal mare" del . . teste . . e chi quiui ròpasì. 4. chettruto . . altera

963. The greater part of this passage has been given as No. 849 in the section on Anatomy.
The same cause which stirs the humours in every species of animal body and by which every injury is repaired, also moves the waters from the utmost depth of the sea to the greatest heights.

It is the property of water that it constitutes the vital human of this arid earth; and the cause which moves it through its ramified veins, against the natural course of heavy matters, is the same property which moves the humours in every species of animal body. But that which crowns our wonder in contemplating it is, that it rises from the utmost depths of the sea to the highest tops of the mountains, and flowing from the opened veins returns to the low seas; then once more, and with extreme swiftness, it mounts again and returns by the same descent, thus rising from the inside to the outside, and going round from the lowest to the highest, from whence it rushes down in a natural course. Thus by these two movements combined in a constant circulation, it travels through the veins of the earth.
finano, ma solo si leva quando la secchezza del motte ne tira; E se per l'avversario la pioggia, che penetra dalla cima del monte alle radici sua, che col mare confinano, discende e mollifica la spiggioppa opposta del me^desimo monte e tira al continuo, si come 11 fa la cicoggiola che versa per il suo lato più lùsgo, fusse quella che tira in alto l’acqua del mare; come se s n fusse la pelle del matrë, e la pioggia discende dalla cima del motte a allo n da un lato e dall’altro lato di scède da a allo m, senza dubbio que17 sto sarebbe il modo dello stileare a feltro o come si fa per la canna detta cico^gniola, e sempre l’acqua che à mollificato il monte per la gran pioggia, che discende dal11 due oppositi lati, tirerebbe a sè al lato più lungo la pioggia a n insieme coll’acqua del mare perpetuamente; se il lato del motte a m fosse più lungo che l’altro n, il che essere 17 no più, perché nessuna parte di terra che non sia sommersa dall’oceano sarà più bassa 2 d’esso oceano ecc.

967. DELLE VENE DEL’ACQUA SOPRA LE CIME DELLE MÔTÂGNIIE.

Chiaro, apparisce, che tutta la superficie dell’oceano, quando non à fortuna, è di pari distàta al cielo della terra, e che le cime delle montagne sono tanto più lentùne da esso cielo quanto che s’alzano sopra alla superficie d’esso mare; Adunque se’l corpo della terra non avesse similitudine coll’omo, sarebbe impossibile che l’acqua del mare, essendo tito pavì bassa che le montagne, ch’ella potesse di sua natura salire alle sommità d’esse montagne; Onde è da credere, che quella cagione, che tiene il sangue nella sommità della testà dell’omo, quella modesima tenga l’acqua nella sommità de’ monti.

Of springs of water on the tops of mountains.

It is quite evident that the whole surface of the ocean—when there is no storm—is at an equal distance from the centre of the earth, and that the tops of the mountains are farther from this centre in proportion as they rise above the surface of that sea; therefore if the body of the earth were not like that of man, it would be impossible that the waters of the sea—being so much lower than the mountains—could by their nature rise up to the summits of these mountains. Hence it is to be believed that the same cause which keeps the blood at the top of the head in man keeps the water at the summits of the mountains.
968. 9°9.]

SUBTERRANEAN WATER COURSES.

199

968.

IN CONFIRMATION OF WHY THE WATER GOES TO THE TOPS OF MOUNTAINS.

I say that just as the natural heat of the blood in the veins keeps it in the head of man,—for when the man is dead the cold blood sinks to the lower parts—and when the sun is hot on the head of a man the blood increases and rises so much, with other humours, that by pressure in the veins pains in the head are often caused; in the same way veins ramify through the body of the earth, and by the natural heat which is distributed throughout the containing body, the water is raised through the veins to the tops of mountains. And this water, which passes through a closed conduit inside the body of the mountain like a dead thing, cannot come forth from its low place unless it is warmed by the vital heat of the spring time. Again, the heat of the element of fire and, by day, the heat of the sun, have power to draw forth the moisture of the low parts of the mountains and to draw them up, in the same way as it draws the clouds and collects their moisture from the bed of the sea.

969.

That many springs of salt water are found at great distances from the sea; this might happen because such springs pass through some mine of salt, like that in Hungary where salt is hewn out of vast caverns, just as stone is hewn.

the MS. A, from which these passages are taken, was written about twenty years earlier than the MS. Leic. (Nos. 963 and 849) and twenty-five years before the MS. W. An. IV.

There is, in the original a sketch with No. 968 which is not reproduced. It represents a hill of the same shape as that shown at No. 982. There are veins, or branched streams, on the side of the hill, like those on the skull Pl. CVIII, No. 4.

969. The great mine of Wieliczka in Galicia, out of which a million cwt. of rock-salt are annually dug out, extends for 3000 metres from West to East, and 1150 metres from North to South.
IV.

OF RIVERS.

970.

Of the origin of rivers.

The body of the earth, like the bodies of animals, is intersected with ramifications of waters which are all in connection and are constituted to give nutriment and life to the earth and to its creatures. These come from the depth of the sea and, after many revolutions, have to return to it by the rivers created by the bursting of these springs; and if you chose to say that the rains of the winter or the melting of the snows in summer were the cause of the birth of rivers, I could mention the rivers which originate in the torrid countries of Africa, where it never rains—and still less snows—because the intense heat always melts into air all the clouds which are borne thither by the winds. And if you chose to say that such rivers, as increase in July and August, come from the snows which melt in May and June from the sun’s approach to the snows on the mountains of Scythia[9], and that such meltings come down into certain valleys and form lakes, into which they enter by springs and subter-

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970. 9. Scythia means here, as in Ancient Geography, the whole of the Northern part of Asia as far as India.
quali riescono poi all'origine del Nilo, questo è falso, inperòch'è più bassa la Scizia che l’origine del Nilo, conciosiaché la Scizia è presso al mare di Pòto a 400 miglia, e l'origine del Nilo è remoto 3000 miglia dal mare d'Egitto, ove versà le sue acque.

Leic. 54^]

Libro 9° della scontri de' fiumi e loro flusso e riflusso, e la medesima causa lo crea nel mare per causa dello stretto di Gibilterra, e ancora accade per le uoragini;

Se due fiumi insieme si scontrano per via medesima linea, la qual sia retta, poi infra 2 angoli retti pigliano insieme loro corso, e seguirà il flusso e riflusso ora a l’uno fiume, ora all'altro, avanti che sieno vinti e massime, se l'uscita nella loro vnitone nò sarà più veloce, che quàd’èra dis-uniti; Qui accadono 4 casi.

Leic. 154^]

Quando il fiume minore verso le sue acque nel maggiore, il quale maggiore corre dall'opposita riva, allora il corso del fiume minore piegherà il suo corso inverso l'auenimeto del fiume maggiore, e questo accade perché, quando esso maggiore fiume enpie d'acqua tutto il suo letto, e gli viene a fare ritroso sotto la bocca di tal fiume, e così spingine có seco l’acqua versata dal fiume minore; Quando il fiume minore versa le sue acque nel fiume maggiore, il quale abbia la corrente alla foce del minore, allora le sue acque si piegheranno inverso la fu'ga del fiume maggiore.

971.

Book 9, of the meeting of rivers and of their ebb and flow. The cause is the same in extrema of Gibraltar; and again it is caused by whirlpools.

3 If two rivers meet together to form a straight line, and then below two right angles take their course together, the flow and ebb will happen now in one river and now in the other above their confluence, and principally if the outlet for their united volume is no swifter than when they were separate. Here occur 4 instances.

972.

When a smaller river pours its waters into a larger one, and that larger one flows from the opposite direction, the course of the smaller river will bend up against the approach of the larger river; and this happens because, when the larger river fills up all its bed with water, it makes an eddy in front of the mouth of the other river, and so carries the water poured in by the smaller river with its own. When the smaller river pours its waters into the larger one, which runs across the current smaller river, its waters will bend with the downward movement of the larger river.
Quando le piene de' fiumi sò dimunite', allor 'li angoli acuti, che si genera nelle congiuntioni de' sua rami, si fanno piv corriti nellori lati e più grossi nelle lor punte, come sia la corrente a n, e la corrente d n. le quali si conguinghino insieme in n, quando il fiume è nelle sue gran pie; dico che, quando sia nella predetta disposizione, che se d n avanti la piena era piv basso che a n, che nel tempo della piena d n sarà pie di rena e fango, il quale nel calare delle acque d n porterà uia il fango e rimarà col fondo basso, e la canale a n, trovandosi alto, scolerà le sue acque nel basso d n e consumerà tutta la punta del renaio b c n, e così rimarrà l'angolo a c d piv grosso che l'angolo a n d, e di lati più corti, come prima dissi.

When the fulness of rivers is diminished, then the acute angles formed at the junction of their branches become shorter at the sides and wider at the point; like the current a n and the current d n, which unite in n when the river is at its greatest fulness. I say, that when it is in this condition if, before the fullest time, d n was lower than a n, at the time of fulness d n will be full of sand and mud. When the water d n falls, it will carry away the mud and remain with a lower bottom, and the channel a n finding itself the higher, will fling its waters into the lower, d n, and will wash away all the point of the sand-spit b n c, and thus the angle a c d will remain larger than the angle a n d and the sides shorter, as I said before.

Aqua.

Del moto d'ú subito enpito fatto da un fiume sopra il suo letto asciutto.

Tanto è più tardo o velocie il corso dell'acqua, data dallo isboccato lago al secco fiume, quà'nto esso fiume sia più largo o piv stretto, over più piano o cupo in un loco che in un altro, per quel che è proposto: il flusso e ripflusso del mare che dallo oceano entra nel Me'diterraneo Mare e de' fiumi, che giostrano con lui, alzano tanto piú o meno le loro acque, quanto tal mare è piv o meno stretto.

Water.

Of the movement of a sudden rush made by a river in its bed previously dry.

In proportion as the current of the water given forth by the draining of the lake is slow or rapid in the dry river bed, so will this river be wider or narrower, or shallower or deeper in one place than another, according to this proposition: the flow and ebb of the sea which enters the Mediterranean from the ocean, and of the rivers which meet and struggle with it, will raise their waters more or less in proportion as the sea is wider or narrower.

Voragine, cioè caverne, ciò residui d'acque precipitose.

Whirlpools, that is to say caverns; that is to say places left by precipitated waters.
Della vibratione della terra.

Li corsi sotterranei delle acque, siccome quelli che son fatti infra l’aria e la terra, sono quelli che al continuo s’ossumano e profondano li letti dell’oli lor corsi.

Leic. 6^j

Il fiume che esce de’ moti pone gran quietà di sassi grossi in nel suo ghiaretto, i quali fatti sono ancora con parte de’ suoi angoli e lati, e nel processo del corso conduce pietre minori con angoli piov cuminati, cioè le gré pietre fa minori, e piov oltre pò ghiaia grossa, e poi minvat’a, e seguita renna grossa, e poi minvta, dipoi procede l’itta grossa, e poi piov sottile, e così seguito giunge al mare l’acqua turbata di renna e di litta; la renna scarica sopra de’ litini marini per il rigurgitamento dell’ode salse, e segue la litta di tanta sottilità che par di natura d’acqua, la qual non si ferma sopra de’ mari liti, ma ritorna indietro coll’acqua per la sua leuità, perché nata di foglie marce e d’altre cose leuissime, si che, essendo quasi, com’è detto, di natura d’acqua, essa poi in tempo di bo-naccia si scarica e si ferma sopra del fondo del mare, ove per la sua sottilità si condensa e resiste all’onde che sopra vi passano per la sua lubricità, e qui stanno li nichi e quest’è terra bianca da far boccali.

Leic. 114^j

Tutte l’uscite dell’acque dal monte nel mare portà co seco li sassi del monte in esso mare, e per la inòdatione dell’acque marine contro alli sua monti, esse pietre erà ributta te inverso il molte, e nell’àiadare e nel ritornare indietro delle acque al mare, le pietre insieme ciò quella torvanono, e nel ritornare li angoli loro insieme si percuoteano, e come parte men resistente alle percosse si còsumavan e facean le piane sanza angoli, in figura rotonda, come ne’ liti dell’Elsa si dimostra, e quelle rimaneva piov grosse, che manco sarà remosse dal lor

Of the vibration of the earth.

The subterranean channels of waters, like those which exist between the air and the earth, are those which unceasingly wear away and deepen the beds of their currents.

Leic. 40^j

A river that flows from mountains deposits a great quantity of large stones in its bed, which still have some of their angles and sides, and in the course of its flow it carries down smaller stones with the angles more worn; that is to say the large stones become smaller. And farther on it deposits coarse gravel and then smaller, and as it proceeds this becomes coarse sand and then finer, and going on thus the water, turbid with sand and gravel, joins the sea; and the sand settles on the sea-shores, being cast up by the salt waves; and there results the sand of so fine a nature as to seem almost like water, and it will not stop on the shores of the sea but returns by reason of its lightness, because it was originally formed of rotten leaves and other very light things. Still, being almost—as was said—of the nature of water itself, it afterwards, when the weather is calm, settles and becomes solid at the bottom of the sea, where by its fineness it becomes compact and by its smoothness resist the waves which glide over it; and in this shells are found; and this is white earth, fit for pottery.

976. All the torrents of water flowing from the mountains to the sea carry with them the stones from the hills to the sea, and by the influx of the sea-water towards the mountains; these stones were thrown back towards the mountains, and as the waters rose and retired, the stones were tossed about by it and in rolling, their angles hit together; then as the parts, which least resisted the blows, were worn off, the stones ceased to be angular and became round in form, as may be seen on the banks of the Elsa. And those remained larger which were less removed...
nasciméto; e così quella si facea minore, che piv si rimouea dal predetto loco, in modo che nel procedere ella si còuerte in ghiaja minvta, e poi in rena 9e in ultimo in fango; dipoi che 'l mare si discosta dalla predetti monti; la salsedine lascia'°ta dal mare con altro umore della terra à fatta in modo che nel procedere ella si còuerte in ghiaja minvta, e poi in rena e in vitimo in fango; dipoi che 'l mare si discosta dalla predetti monti, la salsedine lasciata dal mare con altro umore della terra à fatta vna collegatione a essa ghiaja e rena, che la ghiaja in sasso e la rena in tufo s'è convertita; E di questo si uede l'esenplo in Adda all'uscire de' monti di Como e in Tesino, Adige, Oglio dall'alpi de' Tedeschi, e il si'mile d'Arno dal monte Albano intorno a Mòte Lupo e Capraia, dove li sassi grandissimi son tutti di ghiaia cógela di diuerse pietre e colori.

from their native spot; and they became smaller, the farther they were carried from that place, so that in the process they were converted into small pebbles and then into sand and at last into mud. After the sea had receded from the mountains the brine left by the sea with other humours of the earth made a concretion of these pebbles and this sand, so that the pebbles were converted into rock and the sand into tufa. And of this we see an example in the Adda where it issues from the mountains of Como and in the Ticino, the Adige and the Oglio coming from the German Alps, and in the Arno at Monte Albano[13], near Monte Lupo and Capraia where the rocks, which are very large, are all of conglomerated pebbles of various kinds and colours.

978. 13. At the foot of Monte Albano lies Vinci, the birth place of Leonardo. Opposite, on the other bank of the Arno, is Monte Lupo.
ON MOUNTAINS.

Mountains are made by the currents of rivers.

Mountains are destroyed by the currents of rivers.

That the Northern bases of some Alps are not yet petrified. And this is plainly to be seen where the rivers, which cut through them, flow towards the North; where they cut through the strata in the living stone in the higher parts of the mountains; and, where they join the plains, these strata are all of potter's clay; as is to be seen in the valley of Lamona where the river Lamona, as it issues from the Appenines, does these things on its banks.

That the rivers have all cut and divided the mountains of the great Alps one from the other. This is visible in the order of the stratified rocks, because from the summits of the banks, down to the river the correspondence of the strata in the rocks is visible on either side of the river. That the
stratified stones of the mountains are all layers of clay, deposited one above the other by the various floods of the rivers. That the different size of the strata is caused by the difference in the floods—that is to say greater or lesser floods.

981. The summits of mountains for a long time rise constantly.

The opposite sides of the mountains always approach each other below; the depths of the valleys which are above the sphere of the waters are in the course of time constantly getting nearer to the centre of the world.

In an equal period, the valleys sink much more than the mountains rise.

The bases of the mountains always come closer together.

In proportion as the valleys become deeper, the more quickly are their sides worn away.

982. In every concavity at the summit of the mountains we shall always find the divisions of the strata in the rocks.

983. Of the sea which encircles the earth.

I find that of old, the state of the earth was that its plains were all covered up and hidden by salt water.

983. This passage has already been published by Dr. M. Jordan: *Das Malerbuch des L. da Vinci, Leipzig* 1873, p. 86. However, his reading of the text differs from mine.
Leic. 31 s]

Perché molto sono più antiche le cose che le lettere, non è maraviglia, se alli nostri giorni non appare scrittura de’ predetti ma’ri essere occupatori di tanti pa’esi; e se pure alcuna scrittura apparia, le guerre, l’incendi, li diluvi del’acque le mutationi delle lingue e delle leggi anno cosumato ogni antichità, ma a noi bastano le testimonianze delle cose nate nelle acque salse ritrouarsi nelli alti mòti, lontani dalli mari d’allora.

Since things are much more ancient than letters, it is no marvel if, in our day, no records exist of these seas having covered so many countries; and if, moreover, some records had existed, war and conflagrations, the deluge of waters, the changes of languages and of laws have consumed every thing ancient. But sufficient for us is the testimony of things created in the salt waters, and found again in high mountains far from the seas.
VI.

GEOLOGICAL PROBLEMS.

Leic. 3a]

In questa tua opera tu ài in prima a provare, come li nichi in mille braccia d'altura nò ui furò 2 portati dal diluvio, perchè si uedono a ù medesimo luello, e si vedono auazzare assai mòti sopra 3 esso luello, e a dimàdare se 'l diluvio fu per pioggia o per ringorgamèto di mare, e poi ài a mostrare, che nè per pioggia che ingrossi i fiumi, nè per rigonfiamèto d'esso mare; li nichi, come cosa 5 grave, non sono sospinti dal mare alli mòti, nè tirati a se dalli fiumi còtro al corso delle 6 loro acque.

C. A. 157a; 452a]

DUBITATIONE.

Doubts about the deluge.

985. 1. quessta . . br daltura. 2. perchessi uedano ... e uedesl. 4. mostrare . . piogg chengrossi . . chome. 5. sosspiñi . . asse . . choro. 6. acq"e"a".

986. 2. ecquesso. 4. onno. 5. chessi . . abbian *nella bibbia. 6. chonpossto. 7. noce . . pio. 8. chettal piogg. 9. ghomità.

985. The passages, here given from the MS. Leic., have hitherto remained unknown. Some preliminary notes on the subject are to be found in MS. F 80a and 80b; but as compared with the fuller treatment here given, they are, it seems to me, of secondary interest. They contain nothing that is not repeated here more clearly and fully. LIBRI, Histoire des Sciences mathématiques III, pages 218—221, has printed the text of F 80a and 80b, therefore it seemed desirable to give my reasons for not inserting it in this work.

986. A DOUBTFUL POINT.

Here a doubt arises, and that is: whether the deluge, which happened at the time of Noah, was universal or not. And it would
OF THE DELUGE AND OF MARINE SHELLS.

If you were to say that the shells which are to be seen within the confines of Italy now, in our days, far from the sea and at such heights, had been brought there by the deluge which left them there, I should answer that if you believe that this deluge rose 7 cubits above the highest mountains— as he who measured it has written—these shells, which always live near the sea-shore, should have been left on the mountains; and not such a little way from the foot of the mountains; nor all at one level, nor in layers upon layers. And if you were to say that these shells are desirous of remaining near to the margin of the sea, and that, as it rose in height, the shells quitted their first home, and followed the increase of the waters up to their highest level; to this I answer, that the cockle is an animal of not more rapid movement than the snail is out of water, or even somewhat seem not, for the reasons now to be given: We have it in the Bible that this deluge lasted 40 days and 40 nights of incessant and universal rain, and that this rain rose to ten cubits above the highest mountains in the world. And if it had been that the rain was universal, it would have covered our globe which is spherical in form. And this spherical surface is equally distant in every part, from the centre of its sphere; hence the sphere of the waters being under the same conditions, it is impossible that the water upon it should move, because water, in itself, does not move unless it falls; therefore how could the waters of such a deluge depart, if it is proved that it has no motion? and if it departed how could it move unless it went upwards? Here, then, natural reasons are wanting; hence to remove this doubt it is necessary to call in a miracle to aid us, or else to say that all this water was evaporated by the heat of the sun.

to. chosi... chella pigga fusi. 12. fighura spericha Ella. 13. spericha nogni. 14. distante al. 16. chondizione. 17. chel- lacqua... mov "e". 18. chome. 21. essella... chome. 22. ecquimica. 23. sochor. 25. cholo [per sochorse] per... oddire. 26. chlor.

987. 1 8 del. 2. setu... chelli... lantano dal... alteza si ugghiana. 3. nostri tempi si stato... chausa... lascio... rispôde. 4. diluio superarsi... chessempre. 5. alli del mare dowano... ocho... li radi. 6. ce de... avandi avandi Essett. 7. crescecido... alteza chelli. 8. partirono... lor p' o' sito eseguitorno l'aressamento. 9. alteza... ch sposo. 10. chuss Vol. ii.
10le di non più veloce moto, che si sia la lumaca, fori dell’acqua, e qualche cosa più tarda perché nò nota, e'zi si fa vn solco per l’arena mediante i latti di tal solco ove s’appoggia, camminer il di dalle 3 alle 4. braccia; 11adunque questo cò tale moto no sarà caminato dal mare Adriano insin in Moferriato di Lon’bardi, chè v'è 250 miglia di distanza, in 40 giorni, come disse chi tenne coto d’esso tempo; e se tu dici che '1l’onde ve li portaron, essi per la lor gravezza non si reggono, se nó sopra il suo fondo; e se questo nó mi '8concedi, co-fessanmi al meno ch’elli aveano a rimanere nelle cime de’ piv alti moti e ne’ laghi che in14fra li moti si serrarono, come lago di Lario o di Como, e l Maggiore, e di Fiesole, e di Perugia e simili; 17E se tu dirai che li nichi son 18portati dall’onde, esso voli e morti, io dico che, dove andauano li morti, poco si rimu-veuano da’uii, e in que’ste montagne sono trovati tutti i uiui che si cognoscono che sono colli gusci appaiati, e scno 19 in vn filo doue non è nessun de’ morti, e poco piv alto è trovato doue eran gittati dall’o’de tutti li morti colle loro scorze separate, apresso a dove li fuumi cascavano in 20march in gra profundità; come Arno, che cadea dalla Gonfolina apresso a 21Mote Lupo e quiui lasciavi la ghiaia, la quale ancor si uede, che si è inioe ricegliata e di pie’ di tre di vari paesi nature e colori e durezze se n’è fatto vna sola congelatione, e poco più oltre la congelatione dell’are58 sa s’è fatta tufo, dou’ella s’agirava inverso Castel Fiorintino, più oltre si scaricava il fango, 22nel quale abitavano i nichil, il quale s’inalzava a gradi, secondo che li piene d’Arno torbido 21in quel mare versauano, e di tempo in tempo s’inalzaua il fondo al mare, il quale a gradi 22producea essi nichil, come si mostra nel tagli a Colle Gonzoli, dirupato dal fiume d’Arno, 22che il suo pie' consuma, nel qual taglio si slower; because it does not swim, on the contrary it makes a furrow in the sand by means of its sides, and in this furrow it will travel each day from 3 to 4 braccia; therefore this creature, with so slow a motion, could not have travelled from the Adriatic sea as far as Monferrato in Lombardia[13], which is 250 miles distance, in 40 days; which he has said who took account of the time. And if you say that the waves carried them there, by their gravity they could not move, excepting at the bottom. And if you will not grant me this, confess at least that they would have to stay at the summits of the highest mountains, in the lakes which are enclosed among the mountains, like the lakes of Lario, or of Como and il Maggiore[16] and of Fiesole, and of Perugia, and others.

And if you should say that the shells were carried by the waves, being empty and dead, I say that where the dead went they were not far removed from the living; for in these mountains living ones are found, which are recognisable by the shells being in pairs; and they are in a layer where there are no dead ones; and a little higher up they are found, where they were thrown by the waves, all the dead ones with their shells separated, near to where the rivers fell into the sea, to a great depth; like the Arno which fell from the Gonfolina near to Monte Lupo[23], where it left a deposit of gravel which may still be seen, and which has agglomerated; and of stones of various districts, nature, and colours hardiness, making one single conglomerate. And a little beyond the sandstone conglomerate a tufa has been formed, where it turned towards Castel Florentino; farther on, the mud was deposited in which the shells lived, and which rose in layers according to the levels at which the turbid Arno flowed into that sea. And from time to time the bottom of the sea was raised, depositing these shells in layers, as may be seen in the cutting at Colle Gonzoli, laid open by

987. 13. Monferrato di Lombardia. The range of hills of Monferrato is in Piedmont, and Casale di Monferrato belonged, in Leonardo’s time, to the Marchese di Mantova. 16. Lago di Lario. Lacus Larius was the name given by the Romans to the lake of Como. It is evident that it is here a slip of the pen since the

the words in the MS. are: “Come Lago di Lario o’l Magore e di Como.” In the MS, after line 16 we come upon a digression treating of the weight of water; this has here been omitted. It is 11 lines long. 23. Monte Lupo, compare 970, 13; it is between Empoli and Florence.
uedono manifestaméte li predetti gradi de' nichì in fango azzureggianti, e ui si trova di uarie cose marine; E si è alzata la terra del nostro emisfero per tanto più che nó solea, per quanto ella si fece più lieue delle acque, che le manca rono per il taglio di Calpe e d'Abila, e altrettanto piv' s'è alzata, perché il peso dell'acque, che di qui mácarono, s'aggiunsero alla terra volta all'altro emisfero, E se li nichì fussero stati portati dal Torbido diluuo, essi si sarebbero misti, separatamente l'un dall'altro, in fango e non con ordinati gradi a suoli, come alli nostri tempi si vede.

As to those who say that shells existed for a long time and were born at a distance from the sea, from the nature of the place and of the cycles, which can influence a place to produce such creatures—to them it may be answered: such an influence could not place the animals all on one line, except those of the same sort and age; and not the old with the young, nor some with an operculum and others without their operculum, nor some broken and others whole, nor some filled with sea-sand and large and small fragments of other shells inside the whole shells which remained open; nor the claws of crabs without the rest of their bodies; nor the shells of other species stuck on to them like animals which have moved about on them; since the traces of their track still remain, on the outside, after the manner of worms in the wood which they ate into. Nor would there be found among them the bones and teeth of fish which some call arrows and others serpents' tongues, nor would so many
portions of various animals be found all together if they had not been thrown on the sea shore. And the deluge cannot have carried them there, because things that are heavier than water do not float on the water. But these things could not be at so great a height if they had not been carried there by the water, such a thing being impossible from their weight. In places where the valleys have not been filled with salt sea water shells are never to be seen; as is plainly visible in the great valley of the Arno above Gonfolina; a rock formerly united to Monte Albano, in the form of a very high bank which kept the river pent up, in such a way that before it could flow into the sea, which was afterwards at its foot, it formed two great lakes; of which the first was where we now see the city of Florence together with Prato and Pistoia, and Monte Albano. It followed the rest of its bank as far as where Serravalle now stands. From the Val d’Arno upwards, as far as Arezzo, another lake was formed, which discharged its waters into the former lake. It was closed at about the spot where now we see Ginone, and occupied the whole of that valley above for a distance of 40 miles in length. This valley received on its bottom all the soil brought down by the turbid waters. And this is still to be seen at the foot of Prato Magno; it there lies very high where the rivers have not worn it away. Across this land are to be seen the deep cuts of the rivers that have passed there, falling from the great mountain of Prato Magno; in these cuts there are no vestiges of any shells or of marine soil. This lake was joined with that of Perugia[23].

A great quantity of shells are to be seen where the rivers flow into the sea, because on such shores the waters are not so salt owing to the admixture of the fresh water, which is poured into it. Evidence of this is to be seen where, of old, the Appenines poured their rivers into the Adriatic sea; for there in most places great quantities of shells are to be found, among the mountains, together


23. See Pl. CXIII.
with bluish marine clay; and all the rocks which are torn off in such places are full of shells. The same may be observed to have been done by the Arno when it fell from the rock of Gonfolina into the sea, which was not so very far below; for at that time it was higher than the top of San Miniato al Tedesco, since at the highest summit of this the shores may be seen full of shells and oysters within its flanks. The shells did not extend towards Val di Nievole, because the fresh waters of the Arno did not extend so far.

That the shells were not carried away from the sea by the deluge, because the waters which came from the earth although they drew the sea towards the earth, were those which struck its depths; because the water which goes down from the earth, has a stronger current than that of the sea, and in consequence is more powerful, and it enters beneath the sea water and stirs the depths and carries with it all sorts of movable objects which are to be found in the earth, such as the above-mentioned shells and other similar things. And in proportion as the water which comes from the land is muddier than sea water it is stronger and heavier than this; therefore I see no way of getting the said shells so far in land, unless they had been born there. If you were to tell me that the river Loire[38], which traverses France, covers when the sea rises more than eighty miles of country, because it is a district of vast plains, and the sea rises about 20 braccia, and shells are found in this plain at the distance of 80 miles from the sea; here I answer that the flow and ebb in our Mediterranean Sea does not vary so much; for at Genoa it does not rise at all, and at Venice but little, and very little in Africa; and where it varies little it covers but little of the country.

The course of the water of a river always rises higher in a place where the current is impeded; it behaves as it does where it is reduced in width to pass under the arches of a bridge.

38. Leonardo has written Era instead of Loera or Loira—perhaps under the mistaken idea that Lo was an article.
A CONFUTAIONE OF THOSE WHO SAY THAT SHELLS MAY HAVE BEEN CARRIED TO A DISTANCE OF MANY DAYS’ JOURNEY FROM THE SEA BE THE DELUGE, WHICH WAS SO HIGH AS TO BE ABOVE THOSE HEIGHTS.

I say that the deluge could not carry objects, native to the sea, up to the mountains, unless the sea had already increased so as to create inundations as high up as those places; and this increase could not have occurred because it would cause a vacuum; and if you were to say that the air would rush in there, we have already concluded that what is heavy cannot remain above what is light, whence of necessity we must conclude that this deluge was caused by rain water, so that all these waters ran to the sea, and the sea did not run up the mountains; and as they ran to the sea, they thrust the shells from the shore of the sea and did not draw them towards themselves. And if you were then to say that the sea, raised by the rain water, had carried these shells to such a height, we have already said that things heavier than water cannot rise upon it, but remain at the bottom of it, and do not move unless by the impact of the waves. And if you were to say that the waves had carried them to such high spots, we have proved that the waves in a great depth move in a contrary direction at the bottom to the motion at the top, and this is shown by the turbidity of the sea from the earth washed down near its shores. Anything which is lighter than the water moves with the waves, and is left on the highest level of the highest margin of the waves. Anything which is heavier than the water moves, suspended in it, between the surface and the bottom; and from these two conclusions, which will be amply proved in their place, we infer that the waves of the surface cannot convey shells, since they are heavier than water.

If the deluge had to carry shells three hundred and four hundred miles from the sea, it would have carried them mixed with various other natural objects heaped together; and we see at such distances oysters all together, and sea-snails, and cuttlefish, and all the other shells which congregate together,
GEOLOGICAL PROBLEMS.

all to be found together and dead; and the solitary shells are found wide apart from each other, as we may see them on sea-shores every day. And if we find oysters of very large shells joined together and among them very many which still have the covering attached, indicating that they were left here by the sea, and still living when the strait of Gibraltar was cut through; there are to be seen, in the mountains of Parma and Piacenza, a multitude of shells and corals, full of holes, and still sticking to the rocks there. When I was making the great horse for Milan, a large sack full was brought to me in my workshop by certain peasants; these were found in that place and among them were many preserved in their first freshness.

Under ground, and under the foundations of buildings, timbers are found of wrought beams and already black. Such were found in my time in those diggings at Castel Fiorentino. And these had been in that deep place before the sand carried by the Arno into the sea, then covering the plain, had been raised to such a height; and before the plains of Casentino had been so much lowered, by the earth being constantly carried down from them. [30] And if you were to say that these shells were created, and were continually being created in such places by the nature of the spot, and of the heavens which might have some influence there, such an opinion cannot exist in a brain of much reason; because here are the years of their growth, numbered on their shells, and there are large and small ones to be seen which could not have grown without food, and could not have fed without motion—and here they could not move [47].

Leic. 104]

Come in nelle falde, infra l'una e l'altra si trovano ancora lì andamosti delloni brici, che caminavano infra esse questo non erano ancora asciiute; Come tutti li fanghi marni ritengono ancora de' nichi ed è petrifìcato il nicho insieme col fango; della
eutti. 20. effi trovare... lunotti. 21. gorno... Eso... losstriche... aparatici gràdissimi infralle quale. 22. anchora... conco... assignificare... lassiate... ancoraveano. 23. losstretto di gibltàr... inelle... moltidiniede. 24. apichati... ne nefu... sachone. 25. fabricha... nello prarii biàta. 26. essottò... gasi nerì. 27. equestì... profundor "o"no... chelli litàgita. 28. coprìa fusi abondata... alzare e chelle... tante abassate. 29. del... sguarba 30. essettò. 31. niche. 33. nvo. 36. infrunsche. 37. nuoco. 38. di tro. 41. deloro arsenimento. 42. sile. 43. vedè picoli. 45. buo e non si cibèrì. 47. trono.

990. 2. infrassina allaldea... trova anchora. 3. neuer... asscìtta... fangh... ritégnano. 4. essemplicità... uoigliano chettal.
PHYSICAL GEOGRAPHY.

stolitia e semplicità di quelli, che uogliono che tali animali fussino alli lochi distant dai mari portati dal diluvio; come altra setta d’ignoranti affermano la natura, o i ceili aulri in tali lochi creati; per iussi celesti, come in quelli 7no si trovassino l’ossa de’ pesci cresciuti có laghezza di tempo, come nelle scorse de’ nichi e luna-che nò si potesse 8anmerare li anni o i mesi della lor uita, come nelle corna de’ buoi e de’ castroni e nella ramificazione de’le piante, che nò furò mai tagliate in alcuna parte; E auendo con tali segni di mostrato e la lunghezza della lor uita 10es-ser manifesta, e’o bisogno confessare, che tali animali nò uinon sanza moto per cercare 11il loro cibo e in loro non si uede struneto da penetrare la terra e l sasso, ove si trovano rincuasi; 12Ma in chè modo si potrebbe trovare in una grà lumaca i rottami e parte di mol’t’altre sorti di nichi di uarie nature, se ad essa, sopra de’ liti marini già morta, non li fussino state git-tate dalle onde del mare, come dell’altr’iore cose lievi, che esso gitta a terra? Perchè si trouva tanto rottame e nichi interi fra falda e falda di pie’stra, se già quella sopra del lito nò fusse stata ricoperta da una terra rigittata dal mare, la qual poi si uenne petrotricando? E se l diluvio predetto li auessi in tali siti dal mare portato, tu troveresti essi nichi in nel termì ne’l d’una sola falda, e non al termine di molte; deuensi poi anmerare le urrenti deli a4ni, che l mare moltiplicasa le falde dell’arena e fango, portatoli da fiuni vicini, e ch’elli scaricava in sui liti sua, e se 19tu vollesi dire, che piu dilui fussino stati a produrre tali falde e nichi infra loro, e’ bisognierebbe, 20che ancora tu affermassi ogni anno essere vn tal diluvio accaduto; Ancora inerfa li rot4nami di tal nichi si prosume in tal sito essere spiaggia di mare, dove tutti i nichi son gittati rotti e diuisi e nò 22mai appaiati, come infra ’l mare viui si trovano con due gusci, che fan coperchio l’uno all’altro; E infra 23le falde della ruieria e de’ liti marittimi son trovati de’ rottami; E dentro al termini delle pietre son trovati 24rari e appaiati de’ gusci, come che furò lasciati dal mare sotterratì viui dentro al fango, il qual 25poi si seccò e col terreno petrifìcò.

10places remote from the sea by the deluge. Another sect of ignorant persons declare that Nature or Heaven created them in these places by celestial influences, as if in these places we did not also find the bones of fishes which have taken a long time to grow; and as if, we could not count, in the shells of cockles and snails, the years and months of their life, as we do in the horns of bulls and oxen, and in the branches of plants that have never been cut in any part. Besides, having proved by these signs the length of their lives, it is evident, and it must be admitted, that these animals could not live without moving to fetch their food; and we find in them no instrument for penetrating the earth or the rock where we find them enclosed. But how could we find in a large snail shell the fragments and portions of many other sorts of shells, of various sorts, if they had not been thrown there, when dead, by the waves of the sea like the other light objects which it throws on the earth? Way do we find so many fragments and whole shells between layer and layer of stone, if this had not formerly been covered on the shore by a layer of earth thrown up by the sea, and which was afterwards petrified? And if the deluge before mentioned had carried them to these parts of the sea, you might find these shells at the boundary of one drift but not at the boundary between many drifts. We must also account for the winters of the years during which the sea multiplied the drifts of sand and mud brought down by the neighbouring rivers, by washing down the shores; and if you chose to say that there were several deluges to produce these rifts and the shells among them, you would also have to affirm that such a deluge took place every year. Again, among the fragments of these shells, it must be presumed that in those places there were sea coasts, where all the shells were thrown up, broken, and divided, and never in pairs, since they are found alive in the sea, with two valves, each serving as a lid to the other; and in the drifts of rivers and on the shores of the sea they are found in fragments. And within the limits of the separate strata of rocks they are found, few in number and in pairs like those which were left by the sea, buried alive in the mud, which subsequently dried up and, in time, was petrified.

E se tu vuoi dire che tale diluvio fu
quello che portò tali nichi fuor de' mari
ché na di miglia, questo nò può accade're,
esendo stato esso diluvio per cause di
pioggie, perchè naturalmente le pioggie
spingono i fiumi insieme colle cose da loro
portate inverno il mare, e nò tirano in-
verso de' moti le cose morte dai liti mariti-
ti, e se tu dicesse che il diluvio poi s'alt'zò
colle sue acque sopra de' moti, il moto del
mare fu si tardo col camino suo contro al
corso de' fiumi, che non avrebbe sopra di
teso a noto le cose pve gravi di lui,
e se pur l'auesse sostenute, esso nel ca-
lare l'avrebbe lasciate in diversi luochi
seminate; Ma come accomodernoi noi
li coralli, li quali inverso Monte Ferrato
di Lombardia esser si tutto'di trovati
intarlati appiccati alli scogli, scoperti
dalle correnti de'fiumi; e li detti scogli sono
tutti coperti di parentadi e famiglie
d'ostiche, le quali noi sappiamo che nò
si movono, ma stà sempre appiccate col'
ù de' gusci al sasso, e l'altro apro'no per
cibarsi d'animaluzzi, che notà per l'acque,
lì quali, credendo trovar bona pastura,
ducentano cibo del predetto nichio; non
si trova l'arena mista coll'alga marina
essersi petrificata, poichè l'aliga, che
la ramezzaua, venne meno; e di questo
scopre tutto il giorno l'Po nelle ruine
delle sue ripe.

Perchè sono trovate l'ossa de' grà
pesci e le ostriche e coralli e altri diuersi
nichi e chiocciole sopra l'alte cime de'
moti marittimi nel medesimo modo che
si trovà ne' bassi mari?

Tu ài ora a provare come li nichì nò
nascono, se nò in acque salse, quasi tutte
le sorte, e che li nichì di Lombardia àno
And if you choose to say that it was
the deluge which carried these shells away from
the sea for hundreds of miles, this cannot
have happened, since that deluge was caused
by rain; because rain naturally forces the
rivers to rush towards the sea with all the
things they carry with them, and not to bear
the dead things of the sea shores to the
mountains. And if you choose to say that
the deluge afterwards rose with its waters
above the mountains, the movement of the sea
must have been so sluggish in its rise against
the currents of the rivers, that it could not
have carried, floating upon it, things heavier
than itself; and even if it had supported them,
in its receding it would have left them strewn
about, in various spots. But how are we to
account for the corals which are found every
day towards Monte Ferrato in Lombardy,
with the holes of the worms in them, sticking
to rocks left uncovered by the currents of
rivers? These rocks are all covered with
stocks and families of oysters, which as we
know, never move, but always remain with
one of their halves stuck to a rock, and the
other they open to feed themselves on the
animalcles that swim in the water, which,
hoping to find good feeding ground, become
the food of these shells. We do not find
that the sand mixed with seaweed has been
petrified, because the weed which was min-
gled with it has shrunk away, and this the Po
shows us every day in the debris of its banks.

Why do we find the bones of great fishes
and oysters and corals and various other
shells and sea-snails on the high summits of
mountains by the sea, just as we find them
in low seas?

You now have to prove that the shells
cannot have originated if not in salt water,
almost all being of that sort; and that
the shells in Lombardy are at four levels,
and thus it is everywhere, having been made at various times. And they all occur in valleys that open towards the seas.

Per le 2 line de' nicchi bisogna dire che la terra per sdegno s'attufasse sotto il mare, e fece il primo suolo, poi il diluvio fece il secondo.

From the two lines of shells we are forced to say that the earth indignantly submerged under the sea and so the first layer was made; and then the deluge made the second.

994. This note is in the early writing of about 1470—1480. On the same sheet are the passages No. 1217 and 1219. Compare also No. 1339. All the foregoing chapters are from Manuscripts of about 1510. This explains the want of connection and the contradiction between this and the foregoing texts.
ON THE ATMOSPHERE.

Come la chiarezza dell'aria na^scie dal-l'acqua che in quella s'è resoluta e fattasi in isësibili graniculi, li quali, preso il lume del sole dall'op^posita parte, rędono la chiarezza che in essa si dimostra, e l'azzurro, che in quella apparisce, nascimento dalle tenebre, che dopo essa aria si nascondono.

That the brightness of the air is occasioned by the water which has dissolved itself in it into imperceptible molecules. These, being lighted by the sun from the opposite side, reflect the brightness which is visible in the air; and the azure which is seen in it is caused by the darkness that is hidden beyond the air.[4]

That the return eddies of wind at the mouth of certain valleys strike upon the waters and scoop them out in a great hollow, whirl the water into the air in the form of a column, and of the colour of a cloud. And I saw this thing happen on a sand bank in the Arno, where the sand was hollowed out to a greater depth than the stature of a man; and with it the gravel was whirled round and flung about for a great space; it appeared in the air in the form of a great bell-tower; and the top spread like the branches of a pine tree, and then it bent at the contact of the direct wind, which passed over from the mountains.

995. 1. chiareza. 2. sicie .. effattasi .. prosi. 3. rędano la chaireza .. dimostra ellazurro .. apparisce nascimento .. nascondono.
996. 1. accerte. 2. percotino .. ecquelle .. chauamento. 3. colunale .. vidio cia. 4. duome he. 5. giara e gittatta. 6. ecres-sèdeva lasomita .. ràmi di girapino essi.

L’onda dell’aria fa il me^desimo vftio infra l’elemento del fuoco, che fa l’onda dell’acqua infra l’aria, o l’onda dell’arena, cioè terra, infra l’acqua, e sono i lor moti in tal proporzione qual è quella de’ lor mot’tori infra loro.

S. K. M. II. 3 196]

DE MOTO.

Domando, se ‘l uerto mot’ de’ nuvoli si può conosciere per lo moto delle sue ombre, e similemente del moto del sole.

H. 3 528]

Per cognosciere meglio i veti.

Leic. 348]

Nessuna cosa nasce in loco dove no’ sia vita sensittu, vegetativa e rationale; nascono le penne sopra li uccelli, e si mutano ogni anno; nascono li peli sopra li animali, e ogni anno si mutano, salvo alcuna parte, come li peli delle barbe de’ li’oni e gatte e simili; nascono l’erbe sopra li prati e le foglie sopra li alberi, e ogn’anno in grà parte si rinovano; adunque potremo dire, ‘la terra avere anima vegetativa, e che la sua carne sia la terra, li sua ossi sieno li ordini delle collezioni de’ sas’si.

The globe is an organism.

997. 1. infrallelemèto .. fochio .. chella. 3. coe .. infrallacqua essono .. quelle quelli delor.
998. 2. nuvolo 190. 3. ore .. 4. essimile .. etc.
999. 1–2 K. 1. cognosciere. 2. e viti.
1000. 1. nasce .. fochio .. vita” .. 3. intellettiva .. 4. ragione .. 5. nasce .. essi .. nasce .. 2. alchuna .. 3. nasce .. elle .. potense .. 4. vegetativa .. 5. cognoscer .. 6. occeano .. crescere e dissipare quando s’è arrampic ci il tepid (Mode of weighing the air and of knowing when the weather will change); by the sponge “Spugna” is written. 1000. Compare No. 929.
which the mountains are composed, its cartilage the tufa, and its blood the springs of water. The pool of blood which lies round the heart is the ocean, and its breathing, and the increase and decrease of the blood in the pulses, is represented in the earth by the flow and ebb of the sea; and the heat of the spirit of the world is the fire which pervades the earth, and the seat of the vegetative soul is in the fires, which in many parts of the earth find vent in baths and mines of sulphur, and in volcanoes, as at Mount Aetna in Sicily, and in many other places.
A large part of the texts published in this section might perhaps have found their proper place in connection with the foregoing chapters on Physical Geography. But these observations on Physical Geography, of whatever kind they may be, as soon as they are localised acquire a special interest and importance and particularly as bearing on the question whether Leonardo himself made the observations recorded at the places mentioned or merely noted the statements from hearsay. In a few instances he himself tells us that he writes at second hand. In some cases again, although the style and expressions used make it seem highly probable that he has derived his information from others—though, as it seems to me, these cases are not very numerous—we find, on the other hand, among these topographical notes a great number of observations, about which it is extremely difficult to form a decided opinion. Of what the Master’s life and travels may have been throughout his sixty-seven years of life we know comparatively little; for a long course of time, and particularly from about 1482 to 1486, we do not even know with certainty that he was living in Italy. Thus, from a biographical point of view a very great interest attaches to some of the topographical notes, and for this reason it seemed that it would add to their value to arrange them in a group by themselves. Leonardo’s intimate knowledge with places, some of which were certainly remote from his native home, are of importance as contributing to decide the still open question as to the extent of Leonardo’s travels. We shall find in these notes a confirmation of the view, that the MSS. in which the Topographical Notes occur are in only a very few instances such diaries as may have been in use during a journey. These notes are mostly found in the MSS. books of his later and quieter years, and it is certainly remarkable that Leonardo is very reticent as to the authorities from whom he quotes his facts and observations: For instance, as to the Straits of Gibraltar, the Nile, the Taurus Mountains and the Tigris and Euphrates. Is it likely that he, who declared that in all scientific research, his own experience should be the foundation of his statements (see XIX Philosophy No. 987—991) should here have made an exception to this rule without mentioning it?
As for instance in the discussion as to the equilibrium of the mass of water in the Mediterranean Sea—a subject which, it may be observed, had at that time attracted the interest and study of hardly any other observer. The acute remarks, in Nos. 985—993, on the presence of shells at the tops of mountains, suffice to prove—as it seems to me—that it was not in his nature to allow himself to be betrayed into wide generalisations, extending beyond the limits of his own investigations, even by such brilliant results of personal study.

Most of these Topographical Notes, though suggesting very careful and thorough research, do not however, as has been said, afford necessarily indisputable evidence that that research was Leonardo’s own. But it must be granted that in more than one instance probability is in favour of this idea.

Among the passages which treat somewhat fully of the topography of Eastern places by far the most interesting is a description of the Taurus Mountains; but as this text is written in the style of a formal report and, in the original, is associated with certain letters which give us the history of its origin, I have thought it best not to sever it from that connection. It will be found under No. XXI (Letters).

That Florence, and its neighbourhood, where Leonardo spent his early years, should be nowhere mentioned except in connection with the projects for canals, which occupied his attention for some short time during the first ten years of the XVIth century, need not surprise us. The various passages relating to the construction of canals in Tuscany, which are put together at the beginning, are immediately followed by those which deal with schemes for canals in Lombardy; and after these come notes on the city and vicinity of Milan as well as on the lakes of North Italy.

The notes on some towns of Central Italy which Leonardo visited in 1502, when in the service of Cesare Borgia, are reproduced here in the same order as in the note book used during these travels (MS. L., Institut de France). These notes have but little interest in themselves excepting as suggesting his itinerary. The maps of the districts drawn by Leonardo at the time are more valuable (see No. 1054 note). The names on these maps are not written from right to left, but in the usual manner, and we are permitted to infer that they were made in obedience to some command, possibly for the use of Cesare Borgia himself; the fact that they remained nevertheless in Leonardo’s hands is not surprising when we remember the sudden political changes and warlike events of the period. There can be no doubt that these maps, which are here published for the first time, are original in the strictest sense of the word, that is to say drawn from observations of the places themselves; this is proved by the fact—among others—that we find among his manuscripts not only the finished maps themselves but the rough sketches and studies for them. And it would perhaps be difficult to point out among the abundant contributions to geographical knowledge published during the XVIth century, any maps at all approaching these in accuracy and finish.

The interesting map of the world, so far as it was then known, which is among the Leonardo MSS. at Windsor (published in the ‘Archeologia’ Vol. XI) cannot be attributed to the Master, as the Marchese Girolamo d’Adda has sufficiently proved; it has not therefore been reproduced here.
Such of Leonardo's observations on places in Italy as were made before or after his official travels as military engineer to Cesare Borgia, have been arranged in alphabetical order, under Nos. 1034—1054. The most interesting are those which relate to the Alps and the Appenines, Nos. 1057—1068.

Most of the passages in which France is mentioned have hitherto remained unknown, as well as those which treat of the countries bordering on the Mediterranean, which come at the end of this section. Though these may be regarded as of a more questionable importance in their bearing on the biography of the Master than those which mention places in France, it must be allowed that they are interesting as showing the prominent place which the countries of the East held in his geographical studies. He never once alludes to the discovery of America.
I. 

ITALY.

I001.

CANAL DI FIRENZE.

2 Facciasì alle Chiane d'Arezzo tali cateratte che, machtando acqua l'estate in Arno, il canale nò rimaga aridò; e facciasì esso canale largo in fodo braccia 20, e 30 in bocca, e braccia 2: s per l'acqua 0: 4, perchè dua d' esse braccia reca 4allì mvlini e li prati; questo bonificherà il paese, e Prato, Pistoia e Pisa insieme có Firèze, faranno l'anno di meglio 5dugièto mila ducati, e porgieranno le mani e spesa a esso aivtorio, e i Lucchesi il simile, perchè lì lago di Sesto fia navicable; 6fo lo fare la uia di Prato e Pistoia e tagliare Serravalle e uscire nel lago, perchè nò bisogna conche o sostegni i qua'lì nò sono eternì, anzi sempre si sta in esercito a operarli e mantenerli.

5 E sappi che se, cauâdo il canale, dove esso è profondo 4 braccia, si dà 4 dinari per braccio quadro, in doppia profondità si 9dà 6 dinari, se fai 4 10 braccia e' sono

1001. 2. alle chiane darero chateratte mačandó acqua l'lastate innarno. 3. effacciai br. 20. bocca e br. 2. 5. per qua. dui desse br. ruz 7. 4. ellì. questo piało. ch5. fia lano dimeglio. 5. porgierano le mani "esspesa" sesso. 6. fobi fare. ettagliare essere. 7. eterni. Lucæ 8—15 br. stands always for braccia. 8. Fesspi cheese chauâdo il canale dopo. 9. dinari [onali in. 7. si da il doppio perche. quelle sechonde 4 br. il terreno e giiasmòso e poi perche] seffatì 4. 10. deebrì. ellatro. 11. esse fussi. 12. crese solo. 1. bancho. cresade. 13. viene dinari sei

I001. This passage is illustrated by a slightly sketched map, on which these places are indicated from West to East: Pisa, Luccha, Lago, Serravalle, Pistoja, Prato, Firenze.

CANAL OF FLORENCE.

Sluices should be made in the valley of la Chiana at Arezzo, so that when, in the summer, the Arno lacks water, the canal may not remain dry: and let this canal be 20 braccia wide at the bottom, and at the top 30, and 2 braccia deep, or 4, so that two of these braccia may flow to the mills and the meadows, which will benefit the country; and Prato, Pistoia and Pisa, as well as Florence, will gain two hundred thousand ducats a year, and will lend a hand and money to this useful work; and the Lucchese the same, for the lake of Sesto will be navigable; I shall direct it to Prato and Pistoia, and cut through Serravalle and make an issue into the lake; for there will be no need of locks or supports, which are not lasting and so will always be giving trouble in working at them and keeping them up.

And know that in digging this canal where it is 4 braccia deep, it will cost 4 dinari the square braccio; for twice the depth 6 dinari, if you are making 4 braccia
From the wall of the Arno at [the gate of] la Giustizia to the bank of the Arno at Sardigna where the walls are, to the mills, is 7400 braccia, that is 2 miles and 1400 braccia and beyond the Arno is 5500 braccia.

By guiding the Arno above and below a treasure will be found in each acre of ground by whomsoever will.
640 braccia è il muro rotto, e 130 è il muro rimanente, 1300 braccia a rotto dal Bisarno in 4 anni.

Nó sanno, perchè Arno & non starà mai in canale; perchè i fiumi che vi mettono, nella loro entrata polgono terreno, e dalla opposita parte leuano e piegansi il fiume; 96 miglia si fa per Arno dalla Caprona a LiÌtvorno, e 12 si fa per li 12 stagni che s'avanzano 32. 13 miglia, e 16 dalla Caprona in sù, che fa 48 per Arno da Firenze, avanzasi 16 miglia; a Vico miglia 16, e' canale à 5; da Firenze a Fucechio miglia 40 per 19 acqua d'Arno.

Miglia 56. per Arno da Firenze a Vico, e pel canale di Pistoia è miglia 44: adunque è più corta 12. 25 miglia per canale che per Arno.

Cocaità fatta da Mensola, quàndo Arno è basso e Mensola grossa.

The ruined wall is 640 braccia; 130 is the wall remaining with the mill; 1300 braccia were broken in 4 years by Bisarno.

They do not know why the Arno will never remain in a channel. It is because the rivers which flow into it deposit earth where they enter, and wear it away on the opposite side, bending the river in that direction. The Arno flows for 6 miles between the Caprona and Leghorn; and for 12 through the marshes, which extend 32 miles, and 16 from La Caprona up the river, which makes 48; by the Arno from Florence beyond 16 miles; to Vico 16 miles, and the canal is 5; from Florence to Fucechio it is 40 miles by the Arno.

56 miles by the Arno from Florence to Vico; by the Pistoia canal it is 44 miles. Thus it is 12 miles shorter by the canal than by the Arno.

The eddy made by the Mensola, when the Arno is low and the Mensola full.

1005. 1. 640 bre. 2. muro.
1006. 2. non istituà. 3. mettono. 6. già terreno e dallo po. 10. caprona alli. 12. savàza. 17. canale. 19. muro. 24. chiusa.

1006. This passage is written by the side of a map washed in Indian ink, of the course of the Arno; it is evidently a sketch for a completer map.


The passage above is in some degree illustrated by the map on Pl. CXII, where the course of the Arno westward from Empoli is shown.

1007. Mensola is a mountain stream which falls into the Arno about a mile and a half above Florence.

A=Arno, I=Isola, M=Mvgone, P=Pesa, N=Mensola.
1008. 

That the river which is to be turned from one place to another must be coaxed and not treated roughly or with violence; and to do this a sort of floodgate should be made in the river, and then lower down one in front of it and in like manner a third, fourth and fifth, so that the river may discharge itself into the channel given to it, or that by this means it may be diverted from the place it has damaged, as was done in Flanders—as I was told by Niccolò di Forsore. 

How to protect and repair the banks washed by the water, as below the island of Cocomeri.

Ponte Rubaconté (Fig. 1); below [the palaces] Bisticci and Canigiani (Fig. 2). Above the flood gate of la Giustizia (Fig. 3); a b is a sand bank opposite the end of the island of the Cocomeri in the middle of the Arno (Fig. 4).

1009. 

The canal of San Cristofano at Milan made May 3rd 1509.

1010. 

Of the canal of Martesana.

By making the canal of Martesana the water of the Adda is greatly diminished by its distribution over many districts for the irrigation of the fields. A remedy for this
would be to make several little channels, since the water drunk up by the earth is of no more use to any one, nor mischief neither, because it is taken from no one; and by making these channels the water which before was lost returns again and is once more serviceable and useful to men.

No canal which is fed by a river can be permanent if the river whence it originates is not wholly closed up, like the canal of Martesana which is fed by the Ticino.

From the beginning of the canal to the mill.

From the beginning of the canal of Brivio to the mill of Travagla is 2794 trabochi, that is 11176 braccia, which is more than 3 miles and two thirds; and here the canal is 57 braccia higher than the surface
Adda braccia 57, 8 a dare due öcic di calo per ogni ceto trabochi, 9 e in tal sito of the water of the Adda, giving a fall of two inches in every hundred trabochi; and
disegniamo torre la bocha 10 del nostro navilio.

C. A. 233 a; 700 a]

Se nò ui si da fama che questo sia canale pubblico, e'sarà necessario pagare il terreno, 3 e lo pagherà il ré col lasciare li dazi d'un año.

H. 2 45 a]

Navilio.

If it be not reported there that this is to be a public canal, it will be necessary to pay for the land; and the king will pay it by remitting the taxes for a year.

Canal.

The canal which may be 16 braccia wide at the bottom and 20 at the top, we may say is on the average 18 braccia wide, and if it is 4 braccia deep, at 4 dinari the square braccia; it will only cost 900 ducats, to excavate by the mile, if the square braccio is calculated in ordinary braccia; but if the braccio are those used in measuring land, of which every 4 are equal to 4 1/2, and if by the mile we understand three thousand ordinary braccia; turned into land braccia, these 3000 braccia will lack 1/2; there remain 2250 braccia, which at 4 dinari the braccio will amount to 675 ducats a mile. At 3 dinari the square braccio, the mile will amount to 506 1/4 ducats so that the excavation of 30 miles of the canal will amount to 15187 1/4 ducats.

of Lecco overflowing at Tre Corni, in Adda,—a permanent sluice). Near the second sketch, referring to the sluice near Q: qui la chataina italica d'è peo (here the chain is in one piece). At M in the lower sketch: mot del travaglia, nel cavare la concha il terreno ara chérapeso e casa d'acqua (Mill of Travaglia, in digging out the sluice the soil will have as a counterpoise a vessel of water).
Per fare il gran canale, fa prima il piccolo e dalli l’acqua, che colla rota farà il grade.

To make the great canal, first make the smaller one and conduct into it the waters which by a wheel will help to fill the great one.

Indicate the centre of Milan.

The moat of Milan.

The castle with the moats full.

The filling of the moats of the Castle of Milan.

To heat the water for the stove of the Duchess take four parts of cold water to three parts of hot water.

See Pl. CIX. The original sketch is here reduced to about half its size. The gates of the town are here named, beginning at the right hand and following the curved line. In the bird’s eye view of Milan below, the cathedral is plainly recognisable in the middle; to the right is the tower of San Gottardo. The square, above the number 9147, is the Lazaretto, which was begun in 1488. On the left the group of buildings of the ‘Castello’ will be noticed. On the sketched Plan of Florence (see No. 1004 note) Leonardo has written on the margin the following names of gates of Milan: Vercellina—Ticinese—Ludovica—Romana—Orientale—Nova—Beatrice—Cumana.—Compare 100 No. 1448, ll. 5, 12.
In domo alla car
ruola del chiodo
della croce;
3 item.
4 Da mettere il 
corpo $\nu r$ nello . . . 

Della potestà del uacco $^2$ generato in 

istàte.

Vidi a Milano va saetta percuotere la 
torre della Credenza da quella parte $^5$ che 
risguarda tramótana e discesse $^6$ con tardo 
moto per esso lato, e immediate $^7$ si divise 
dalla torre, $^8$ e si ualse d’esso $^9$ muro uno 
spalàtio di 3 braccia per 80 ignio e pro-
fondo due, e $^{12}$ questo muro $^8$ era grosso 
4 braccia, $^{13}$ ed era muro $^{14}$ di sottili e 
17 minuti matto$^{15}$ni antichi, $^{16}$ e questo fu 
tirato dal uacco$^{10}$, che la $^{17}$ fiama della 
3 saetta lasciò $^{18}$ di se ecc.

Io sono già stato a vedere tal multipli-
catione (di arie) e già $^{13}$ sopra a Milano in-
verso lago Maggiore vidi vna nuvola in 

risguarda mútana e discesse. 7. torre e porto chonsecho.

1019. On this passage Amoretti remarks (Mem-
ori Storiche chap. IX): Nell’anno stesso lo veggiemo 
formare un congegno di carucole e di corde, con cui tras-
portare in più venerabile e più sicuro luogo, cioè nel-
I’ultima arcata della nove di mezo della metropolitana, la
sacra reliquia del Santo Chiodo, che ivi ancor si venera.
Al fol. 15 del codice segnato Q. R. in 16, esè ci ha la-
sciato di tal congegno una doppia figura, cioè una di
quattro carucole, e una di tre colle rispettive corde, sog-
ghiandoosi: in Domo alla carucoli del Chiodo della
Croce.

Amoretti’s views as to the mark on the MS. 
and the date when it was written are, it may be
observed, wholly unfounded. The MS. I, in which it occurs, is of the year 1502, and it is very un-
likely that Leonardo was in Milan at that time; this however would not prevent the remark, which is
somewhat obscure, from applying to the Cathedral at Milan.

1020. With reference to buildings at Milan see 
also Nos. 751 and 756, and Pl. XCV, No. 2 (ex-
plained on p. 52), Pl. C (explained on pages 60–62). 
See also pages 25, 39 and 40.

1021. Di arie is wanting in the original but may
safely be inserted in the context, as the formation
of clouds is under discussion before this text.
forma di grandissima motagna, piena di scogli infocati, perché li razzi del sole, che già era all'orizzonte che rosseggia, la tigneano del suo colore, e questa tal nugola, attreva a se tutti li ngvoli piccoli che intorno li stavano, e la nugola gràde nò si moaeu di suo loco, anzi risseruò nella sua sommità il lume del sole insino a una ora e mezzo di notte, tant'era la sua immésa gràdezza; e infra due ore di notte generò si gran vèto che fu cosa stupèda e inavdita.

W. XXVIII.

A di 10 di dicembre a ore 15 fu appicato il fuoco; 
A di 18 di dicembre 1511 a ore 15 fu fatto questo secondo incendio da Suizzeri a Milano al luogo detto DCXC.

Canini del castello di Pavia, àno 6 gradi di busi; è dall' uno all'altro uno braccio.

The chimneys of the castle of Pavia have 6 rows of openings and from each to the other is one braccio.

1022. With these two texts, (l. 1—2 and l. 3—5 are in the original side by side) there are sketches of smoke wreaths in red chalk.
On the 2nd day of February 1494. At Sforzesca I drew twenty five steps, $2/3$ braccia to each, and 8 braccia wide.

The vineyards of Vigevano on the 20th day of March 1494.

To lock up a butteris at Vigevano.

Again if the lowest part of the bank which lies across the current of the waters is made in deep and wide steps, after the manner of stairs, the waters which, in their course usually fall perpendicularly from the top of such a place to the bottom, and wear away the foundations of this bank can no longer descend with a blow of too great a force; and I find the example of this in the stairs down which the water falls in the fields at Sforzesca at Vigevano over which the running water falls for a height of 50 braccia.
Come in molti lochi si trovano ve'ne d'acqua che sei ore crescono e sei ore calano, e io per me n'ò veduto una in sul lago di Como, detta fonte Pliniana, la quale fa il predetto crescere e diminuire in modo che, quando ursa, macina due mulini, e quado màca, 4 cala si ch'egli è come guardare l'acqua in vn profondo pozzo.

Lago di Como, 2 Val de Chiauenna.

Sù pel lago di Como, diuerso la Magnia, è valle Chiauenna doue la Mera fume mette in esso lago; qui si truovano mòtagnie, sterili e altissime con gràdi scogli; j queste mòtagnie 3 lì uccielli d'acqua sono detti maragòni; qui nascono abeti, larici e pini, daini, stàbecchi, camozzi e terribili orsi; no ci si può mòtare, se non è a 4 piedi; vanoci, i villani a'tépi delle nevi có gràdi ingegni per fare traboccare gli orsi giv per esse'ripe; queste 4 mòtagnie strettte mettono in mezzo il fiume, sono a dresta e a sinistra per spatio 9d' miglia 20. tutte a detto modo; truovåsi di miglio in miglio bone eosterie; su10 per detto fiume si truovano cadute d'acqua di 400 brace, le quali fanno bel vedere; 11 e c'è bò uiiere a 4 soldi per scotto; per esso fiume si còduce assai legnami.

Val Sasina.

13 Val Sasina viene diuerso la Italia; questa è quasi di simile forma e natura; 12 nasce vi assai mappello, e ci sono grà ruine e cadute d'acque.

In many places there are streams of water which swell for six hours and ebb for six hours; and, for my part, have seen one above the lake of Como called Fonte Pliniana, which increases and ebbs, as I have said, in such a way as to turn the stones of two mills; and when it fails it falls so low that it is like looking at water in a deep pit.

Lake of Como. Valley of Chiauenna.

Above the lake of Como towards Germany is the valley of Chiauenna where the river Mera flows into this lake. Here are barren and very high hills, with huge rocks. Among these mountains are to be found the water-birds called gulls. Here grow fir trees, larches and pines. Deer, wild-goats, chamois, and terrible bears. It is impossible to climb them without using hands and feet. The peasants go there at the time of the snows with great snares to make the bears fall down these rocks. These mountains which very closely approach each other are parted by the river. They are to the right and left for the distance of 20 miles throughout of the same nature. From mile to mile there are good inns. Above on the said river there are waterfalls of 400 braccia in height, which are fine to see; and there is good living at 4 soldi the reckoning. This river brings down a great deal of timber.

Val Sasina.

Val Sasina runs down towards Italy; this is almost the same form and character. There grow here many mappello and there are great ruins and falls of water[14].

Notes on the North Italian lakes[1029—1033].

1029. i. imoli . . trova. 2. crescono essei . . chalano . . veduta . . sulago di chomo . . fonte pri. 3. cresciere macina piumolina . . màcha. 4. chalisi . . lacqua non . . posto.

1030. 1. claunna. 2. super . . dier . . claunna . . "fume" mente. 4. truovamòtagni . . chon. 5. dàqua dette . . nassie . . larice espini . . stà becche chamo. 6. ze . . terribili . . po . . delli. 7. chì gràde ingiëgi . . trabocchare. 8. metano . . mezo . . descira e assinistra . . ispazio. 9. imiglìo. 10. truova cadute . . br. le quale. 11. uii bò . . ischetto per ess . . chòduce. 14. nassievi . . ecci grà . . ecchadute. 15. valle dìtrozoze. 16.ellarici. 17. tessita . . Voltolina elle . . leorne. 18. sepre were made in Leonardo's youth; and I should infer from their contents, that they were notes made in anticipation of a visit to the places here described, and derived from some person (unknown to us) who had given him an account of them.

14. The meaning of mappello is unknown.
**Valle d'introzzo.**

16 Questa valle produce assai abeti, pini e larici; è dunque Ambrogio Fereri fu venire il suo legnamiere; in testa della Valtellina sono le motagne di Bormio, terribili e piane sèpre di neve; qui nascono ermelini.

A bellagio.

20 A riscontro a Bellaggio castello è il fiume Latte, il quale cade da alto piv che braccia 100 dalla vena, donde nasce, a piòbo nel lago cò inestimabile strepito e romore; questa vena versa solamente agoesto e settébre.

**Valtellina.**

24 Valtellina, com'è detto, valle circùdata d'alti e terribili moti, fa vini poteti e assai, e fa tanto bestiame che da paesani è concluso nascierui piv latte che uino; questa è la valle dove passa Adda, la quale prima corre piv che 40 miglia per la Magnia; questo fiume fa il pesci temolo, il quale vive d'argieto, del quale se ne trova assai per la sua rena; questo paese ognivno può vedere pane e vino, e' l'uno vale al piv uno soldo il bocale e la libra della uitella uno soldo, e' l'altro 10 dinari, e' l simile il burro, ed è la loro libbra 30 ócie e l'oua uno soldo la soldata.

C. A. 2116; 6196

**A Bormio.**

2 A Bormio sono i bagni,—sopra Como otto miglia è la Pliniana, la quale cresce e discese ogni 6 ore, e' l'uso cresciere fa acqua per 2 mvlina e n'avanza, e' l'uso calare fa asciugare la fonte; più su 2 miglia è Nesso, terra, dove cade uno fiume cò grade cò nitro per una gradissima fessura di mòte; Queste gitte só da fare nel mese di maggio; E i maggior sassi scoperti che si trovanó in questi paesi sono le motagne di Mâdello, vicine alle motagne di Lecco e di Gravidona inverso Bellin-

1031

**At Bormio.**

At Bormio are the baths;—About eight miles above Como is the Pliniana, which increases and ebbs every six hours, and its swell supplies water for two mills; and its ebbing makes the spring dry up; two miles higher up there is Nesso, a place where a river falls with great violence into a vast rift in the mountain. These excursions are to be made in the month of May. And the largest bare rocks that are to be found in this part of the country are the mountains of Madello near to those of Lecco, and
of Gravidona towards Bellinzona, 30 miles from Lecco, and those of the valley of Chiavenna; but the greatest of all is that of Mandello, which has at its base an opening towards the lake, which goes down 200 steps, and there at all times is ice and wind.

**In Valsasina.**

In Valsasina infra · Vimognio et · Introbbio, a man destra entràdo per uia di d'Annone, si trova la Troggia fiume, che cade da uno sass o altissimo e cadèdo entra sotto terra · e li finisce · il fiume ·; la più · miglia · pìù · li si trouano li edifìti · della · ve na · del rame · e dello argèto, presso a una terra · detta Prato Santo Pietro, e vene di ferro, e cose fantastiche ·; la Grignia è pìv alta · motàgnia ch'abbino questi paesi ed è pelàta.

The lake of Pusiano flows into the lake of Segrino [3] and of Annone and of Sala. The lake of Annone is 22 braccia higher at the surface of its water than the surface of the water of the lake of Lecco, and the lake of Pusiano is 20 braccia higher than the lake of Annone, which added to the afore said 22 braccia make 42 braccia and this is the greatest height of the surface of the lake of Pusiano above the surface of the lake of Lecco.

**In Val Sasina.**

In Val Sasina, between Vimognio and Introbbio, to the right hand, going in by the road to Lecco, is the river Troggia which falls from a very high rock, and as it falls it goes underground and the river ends there. 3 miles farther we find the buildings of the mines of copper and silver near a place called Pra' Santo Pietro, and mines of iron and curious things. La Grigna is the highest mountain there is in this part, and it is quite bare.

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**Notes:**

1. Valsasina infra · Vimognio et · Introbbio.
2. I lago di Pusiano 2 versa in nel lago d'Annone e di Sala; 3 lago d'Annone ha 22 braccia più alta la pelle della sua acqua che la pelle del lago di Lecco, e 20 braccia è più alto 4 il lago di Pusiano ch'el lago d'Annone, 9 e quali, giute colle braccia 22 dette, fan braccia 42, 5 e quest è la maggiore altezza che abbia la pelle del lago di Pusiano sopra la pelle del lago di Lecco.

3. Santa Maria nella valle di Ravagnate, ne' moti Briàia sò le pertiche di castagne di 9 braccia e di 14 l'un'uo in 100. 5 A Varallo di Ponbia presso a Sesto sopra Tesino sono li cotogni biàchi grà di e duri.

4. At Santa Maria in the Valley of Ravagnate in the mountains of Brianza are the rods of chestnuts of 9 braccia and one out of an average of 100 will be 14 braccia. At Varallo di Ponbia near to Sesto on the Ticino the quinces are white, large and hard.

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**Translation:**

- The lake of Pusiano flows into the lake of Segrino and of Annone and of Sala. The lake of Annone is 22 braccia higher at the surface of its water than the surface of the water of the lake of Lecco, and the lake of Pusiano is 20 braccia higher than the lake of Annone, which added to the afore said 22 braccia make 42 braccia and this is the greatest height of the surface of the lake of Pusiano above the surface of the lake of Lecco.

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1. The lake of Pusiano flows into the lake of Segrino [3] and of Annone and of Sala. The lake of Annone is 22 braccia higher at the surface of its water than the surface of the water of the lake of Lecco, and the lake of Pusiano is 20 braccia higher than the lake of Annone, which added to the afore said 22 braccia make 42 braccia and this is the greatest height of the surface of the lake of Pusiano above the surface of the lake of Lecco.

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2. At Santa Maria in the Valley of Ravagnate in the mountains of Brianza are the rods of chestnuts of 9 braccia and one out of an average of 100 will be 14 braccia. At Varallo di Ponbia near to Sesto on the Ticino the quinces are white, large and hard.
Colòbaia a Urbino a di 30 di luglio 1502.

Pigeon-house at Urbino, the 30th day of July 1502.

Fatt al mare di Piombino.

Made by the sea at Piombino.

Acquapendente è a Orvieto.

Acquapendente is near Orvieto.

Rocca di Cesena.

The rock of Cesena.

Siena 4 a b braccia 34, 4 a c braccia 410;
6 Scale d’Urbino.

Siena, a b 4 braccia, a c 10 braccia.
Steps at [the castle of] Urbino.

Campana di Siena, cioè il modo del suo moto e sito della dinodatura del battaglio suo.

The bell of Siena, that is the manner of its movement, and the place of the attachment of the clapper.

Notes on places in Central Italy, visited in 1502 (1031—1034).

L. 6a

1034. Varallo di Ponbia, about ten miles South of Arona is distinct from Varallo the chief town in the Val di Sesia.

1035. An indistinct sketch is introduced with this text, in the original, in which the word Scolatore (conduit) is written.

1036. Below the sketch there are eleven lines of text referring to the motion of waves.

1037. Acquapendente is about 10 miles West of Orvieto, and is to the right in the map on Pl. CXIII, near the lake of Bolsena.

1038. See Pl. CXIV No. 1, the lower sketch. The explanation of the upper sketch is given on p. 29.

1039. See Pl. CX No. 3; compare also No. 765.

The text is accompanied by an indistinct sketch.
1040. El di di Sāta Maria mezz'agosto a Cesena 1502.

1041. Scale del côte d’Urbino, salutichie.

1042. Alla fiera di Scō Lorenzo a Cesena, 1502.

1043. Finestre da Cesena.

1044. Porto Cesenatico a di 6 di settembre 1502, a ore 15.

1045. La rocca del porto di Cesena sta a Cesena per la 4ª di libeccio.

1046. In Romagnia, capo d’ogni grossezza, d’ingegno, vsano i carri di 4 rote, de quali O n’año 2 dinanzi basse e due alte dirieto, la qual cosa è in gran dissfaure di moto, perché in sulle 4 rote dinanzi si scarica pìv peso, che in su quelle dirieto, come mostrai nella prima del 5ª delle elemeti.
Uve portate a Cesena; thus grapes are carried at Cesena. The number of the diggers of the ditches is pyramidically arranged.

There might be a harmony of the different falls of water as you saw them at the fountain of Rimini on the 8th day of August, 1502.

Imola vede Bologna a 5/8 di ponente inverso maestro con ispatio di 20 miglia; Castel san Piero è ueduto da Imola in 1/2 infra ponente e maestro con ispatio di 5/7 miglia; Faenza sta con Imola tra levante e scirocco in mezzo giusto a 10 miglia di spatio; Forli sta có Faenza infra scirocco e levante in mezzo giusto con ispatio di 25 miglia da Imola e 10 da Faenza; Forlimpopoli fa il simile a 25 miglia da Imola; Bertinoro sta con Imola a 5/8 infra levante e scirocco a 27 miglia.

Imola, as regards Bologna, is five points from the West, towards the North West, at a distance of 20 miles. Castel San Piero is seen from Imola at four points from the West towards the North West, at a distance of 7 miles. Faenza stands with regard to Imola between East and South East at a distance of ten miles. Forli stands with regard to Faenza between South East and East at a distance of 20 miles from Imola and ten from Faenza. Forlimpopoli lies in the same direction at 25 miles from Imola. Bertinoro, as regards Imola, is five points from the East towards the South East, at 27 miles.
1051. Leonardo inserted this passage on the margin of the circular plan, in water colour, of Imola—see Pl. CXI. No. 1.—In the original the fields surrounding the town are light green; the moat, which surrounds the fortifications and the windings of the river Santerno, are light blue. The parts, which have come out blackish close to the river are yellow ochre in the original. The dark groups of houses inside the town are red. At the four points of the compass drawn in the middle of the town Leonardo has written (from right to left): Messina (South) at the top; to the left Scirocco (South east), levante (East), Greco (North East), Septentrione (North), Maestra (North West), ponente (West) Libeccio (South West). The arch in which the plan is drawn is, in the original, 42 centimètres across.

At the beginning of October 1502 Cesare Borgia was shut up in Imola by a sudden revolt of the Condottieri, and it was some weeks before he could release himself from this state of siege (see Gregorovius, Geschichte der Stadt Rom im Mittelalter, Vol. VII, Book XIII, 5. 5).

Besides this incident Imola plays no important part in the history of the time. I therefore think myself fully justified in connecting this map, which is at Windsor, with the siege of 1502 and with Leonardo's engagements in the service of Cesare Borgia, because a comparison of these texts, Nos. 1050 and 1051, raise, I believe, the hypothesis to a certainty.

1052. Most of the places here described lie within the district shown in the maps on Pl. CXIII.
2. Scorta sulle sommità e in su' lati de' colli le figure de' terreni e le sue divisi-
oni, e nelle cose volte a te fa le in pro-
pia forma.

1054. This passage evidently refers to the
making of maps, such as PI. CXII, CXIII, and
CXIV. There is no mention of such works, it is
true, excepting in this one passage of MS. L. But
this can scarcely be taken as evidence against
my view that Leonardo busied himself very exten-
sively at that time in the construction of maps;
and all the less since the foregoing chapters
clearly prove that at a time so full of events Leo-
nardo would only now and then commit his obser-
vations to paper, in the MS. L.

1055. By the side of this text we find, in the original,
a very indistinct sketch, perhaps a plan of a posi-
tion. Instead of this drawing I have here inserted
a much clearer sketch of a position from the
same MS., L. 82b and 83a. They are the only
drawings of landscape, it may be noted, which
occur at all in that MS.

1055. 2. Messer Gualtieri, the same probably as is
mentioned in Nos. 672 and 1344.
At Alessandria della Paglia in Lombardy there are no stones for making lime of; but such as are mixed up with an infinite variety of things native to the sea, which is now more than 200 miles away.

At Monbracco, above Saluzzo,—a mile above the Certosa, at the foot of Monte Viso, there is a quarry of flakey stone, which is as white as Carrara marble, without a spot, and as hard as porphyry or even harder; of which my worthy gossip, Master Benedetto the sculptor, has promised to give me a small slab, for the colours, the second day of January 1511.

That there are springs which suddenly break forth in earthquakes or other convulsions and suddenly fail; and this happened in a mountain in Savoy where certain forests sank in and left a very deep gap, and about four miles from here the earth opened itself like a gulf in the mountain, and threw out a sudden and immense flood of water which scourcd the whole of a little valley of the tilled soil, vineyards and houses, and did the greatest mischief, wherever it overflowed.

The river Arve, a quarter of a mile from Geneva in Savoy, where the fair is held on midsummerday in the village of Saint Gervais.

To this it may be objected that Benedetto da Majano had already lain in his grave fourteen years, in the year 1511, when he is supposed to have given the promise to Leonardo. The colours may have been given to the sculptor Benedetto and the stone may have been in payment for them. From the description of the stone here given we may conclude that it is repeated from hearsay of the sculptor's account of it. I do not understand how, from this observation, it is possible to conclude that Leonardo was on the spot.

An indistinct sketch is to be seen by the text.
1060.

E questo vedrà come vid'io, chi adrà so pra Móboso, gioio dell'Alpi che dividono la Francia dalla Italia, la qual montagna à la sua basa che partiurisce '1 li 4 fiumi che riga per 4 aspeti contrari tutta l'Europa, e nessuna montagna à le sue base in simile altezza; questa si leua in tanta altura che quasi passà tutti li nuvoli e rare volte vi cade neve, ma sol gradishe d'istante quando li nuvoli sono nella maggiore altezza, e questa grandine vi si co sera in modo, che se nò fusse la retà del caderu e del montarui nuvoli, che non accade 2 volte in vna età, egli ui sarebbe altissima qualità di ghiaaccio inalzado dal gradi della gradine, il quale di mezzo lugli vi trouai grossissimo , e vidi l'aria sopra di me tenebrosa e l sole che percor itsa la mòta'gnoia essere pìv luminoso quii assai che nelle basse pianure, perché minor grossizza d'aria s'interpone in'fra la cima d'esso monte e l' sole.

Leic. 94)

Truovasi nelle montagnie di Verona la sua pietra rossa mista tutta di nichio convertiti 2 in essa pietra , dali quali, per la loro bocca, era gommata la materia d'essa pietra, ed erano in alcuna parte restati - - - separatì dall'altra massa del sasso che li circundava; perché la scorza del nichio s'era interposta, e nó li aua lasciati congiungiere; E in alcun altra parte tal gomma aua petrificate le invecchiate e quasi la scorza.

C. A. 231 e (694)

Ponti di Gorizia 2 Vilpago.

1061.

In the mountains of Verona the red marble is found all mixed with cockle shells turned into stone; some of them have been filled at the mouth with the cement which is the substance of the stone; and in some parts they have remained separate from the mass of the rock which enclosed them, because the outer covering of the shell had interposed and had not allowed them to unite with it; while in other places this cement had petrified those which were old and almost stripped the outer skin.

Bridge of Goertz—Wilbach (?).

1062.

I have vainly enquired of every available authority for a solution of the mystery as to what mountain is intended by the name Mom boso (Comp. Vol. I Nos. 300 and 301). It seems most obvious to refer it to Monte Rosa. Rosa is derived from the Keltic ro which survives in Breton and in Gaelic, meaning, in its first sense, a mountain spur, but which also—like Hohn—means a very high peak; thus Monte Rosa would mean literally the High Peak.

6. in una età. This is perhaps a slip of the pen on Leonardo's part and should be read estate (summer).

1062. There is a slight sketch with this text, Leonardo seems to have intended to suggest, with a few pen-strokes, the course of the Isonzo and of the Wilbach in the vicinity of Gorizia (Goerz). He himself says in another place that he had been in Friuli (see No. 1077 l. 19).
That part of the earth which was lightest remained farthest from the centre of the world; and that part of the earth became the lightest over which the greatest quantity of water flowed. And therefore that part became lightest where the greatest number of rivers flow; like the Alps which divide Germany and France from Italy; whence issue the Rhone flowing Southwards, and the Rhine to the North. The Danube or Ta- 

The shores of the sea are constantly moving towards the middle of the sea and displace it from its original position. The lowest portion of the Mediterranean will be reserved for the bed and current of the Nile, the largest river that flows into that sea. And with it are grouped all its tributaries, which at first fell into the sea; as may be seen with the Po and its tributaries, which first fell into that sea, which between the Appenines and the German Alps was united to the Adriatic sea.

That the Gallic Alps are the highest part of Europe.

And of these I found some in the rocks of the high Appenines and mostly at the rock of La Vernia.

A note on the petrifactions, or fossils near Parma will be found under No. 989.
1066. A method for drying the marsh of Piombino.

1067. The shepherds in the Romagna at the foot of the Apennines make peculiar large cavities in the mountains in the form of a horn, and on one side they fasten a horn. This little horn becomes one and the same with the said cavity and thus they produce by blowing into it a very loud noise.

1068. A spring may be seen to rise in Sicily which at certain times of the year throws out chestnut leaves in quantities; but in Sicily chestnuts do not grow, hence it is evident that that spring must issue from some abyss in Italy and then flow beneath the sea to break forth in Sicily.

1066. There is a slight sketch with this text in the original. — Piombino is also mentioned in Nos. 609, l. 55–58 (compare Pl. XXXV, 3, below). Also in No. 1035.

1067. As to the Romagna see also No. 1046.

1046. The chestnut tree is very common in Sicily. In writing sicilia Leonardo meant perhaps Cilicia.
### II. FRANCE.

<table>
<thead>
<tr>
<th>ALEMAIGNIA</th>
<th>FRANÇA</th>
<th>GERMANY</th>
<th>FRANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Austria</td>
<td>2. Picardia</td>
<td>3. Austria</td>
<td>4. Picardy</td>
</tr>
</tbody>
</table>

**SPAGNIA.**


**1069.**

- In the original the three columns are parallel.
- Alemagnia franca — Spagnia
- Alemagnia — Spagnia
- Francia — Spagnia

**1070.**

- Perpigniana
- Roâne
- Lyon
- Paris
- Ghent
- Bruges
- Holland

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**1069.** Two slightly sketched maps, one of Europe the other of Spain, are at the side of these notes.

**1070.** Roâne does not seem to mean here Roten in Normandy, but is probably Roanne (Rodunna) on the upper Loire, Lyonnais (Dép. du Loire). This town is now unimportant, but in Leonardo's time was still a place of some consequence.
TOPOGRAPHICAL NOTES.

1071.

Come in Bordeaux presso a Guascogna alza il mare circa a 40 braccia pel suo refluxso, e il suo fiume ringorga l'acque salve piv di cento cinquanta miglia, e li nauuli, che 3 si debbono calaftare, restano alti sopra vn alto collo sopra dello abassato mare.

At Bordeaux in Gascony the sea rises about 40 braccia before its ebb, and the river there is filled with salt water for more than a hundred and fifty miles; and the vessels which are repaired there rest high and dry on a high hill above the sea at low tide.

1072.

El Rodano esce dal lago di Ginevra e corre prima a ponente, e poi a mezzodi, con corso di 400 miglia, e versa le sue acque nel mare Mediterranéo.

The Rhone issues from the lake of Geneva and flows first to the West and then to the South, with a course of 400 miles and pours its waters into the Mediterranean.

1073.

c d is the garden at Blois; a b is the conduit of Blois, made in France by Fra Giocondo, b c is what is wanting in the height of that conduit, c d is the height of the garden at Blois, e f is the siphon of the conduit, b e, c f, f g is, where the siphon discharges into the river.

1071. 1. guascogna... circha a 40 br... refru. 2. elli. 3. deano... chollo.
1072. 1. esce del lagho. 2. mezodi... mediterrano.

1071. 2. This is obviously an exaggeration founded on inaccurate information. Half of 150 miles would be nearer the mark.

1073. The tenor of this note (see lines 2 and 3) seems to me to indicate that this passage was not written in France, but was written from oral information. We have no evidence as to when this note may have been written beyond the circumstance that Fra Giocondo the Veronese Architect left France not before the year 1505. The greater part of the magnificent Château of Blois has now disappeared. Whether this note was made for a special purpose is uncertain. The original form and extent of the Château is shown in Androvct, Les plus excellent Bastiments de France, Paris MDCCVII, and it may be observed that there is in the middle of the garden a Pavilion somewhat similar to that shown on pl. LXXXVIII. No. 7.

See S. DE LA SAUSAYE, Histoire du Château de Blois 4ème édition Blois et Paris p. 175: En marquant sa belle allée à François, comte d'Angoulême, Louis XII lui avait consacré en dot les comtés de Blois, d'Asi, de Courv, de Montfort, d'Étampes et de Vertus. Une ordonnance de François I, lui laissa en 1516 l'administration du comté de Blois.

Le roi fit commencer, dans la même année, les travaux de cette belle partie du château, comme sous le nom d'aile de François I, et dont nous avons donné la description au commencement de ce livre. Nous trouvons en effet, dans les archives du Baron de Journaudant, une pièce qui en fixe parfaitement la date. On y lit: "Jc, Baymon Philipeaux, commis par le Roy à tenir le compte et faire le payement des bastiments, édifices et reparations que le dit seigneur fait faire en son chastu de Blois, confesse avoir eu et reçu . . . la somme de trois mille livres tournois . . . . le cinquième jour de juillet, l'an mil cinq cent et seize. P. 24: Les jardins avaient été décorés avec beaucoup de luxe par les différents possesseurs du château. Il ne reste de tous les bâtiments qu'ils y élevèrent que ceux des officiers chargés de l'ad-
Loira fiume d'Amboise.

Il fiume è più alto dentro all'argine b d che fuori d'essa argine;
Isola dove è vna parte d'Amboise.

Il fiume Loira che passa per Ambosia passa per a b c d, e poiché è passato il pote, ritoma contro al suo avenimento per il canale d e, b f in contato dell'argine che si interpone infra li due moti contrari del predetto fiume a b, c d, e d f; di poi si riolit in giù per il canale f l, g h, n m, e si ricongiugne col fiume dode prima si divise, che passa per k n, che fa k m, r f; ma quando il fiume è grosso, allora eelli corre tutto per uno solo verso, passando l'argine b d.

The river Loire at Amboise.
The river is higher within the bank b d than outside that bank.
The island where there is a part of Amboise.

This is the river that passes through Amboise; it passes at a b c d, and when it has passed the bridge it turns back, against the original current, by the channel d e, b f in contact with the bank which lies between the two contrary currents of the said river, a b, c d, and e f. It then turns down again by the channel f l, g h, n m, and reunites with the river from which it was at first separated, which passes by k n, which makes k m, r f. But when the river is very full it ilows all in one channel passing over the bank b d.

L'acque sono rigorgate sopra il termine di Romorantino in tanta altezza, ch'elle fancino poi nel loro disciesso molite molina;

The water may be dammed up above the level of Romorantin to such a height, that in its fall it may be used for numerous mills.

1075. 1. gardino. 4. alteza. 5. elleata del gur. 6. ella.
1075. 1. Laqua sia rio. 2. ghorghata. 5. alteza. 7. suo disciesso. 9. uilla. 10. franca. 11. docto a remoli. 12. del minnistration et de la culture des jardins, et un pavillon carre en pierre et en brique flanqué de terrasses à chauss de ses angles. Quase figuré par des mesures élevées sur la terrasse, cet edifice est très-digne d'intérêt par l'originalité du plan, la décoration architecturale et le souvenier d'Anne de Bretagne qui le fit construire. F-bien descript le garden as follows: Le jardin haut était fort bien décoré par grands compartiments de toutes sortes de figures, avec des allées de meuniers blancs et des palissades de coulôirs. Deux grands berceaux de charpenterie séparent toute la longueur et la largeur du jardin, et dans les quatre angles des allées, où ces berceaux se croisent, il y a deu iabinets, de mêmeparten... Il y a pas longtemps qu'il y avait dans ce même jardin, à l'endroit où se croisent les allées du milieu, un edifice de figure octogone, de plus de 7 thoses de diamètre et de plus de neuf thoses de haut; avec 4 movimenti in forme de nches dans les 4 angles des allées. Ce basment... était de charpente mais d'un extraordinamement bien travaillé. On y voyoit particulèremen la cordière qui regoit tout autour en forme de cordon. Car la Royale affectait de la modez non seulement à ses armes et à ses chiffres mais de la faire représenter en divers manières dans tous les ouvrages qu'on lui faisait pour elle... le basment était couvert in forme de dôme qui dans son milieu avait encore un plus petit dôme, un lanternine octogone, de laquelle était une figure dorée représentant Saint Michel. Les deux dômes étaient proprement couvert d'ardoise et de plomb doré par dehors; par dedans ils étaient lambrissés d'une menuiserie très délicate. Au milieu de ce Salon il y avait un grand bassin octogone de marbre blanc, dont toutes les faces étaient enrichies de différentes sculptures, avec les armes et les chiffres du Roy Louis XII et de la Reine Anne. Dans ce bassin il y en avait un autre post sur un pilastre lequel avait sept pieds de diamètre. Il était de figure ronde à goûters, avec des masques et d'autres ornements très équément taillés. Du milieu de ce deuxième bassin il y avoit un autre petit pilastre que porait un troisième bassin de trois pieds de diamètre, auxx parfaitement bien taillé; d'este de ce dernier bassin que passoit l'eau qui se répandait en suite dans les deux autres bassins. Les beaux ouvrages faits d'un marbre également blanc et poli, furent brises par la poulinerie de tout l'édifice, que les injures de l'air rosenrent de font en comble.

1074. See Pl. CXV. Lines 1—7 are above, lines 8—10 in the middle of the large island and the word Isola is written above d in the smaller island; a is written on the margin on the bank of the river above l 1; in the reproduction it is not visible. As may be seen from the last sentence, the observation was made after long study of the river's course, when Leonardo had resided for some time at, or near, Amboise.
The river at Villefranche may be conducted to Romorantin which may be done by the inhabitants; and the timber of which their houses are built may be carried in boats to Romorantin. The river may be dammed up at such a height that the waters may be brought back to Romorantin with a convenient fall.

As to whether it is better that the water should all be raised in a single turn or in two?

The answer is that in one single turn the wheel could not support all the water that it can raise in two turns, because at the half turn of the wheel it would be raising 100 pounds and no more; and if it had to raise the whole, 200 pounds in one turn, it could not raise them unless the wheel were of double the diameter and if the diameter were doubled, the time of its revolution would be doubled; therefore it is better and a greater advantage in expense to make such a wheel of half the size (2) &c.

The going down of the nave of the wheel must not be so low as to touch the surface of the water, because by touching the water its momentum will be lessened.

And if on the contrary the conduit for the water were ten times the size of the pipe for the water escaping from it, and if it had ten times less motion, what would be its office? This is answered by the 9th of this which says that the water would rise in the pipe whence it first flow, to a tenth part of its original height.

Se l'fume m n, ramo del fiume Loira, si manda nel fiume di Romorontino colle sua acque torbide, esso piaggerà le canali.

If the river m n, an affluent of the river Loire, were turned with its muddy waters, into the river of Romorantin, this would fatten.

The topographical interest of this passage arises from the circumstance that it is written on the reverse of the sheet on which we find the text relating to Romorantin, No. 1074.
pagnie sopra le quali esso adaque'trà, e
deberà il paese fertile da nutrire li abitatori, e farà canale navigabile e mercatile.

6 Modo che l'fume col suo corso netti il fondo del fume.

10 Per la nona del 3°; 11 Quello ch'è più veloce, più costa il suo fondo, e per la có-
versa: l'acqua ch'è più tarda piva lascia di quel che la intorbi?

18 E facciasi il serraglio mobile, che io or'dinai nel Friuli, del quale, aperto vna cataratta, l'acqua che di quella scivava cavò il fondo; 22 addunque nelle ditte de' fiumi si debbono aprire le cate'ratte de'molino, acciochè tutto il corso del fume si renda per cataratta in ciascun molino; sieno molte, acciochè... 24 si faccia maggiore ipeto, e così netterà tutto il fume; 25 e infra le due poste de' molini sia vna delle dette cataratte; sia vna d'esse poste di tal cataratte infra l'uno e l'altro molino.

And let the sluice be movable like the one I arranged in Friuli [19], where when one sluice was opened the water which passed through it dug out the bottom. Therefore when the rivers are flooded, the sluices of the mills ought to be opened in order that the whole course of the river may pass through falls to each mill; there should be many in order to give a greater impetus, and so all the river will be scourd. And below the site of each of the two mills there may be one of the said sluice falls; one of them may be placed below each mill.

G. A. 903b

Vno trabocco è quattro braccia e vno miglio è tre mila d'esse braccia; E l'brac-
cio si diuide in 12 ocie; e l'acqua de'canali à di corno in ogni corno dunque 2 del
dette oncie; adiue 14 oncie di calon necessarie a due mila ottocento braccia di
moto ne'detti canali; seguita che 15 oncie di calo danno debito moto aulli corsi de'
l'acque dei predetti canali, cioè uno bracco e 1/2 5 per miglio; E per questo coludemeremo che l'acqua che si toglie dal fume di Villa

A trabocco is four braccia, and one mile is three thousand of the said braccia. Each bracco is divided into 12 inches; and the water in the canals has a fall in every hundred trabocchi of two of these inches; therefore 14 inches of fall are necessary in two thousand eight hundred braccia of flow in these canals; it follows that 15 inches of fall give the required momentum to the currents of the waters in the said canals, that is one bracco and a half in the mile. And from this it may be concluded that the water taken from the river of Ville-

1078. 19. This passage reveals to us the fact that Leonardo had visited the country of Friuli and that he had stayed there for some time. Nothing whatever was known of this previously.
Franca e si presta al fiume di Romorontino vuole... Dove l’ù fiume mediante la sua bassezza no può entrare nell’altro, è necessario ringorgarlo in tale altezza che possa disciòdere in quel che prima era pis alto.

Vigilia di Sco Antoonio tornai da Romozòtino in Abuosa, 12 e ’l re si parti due 13 di innanti da Romoròtinino.

Da Romorontino insino al 16 pote a Sodro | si chiama Soudru; 17 e da esso pote insino a Tours 18 si chiama Schier.

Farai saggio del 21 luvello di quel cat nale che si à a còdurre 22 da la Loira a Romozòtintonino con vn ca’gnale largo vn braccio e 23 profondo vn braccio.

franche and lent to the river of Romorantin will ... Where one river by reason of its low level cannot flow into the other, it will be necessary to dam it up, so that it may acquire a fall into the other, which was previously the higher.

The eve of Saint Antony I returned from Romorantin to Amboise, and the King went away two days before from Romorantin.

From Romorantin as far as the bridge at Saudre it is called the Saudre, and from that bridge as far as Tours it is called the Cher.

I would test the level of that channel which is to lead from the Loire to Romorantin, with a channel one braccio wide and one braccio deep.

Strada d’Orléans.

At 1/4 from the South to the South East. At 1/3 from the South to the South East. At 1/1, from the South to the South East. At 1/2 from the South to the South East. Between the South West and South, to the East bearing to the South; from the South towards the East 1/8; thence to the West, between the South and South West; at the South.

The Road to Orleans.

At 1/4 from the South to the South East. At 1/3 from the South to the South East. At 1/1, from the South to the South East. At 1/2 from the South to the South East. Between the South West and South, to the East bearing to the South; from the South towards the East 1/8; thence to the West, between the South and South West; at the South.

M. Ravaission has enlarged on this idea in the Gazette des Beaux Arts (1881 p. 539): Les traces de Léonard permettent d’entendre que le canal commençant soit auprès de Tours, soit auprès de Blois et passant par Romorantin, avec port d’embarquement à Villefranche, devait, au delà de Bourges, traverser l’Allier au-dessous des affluents de la Dore et de la Sioule, aller par Moulins jusqu’à Digon; enfin, sur l’autre rive de la Loire, dépasser les monts du Charolais et rejoindre la Sioule auprès de Mâcon. It seems to me rash, however, to found so elaborate an hypothesis on these sketches of rivers. The slight stroke going to Lione is perhaps only an indication of the direction. — With regard to the Loire compare also No. 988. l. 38.

1079. The meaning is obscure; a more important passage referring to France is to be found under No. 744.
1080.

The way in which the Germans closing up together cross and interweave their broad leather shields against the enemy, stooping down and putting one of the ends on the ground while they hold the rest in their hand.

1081.

The Germans are wont to annoy a garrison with the smoke of feathers, sulphur and realgar, and they make this smoke last 7 or 8 hours. Likewise the husks of wheat make a great and lasting smoke; and also dry dung; but this must be mixed with olive husks, that is olives pressed for oil and from which the oil has been extracted.

1082.

That the valleys were formerly in great part covered by lakes the soil of which always forms the banks of rivers,—and by seas, which afterwards, by the persistent wearing of the rivers, cut through the mountains and the wandering courses of the rivers carried away the other plains enclosed by the mountains; and the cutting away of the mountains is evident from the strata in the rocks, which correspond in their sections as made by the courses of the rivers. 

The Hæmus mountains which go along Thrace and Dardania and join the Sardonus mountains which, going on to the westward change their name from Sardus to Rebi, as they come near Dalmatia; then turning to the West cross Illyria, now called Sclavonia, changing the name of Rebi to Albanus, and going on still to the West, they change to Mount Ocra in the North; and to the South above Istria they are named Caruancas; and to the West above Italy they join the Adula, where the Danube rises, which stretches to the East and has a

1080. Above the text is a sketch of a few lines crossing each other and the words de ponderibus. The meaning of the passage is obscure.

1081. There is with this passage a sketch of a round tower shrouded in smoke.

1082. 4. Emus, the Balkan; Dardania, now Servia.
Adula, doue nasce il Danubio, il quale s'asticende a leuante con corso di 1500 miglia, e la sua linea breisima e circa 9 mille miglia, e altrettanto o circa e'l ramo del Monte Adula mutato ne' predetti nomi di moti; sta a tramontaunata il monte Carpatus, il quale termina la larghezza della valle del Danubio, la qual', come dissi, s'asticende a leuante co lunghezza di circa 9 mille miglia, ed è larga doue 200 e doue 300 miglia; questa si mette pel mezzo il Danubio, primo fiume d'Europa per magnitudine, il qual Danubio si lascia per mezzo di Austria e Albania e per tramontana Bavaria, Polonia, Ungheria, Valachia e Bosnia; versa adunque il Danubio | over | Daunia nel mare di Ponto, il quale s'astende insino vicino all' Austria e occupa tutta la pianvra che oggi discorre esso Danubio, e'l segno dico ne mostrano l'ostiche e li nichi e bovelli cappe e ossa di grà pesci, che in cora in molti loci si trovano nell' alte coste de' predetti moti; ed era tale mare fatto per la ringorgazione del rami del Monte Adula, che s'asticende a leuante e si coniugnano colli rami del Môte Tauro, che s'asticendono a pochè, e circa alla Bitinia versa l'acqua d'esso Mare di Poto nel Propontico, cadendo nel Mare Egeo cioè Mar Mediterraneo, doue poi il lungo corso spicco li rami del Monte Adula dalla rami del Môte Tauro; li Mare di Poto s'abbassò e scorsero la Val di Danubio coll'pole prenominate provincie, e tutta l'Asia Minore di là dal monite Tauro per tramontana e la pianvra ch'è da Môte Cauccaso al mare di Ponto per ponete, e la pianvra del Tauro dentro alli monti Rifi cioè a' piedi loro; Ecco che l'mare di Ponto abbassò circa a braccia 1000 nello scoprire di tanta pianvra.

The course of 1500 miles; its shortest line is about 1000 miles, and the same or about the same is that branch of the Adula mountains changed as to their name, as before mentioned. To the North are the Carpathians, closing in the breadth of the valley of the Danube, which, as I have said extends eastward, a length of about 1000 miles, and is sometimes 200 and in some places 300 miles wide; and in the midst flows the Danube, the principal river of Europe as to size. The said Danube runs through the middle of Austria and Albania and northwards through Bavaria, Poland, Hungary, Wallachia and Bosnia and then the Danube or Donau flows into the Black Sea, which formerly extended almost to Austria and occupied the plains through which the Danube now courses; and the evidence of this is in the oysters and cockle shells and scollops and bones of great fishes which are still to be found in many places on the sides of those mountains; and this sea was formed by the filling up of the spurs of the Adula mountains which then extended to the East joining the spurs of the Taurus which extend to the West. And near Bithinia the waters of this Black Sea poured into the Propontis [Marmora] falling into the Egean Sea, that is the Mediterranean, where, after a long course, the spurs of the Adula mountains became separated from those of the Taurus. The Black Sea sank lower and laid bare the valley of the Danube with the above named countries, and the whole of Asia Minor beyond the Taurus range to the North, and the plains from mount Caucasus to the Black Sea to the West, and the plains of the Don this side—that is to say, at the foot of the Ural mountains. And thus the Black Sea must have sunk about 1000 braccia to uncover such vast plains.

8. Danubio, in the original Reni; evidently a mistake as we may infer from como dissi l. 10 &c.
A. 57.]

PERCHÉ IL MARE FA LA CORRÈTE NELLO STRETTIO DI SPAGNIA PIV CH'ALTOVRE.

IIIl il fiume d'equal profondità avrà tanto p'iv fugà nella minore larghezza, che nella maggiore, quanto la maggiore larghezza avanza la minore;[1]

Questa propositione si prova chiaramente per ragione coferma dalla sperienza; infìnche, quando per uno canale d'uno miglio di larghezza passerà uno miglio di lunghezza d'acqua, dove il fiumefia largo 5 migli, ciascuno 2 de 5 migli quadri metterà 1/5 di se per ristaurare il miglio quadro d'acqua macato nello pelago, e dove il fiumefiaria largo 3 miglia, ciascuno d'essi migli quadri metterà di se lo terzo di sua qualità per lo mano care che fecle il miglio quadro dello streto, come si dimostra in figura, per lo miglio n.

1083. In the place marked A in the diagram of the Mediterraneano Sea is written in the original. And at B, streto di Spagna (strait of Spain, i.e. Gibraltar). Compare No. 960.
Why the current of Gibraltar is always greater to the West than to the East.

The reason is that if you put together the mouths of the rivers which discharge into the Mediterranean sea, you would find the sum of water to be larger than that which this sea pours through the straits into the ocean. You see Africa discharging its rivers that run northwards into this sea, and among them the Nile which runs through 3000 miles of Africa; there is also the Bagrada river and the Schelaf and others. Likewise Europe pours into it the Don and the Danube, the Po, the Rhone, the Arno, and the Tiber, so that evidently these rivers, with an infinite number of others of less fame, make its great breadth and depth and current; and the sea is not wider than 18 miles at the most westerly point of land where it divides Europe from Africa.

The Gulf of the Mediterranean, as an inland sea, received the principal waters of Africa, Asia and Europe that flowed towards it; and its waters came up to the foot of the mountains that surrounded it and made its shores. And the summits of the Apennines stood up out of this sea like islands, surrounded by salt water. Africa again, behind its Atlas mountains did not expose uncovered to the sky the surface of its vast plains about 3000 miles in length, and Memphis was on the shores of this sea, and above the plains of Italy, where now birds fly in flocks, fish were wont to wander in large shoals.

The greatest ebb made anywhere by the Tunisian Mediterranean is above Tunis, being about two and a half braccia and at Venice it falls two braccia. In all the rest of the Mediterranean sea the fall is little or none.
Descrivi li moti de' flessibili aridi, cioè della creazione dell'onde della renai portate dal vento, e de' suoi moti e colli, come accade nella Libia; l'esempio ne vedrai sull' onda renai di Po o di Tesino o altri gravi fiumi.

Describe the mountains of shifting deserts; that is to say the formation of waves of sand borne by the wind, and of its mountains and hills, such as occur in Libya. Examples may be seen on the wide sands of the Po and the Ticino, and other large rivers.

Circumfulgore è una macchina navale, fu invettione di quelli di Majolica.

Circumfulgore is a naval machine. It was an invention of the men of Majorca.

Alcuni nel Mare Tirreno vsaranno questo modo, cioè sappiccauano on acqua a l'una delle stremità dell' atena, e dall'altra vna corda che i basso s'appicca a on acqua, e nel pigniare attaccavano detta acqua ai remeggi dell'o positivo navilio, e per forza d'argano quello m' adavano alla bāda e gittavano sapon tenero e stoppa ipeciata focata sulla prim' onda dou'era l' acqua attaccata, acciocché, per fugir detto foco, i difenditori d'esso navilio avessino a fugire da on opposite bāda, e faciendosì così facievanovmceto allo spugniatòre, perché la galera pive facilmente per lo contrapeso andava alla bāda.

Some at the Tyrrhene sea employ this method; that is to say they fastened an anchor to one end of the yard, and to the other a cord, of which the lower end was fastened to an anchor; and in battle they flung this anchor on to the oars of the opponent's boat and by the use of a capstan drew it to the side; and threw soft soap and tow, daubed with pitch and set ablaze, on to that side where the anchor hung; so that in order to escape that fire, the defenders of that ship had to fly to the opposite side; and in doing this they aided to the attack, because the galley was more easily drawn to the side by reason of the counterpoise.

The machine is fully described in the MS. and shown in a sketch.

This text is illustrated in the original by a pen and ink sketch.
IV.

THE LEVANT.

On the shores of the Mediterranean 300 rivers flow, and 40, 200 ports. And this sea is 3000 miles long. Many times has the increase of its waters, heaped up by their backward flow and the blowing of the West winds, caused the overflow of the Nile and of the rivers which flow out through the Black Sea, and have so much raised the seas that they have spread with vast floods over many countries. And these floods take place at the time when the sun melts the snows on the high mountains of Ethiopia that rise up into the cold regions of the air; and in the same way the approach of the sun acts on the mountains of Sarmatia in Asia and on those in Europe; so that the gathering together of these three things are, and always have been, the cause of tremendous floods: that is, the return flow of the sea with the West wind and the melting of the snows. So every river will overflow in Syria, in Samaria, in Judea between Sinai and the Lebanon, and in the rest of Syria between the Lebanon and the Taurus mountains, and in Cilicia, in the Armenian mountains, and in Pamphilia and in Lycia within the hills,

To the reader an allusion to the legend of the pillars of Hercules.

Leonardo seems here to mention 9. and in Egypt as far as the Atlas mountains. The gulf of Persia which was formerly a vast lake of the Tigris and discharged into the Indian Sea, has now worn away the mountains which formed its banks and laid them even with the level of the Indian ocean. And if the Mediterranean had continued its flow through the gulf of Arabia, it would have done the same, that is to say, would have reduced the level of the Mediterranean to that of the Indian Sea.

Versò l'acqua Mediterranea lungamente pel Mare Rosso, el quale è largo cento miglia e lungo mille cinque cento; è tutto pieno di scogli, e à consumato li latti del Monte Sinai, la qual cosa testifica, nò da inodazione del Mar d'India, che in tali litii percuotesse, ma da una ruina d'acqua, la qual portaua con seco tutti li fiumi che soprabbon5dauano al Mare Mediterrano, e oltre a questo il rilusso del mare; òe poi, essendo tagliato nel ponente, 3 mila miglia remoto da questo loco, il móte Calpe è spiccato dal Mòte Abila, e fu tal taglio fatto bassissimo nelle pianure che si trovauà infra Abila òe l'oceano a piè del monte in loco basso, aiutato dal concavaméto di qualche vallata fatta òda alcuni fiume che quiui passasse; venne Ercole ad aprire il mare nel ponente, e allora òe l'acque marine cominciarono a uersare nell'oceano occidentale, e per la grà bassezza, il Mare òi Rosso rimase pìv alto, onde l'acque anno abbandonato il corso di quini; sempre anno poi versìòl l'acque per lo Stretto di Spagna.

For a long time the water of the Mediterranean flowed out through the Red Sea, which is 100 miles wide and 1500 long, and full of reefs; and it has worn away the sides of Mount Sinai, a fact which testifies, not to an inundation from the Indian sea beating on these coasts, but to a deluge of water which carried it with all the rivers which abound round the Mediterranean, and besides this there is the reflux of the sea; and then, a cutting being made to the West 3000 miles away from this place, Gibraltar was separated from Ceuta, which had been joined to it. And this passage was cut very low down, in the plains between Gibraltar and the ocean at the foot of the mountain, in the low part, aided by the hollowing out of some valleys made by certain rivers, which might have flowed here. Hercules came to open the sea to the westward and then the sea waters began to pour into the Western Ocean; and in consequence of this great fall, the Red Sea remained the higher; whence the water, abandoning its course here, ever after poured away through the Straits of Spain.

La superfitie del Mare Rosso è in liuello coll'oceano.

C. A. 321 6; 072 6


1091. 1. mediterrana lungamente . 2. largo . elonghu . cinquecento tutto . 3. de mòti sini . litii perco . 4. tessi . con-secho . soprabbon . 5. duano . mediterrano e oltre adique il refluxo . 6. chalpe es . 7. picchato . abile effu . chesi trova . abile . 8. ellocceano . locho . chonchiamèto . 9. passasi . erchele . 10. comuncorono . oceano . perla . bassse . 11. jacco abbandonato.

1092. 1. mare [50] rosso e illiuellio . 2. chaduta . esserrato [el] la bocha . 3. mediterano . 4. righorghiato . 5. fralli . ghade-

1091. 9. Leonardo seems here to mention the reader an allusion to the legend of the pillars of Hercules.
1 Può esser caduta vna motagnia e, serrato la bocca del Mare Rosso, e proibito l'esito al Mediterraneo, e così si rigorgato tal mare abbia per esito il trasito sì fra li gioghi Gadetani, perchè similmente abbia veduti alli nostri tēpi cadere y monte di sette miglia e serrare vna valle e farne lago, e così sì fatti la maggior parte de'laghi da motti come Lago di 9Garda di Como e Lugano, e l' lago Maggiore; 10il Mediterraneo poco s'abbassò per il taglio Gaditano ne'11li cōfini della Siria e assai in esso taglio, perchè pr'12ma che tal taglio si creasse, esso mare versava per scirocco, 13e poi s'ebbe a fare la calata, che corresse a tal Gaditano.

11In a cadea l'acqua del Mediterraneo nel oce16ano.

17Tutte le pianure che son dalli mari, alli motti, sono già state coperte dall'acque salse.

18Ogni valle è fatta dal suo fiu19me e tal proporzione è da valle a val20le, quale è da fiuume a fiuume.

19Il massimo fiuume del nostro mòdo è il Mediterraneo fiuume.

20che si move dal principio del Nilo all'Oceano occid12male.

21e la sua suprema altezza è alla Mavretania est10riore, e a di corso 10mila 31miglia, prima che si ripatri 32col suo Oceano, padre dell'11le acque.

33Cioè 3000 il Mediterraneo, 3000 35il Nilo scoperto, e 3000 il Nilo che corre a oirièquire.

A mountain may have fallen and closed the mouth of the Red Sea and prevented the outlet of the Mediterranean, and the Mediterranean Sea thus overflooded had for outlet the passage below the mountains of Gades; for, in our own times a similar thing has been seen[6]; a mountain fell seven miles across a valley and closed it up and made a lake. And thus most lakes have been made by mountains, as the lake of Garda, the lakes of Como and Lugano, and the Lago Maggiore. The Mediterranean fell but little on the confines of Syria, in consequence of the Gaditanean passage, but a great deal in this passage, because before this cutting was made the Mediterranean sea flowed to the South East, and then the fall had to be made by its run through the Straits of Gades.

At a the water of the Mediterranean fell into the ocean.

All the plains which lie between the sea and mountains were formerly covered with salt water.

Every valley has been made by its own river; and the proportion between valleys is the same as that between river and river.

The greatest river in our world is the Mediterranean river, which moves from the sources of the Nile to the Western ocean.

And its greatest height is in Outer Mauritania and it has a course of ten thousand miles before it reunites with its ocean, the father of the waters.

That is 3000 miles for the Mediterranean, 3000 for the Nile, as far as discovered and 3000 for the Nile which flows to the East, &c.
1093. Therefore we must conclude those mountains to be of the greatest height, above which the clouds falling in snow give rise to the Nile.

1094. The Egyptians, the Ethiopians, and the Arabs, in crossing the Nile with camels, are accustomed to attach two bags on the sides of the camel's body that is skins in the form shown underneath. In these four meshes of the net the camels for baggage place their feet.

1095. The Tigris passes through Asia Minor and brings with it the water of three lakes, one after the other of various elevations; the first being Munace and the middle Pallas and the lowest Triton. And the Nile again springs from three very high lakes in Ethiopia, and runs northwards towards the sea of Egypt with a course of 4000 miles, and by the shortest and straightest line it is 3000 miles. It is said that it issues from the Mountains of the Moon, and has various unknown sources. The said lakes are about 4000 braccia above the surface of the sphere of water, that is 1 mile and 1/3, giving to the Nile a fall of 1 braccio in every mile.

1096. Very many times the Nile and other very large rivers have poured out their whole element of water and restored it to the sea.
1097. Why does the inundation of the Nile occur in the summer, coming from torrid countries?

1098. It is not denied that the Nile is constantly muddy in entering the Egyptian sea and that its turbidity is caused by soil that this river is continually bringing from the places it passes; which soil never returns in the sea which receives it, unless it throws it on its shores. You see the sandy desert beyond Mount Atlas where formerly it was covered with salt water.

1099. The Assyrians and the people of Euboea accustom their horses to carry sacks which they can at pleasure fill with air, and which in case of need they carry instead of the girth of the saddle above and at the side, and they are well covered with plates of cuir bouilli, in order that they may not be perforated by flights of arrows. Thus they have not on their minds their security in flight, when the victory is uncertain; a horse thus equipped enables four or five men to cross over at need.

1100. The small boats used by the Assyrians were made of thin laths of willow plaited over rods also of willow, and bent into the form of a boat. They were daubed with fine mud soaked with oil or with turpentine, and reduced to a kind of mud which resisted the water and because pine would split; and always remained fresh; and they covered this sort of boats with the skins of oxen in safely crossing the river Sicuris of Spain, as is reported by Lucan[7].
The Spaniards, the Scythians and the Arabs, when they want to make a bridge in haste, fix hurdlework made of willows on bags of ox-hide, and so cross in safety.

1101. In [fourteen hundred and] eighty nine there was an earthquake in the sea of Atalia near Rhodes, which opened the sea—that is its bottom—and into this opening such a torrent of water poured that for more than three hours the bottom of the sea was uncovered by reason of the water which was lost in it, and then it closed to the former level.

1102. Rhodes has in it 5000 houses.


You must make steps on four sides, by which to mount to a meadow formed by nature at the top of a rock which may be hollowed out and supported in front by pilasters and open underneath in a large portico,

(An unpublished Arabic MS. in the possession of Prof. SCHEFER, of the Académie de Belgique, Paris) mention is made of a terrible earthquake in the year 867 of the Mohamedan Era corresponding to the year 1489, and it is there stated that a hundred persons were killed by it in the fortress of Kerak. There are three places of this name. Kerak on the sea of Tiberias, Kerak near Tahlie on the Libanon, which I visited in the summer of 1876—but neither of these is the place alluded to. Possibly it may be the strongly fortified town of Kerak=Kir Moab, to the West of the Dead Sea. There is no notice about this in ALEXIS PERCY, [Mémoires sur les tremblements de terre ressentis dans la péninsule turco-Hellénique et en Syrie] (Mémoires couronnés et mémoires des savants étrangers, Académie Royale de Belgique, Tome XXIII).

1103. See Pl. LXXXIII. Compare also p. 33 of this Vol. The standing male figure at the side is evidently suggested by Michael Angelo’s David. On the same place a slight sketch of horses seems to have been drawn first; there is no reason for

8 L’Ispani, li Sciti e li Arabi, quando vogliono fare vn subito pòte, alligano li graticci fatti di salice sopra le baghe ovvero altri di pelli bouine, e così passa sicuramente.

9 L’Ispani, li Sciti e li Arabi, quando vogliono fare vn subito pòte, alligano li graticci fatti di salice sopra le baghe ovvero altri di pelli bouine, e così passa sicuramente.

1104] Rhodes

Nello ottanta 9 fu vn terremoto nel mar di Atalia presso a Rodi, il quale aperse il mare cioè il fendo, nella qual apertura si sommerse tanto diluuo d’acque, che per piv di 3 ore si scoperse il fendo del mare dall’acque, che 3 di quelli si spogliarono, e poi si richiuse al primo grado.

1101. Nello ottanto 9. It is scarcely likely that Leonardo should here mean 89 A.D. Dr. H. MÜLLER-STRÜBBING writes to me as follows on this subject: “With reference to Rhodes Ross says (Reis auf den Griechischen Inseln, III 70 ff. 1840), that ancient history affords instances of severe earthquakes at Rhodes, among others one in the second year of the 138th Olympiadi=270 B. C.; a remarkably violent one under Antoninus Fius (A. D. 138—161) and again under Constantine and later. But Leonardo expressly speaks of an earthquake “nel mar di Atalia presso a Rodi”, which is singular. The town of Atalia, founded by Attalus, which is what he no doubt means, was in Pamphylia and more than 150 English miles East of Rhodes in a straight line. Leake and most other geographers identify it with the present town of Atalia. Attalia is rarely mentioned by the ancients, indeed only by Strabo and Pliny and no earthquake is spoken of. I think therefore you are justified in assuming that Leonardo means 1489”. In the elaborate catalogue of earthquakes in the East by Selale Dshelal eddin Sayounby

1102. Rodi a dètro 5000 case.

1103. Pel sito di Venere.

2 Farai le scale da 4 faccie, per le quali si pervenga a un prato fatto dalla natura sopra vn sasso, il quale sia fatto vuoto e sostenuto dananzi con pilastri, e sotto traforato con magni portico, nelle quali uada ovo...
l'acqua in diversi vasi di graniti porfidi e serpètini, dentro a emicicli, e spàda l'acqua in se medesimi, e dintorno a tal portico inverso tramótana sia un lago con una isolalette 9 in mezzo, nella quale sia vn folto e óbroso bosco; l'acqua in testa ai pilastri siè ursate in uasi ai piè 7 de' sua inbasamètli, de' quali si spargano piccoli riuetti;

8 Partendosi dalla 9 riviéra di Cilitia in verso meridio si scopre 10 la bellezza dell'isola di Cipri.

in which the water may fall into various vases of granite, porphyry and serpentine, within semi-circular recesses; and the water may overflow from these. And round this portico towards the North there should be a lake with a little island in the midst of which should be a thick and shady wood; the waters at the top of the pilasters should pour into vases at their base, from whence they should flow in little channels.

Starting from the shore of Cilicia towards the South you discover the beauties of the island of Cyprus.

W. XVII

Dalli meridionali lidi di Cilitia si uede per australe la bell'isola 2 di Cipri, la qual fu regno della dea Venere, e molti inciati dalla sua bellezza 3 anno rotte le loro navili e sarte infra li scogli circundati dalle vertiginose òde; 4 quiui la bellezza del dolce colle invita i vagabundi naviganti a resecrearsi infra le sue fiorite verdure, fralle quali i uèti ragiorádosi en-piano l'16 sola e 1 circustante mare di suai odori; o quàte nauì quiui già son sommerse! o quantì 7 navili rotti negli scogli? quiui si potrebbero vedere invermabili navili; chiè roto e mezzo 8 coperto dall'arena, chi si mostra da poppa, e chi da prua, chi da carena e chi da costa, e parà 9 a similitudine d'un giudizio, che voglia risuscitare navili morti; tant'è la somma di quelli, che 10 copre tutto il lito settentrionale; quiui i uenti d'aquilone resa-ndano fan uari e paurosi 11 soniti.

From the shore of the Southern coast of the Caspian Sea Cilitia may be seen to the South the beauti-ful island of Cyprus, which was the realm of the goddess Venus, and many navigators being attracted by her beauty, had their ships and rigging broken amidst the reefs, surrounded by the whirling waters. Here the beauty of delightful hills tempts wandering mariners to refresh themselves amidst their flowery verdure, where the winds are tempered and fill the island and the surrounding seas with fragrant odours. Ah! how many a ship has here been sunk. Ah! how many a vessel broken on these rocks. Here might be seen barks without number, some wrecked and half covered by the sand; others showing the poop and another the prow, here a keel and there the ribs; and it seems like a day of judgment when there should be a resurrection of dead ships, so great is the number of them covering all the Northern shore; and while the North gale makes various and fearful noises there.

C. A. 256a1 773 e

Scirui a Bartolomeo turco del flusso e 2 riflusso del mar di Pont, e che intenda, 3 se tal flusso e riflusso è nel Mare Ircano 4 over Mare Caspio.

4. vada lacque in diversi [s] vasi.. enasp. 5. attal.. si lago. 6. mezo.. testa a pilastri.. uasi a pie. 7. spaza picholi riueti. 8. dalla riviéra [s] le isola Cilitia] partendosi. 9. cilitia [s] scopre] l'16 meridio si co. 10. base.. cipri la qua.

1104. 1. dalla riviéra dalli. 2. della sa bellezza. 3. an rotte lor navili essare... delle marziali òde. 4. belleza del del dolce callo invita [rivita] la. 5. infralle.. fral.. enpiano. 6. adori... ga son somserse. 7. roti negli... potrebbe... roto e mezo 8. arena [altri] chin... popa... charana e qui. 9. assimilitudine dun giudizi che voglia risuscitare navili... tantella somma. 10. varie. 11. chevore... settentroniale [sopra] quiui e uenti... pauro.

1105. 1. tuero... frusso. 2. refrusso. 3. settal frusso e refrusso. 4. caspio.

assuming that the text and this sketch, which have no connection with each other, are of the same date.

Sito di Vener. By this heading Leonardo appears to mean Cyprus, which was always considered by the ancients to be the home and birth place of Aphrodite (Kypri; in Homer).

1105. The handwriting of this note points to a late date.
**TOPOGRAPHICAL NOTES.**

F. 50v]

**1106.**

Perchè l'acqua è in su mò'ti.

Dallo stretto di Gibilterra al Tanai è miglia 3500, ed è alto vn miglio e 1/6; dando vn braccio 6 per miglio di cala a ogni acqua che si move mediocremenete, e il Mar Caspio è assai più al'to; e nessù de' mò'ti d'Europa si leua vn miglio sopra la pelle delli nostri mari; adunque si potrebbe dire, che l'acqua ch'è nelle 11 cime de' nostri mò'ti, venisse dall' altezza d'essi 12 mari e de' fiumi che vi versano, che sò più alti.

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Leic. 31r]

**1107.**

Qui seguita che l'Mare della Tana, che confina col Tanai, è la più alta parte che abbia il Mare Mediterrano, il quale è remoto dallo Stretto di Gibilterra 53500 miglia, come mostra la carta da navigare; è a di calo 3500 braccia, cioè uno 7 miglio e 1/6; e è più alto adunque questo mare che mòte che abbia l'occidète.

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**1108.**

In nello stretto di Tratia il Mare di Pò'to sempre versa nel Mare Egeo, e mai l'Egea in lui, e questo diriua, che l'Mare Caspio, che có 400 miglia sta per leuàte colli i fiumi che li versano, sempre versa per cave sotterrane in esso Mar di Pòto, e l simile fa il Tanai col Danvbio, in modo che sempre esse acque Pòtiche son pìv alte che quelle dello Egea, e per ciò le pìv alte sempre discendono nelle basse, e nò più le basse nelle alte.

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In the Bosphorus the Black Sea flows always into the Egean sea, and the Egean sea never flows into it. And this is because the Caspian, which is 400 miles to the East, with the rivers which pour into it, always flows through subterranean caves into this sea of Pontus; and the Don does the same as well as the Danube, so that the waters of Pontus are always higher than those of the Egean; for the higher always fall towards the lower, and never the lower towards the higher.
The bridge of Pera at Constantinople, 15 braccia wide, 70 braccia high above the water, 600 braccia long; that is 400 over the sea and 200 on the land, thus making its own abutments.

If the river will turn to the rift farther on it will never return to its bed, as the Euphrates does, and this may do at Bologna the one who is disappointed for his rivers.

Mounts Caucasus, Comedorum, and Paropanisidae are joined together between Bactria and India, and give birth to the river Oxus which takes its rise in these mountains and flows 500 miles towards the North and as many towards the West, and discharges its waters into the Caspian sea; and is accompanied by the Oxus, Dargados, Arthamis, Xarispis, Dragamaim, Ocus, Margus, three fiumi grandissimi; from the opposite side towards the South rises the great river Indus which sends its waters for 600 miles Southwards and receives as tributaries in this course the rivers Xaradrus, Hyphasis, Vadril, Vandalbal Bislaspus to the East, Susates and Coe to the West, uniting with these rivers, and with their waters it flows 800 miles to the West; then, turning back by the Arbitti mountains makes an elbow and turns Southwards, where

di San Francisco, che desiderava averlo per fare un ponte che passassi da Constantinopoli a Pera. And Conmatti, Vita di M. Fiammetta, cap. 39: Michelangelo allora volendosi condotto a questo, temendo dell’ira del papa, pensò d’andarsene in Levante; massimamente essendo stato dal Turco ricevuto con grandissime promesse per mezzo di certi frati di San Francesco, per volersene servire in fare un ponte da Constantinopoli a Pera ed in altri affari. Leonardo’s plan for this bridge was made in 1502. We may therefore conclude that at about that time the Sultan Bajazet II had either announced a competition in this matter, or that through his agents Leonardo had first been called upon to carry out the scheme.
dia doue per sette rami in quello si sommergìe.

10 Nell'aspetto del medesimo mòte nasce il magnio 11 Gàgie, il quale fiume corse per mezzodi miglia 500 e per scirocco mille e Sarabas - Diarnvna e Soas 11 e Scilo - Còdranvnda li faìo còpagna; 11 versa in mare Indo per molte bocche.

after a course of about 100 miles it finds the Indian Sea, in which it pours itself by seven branches. On the side of the same mountains rises the great Ganges, which river flows Southwards for 500 miles and to the South-west a thousand ... and Sarabas, Diarnuna, Soas and Scilo, Condranunda are its tributaries. It flows into the Indian sea by many mouths.

C. A. 381; 118, 6]

Li omìni nati in spaes caldi amano la notte, perché li rifre'sca, e àno in odio la luce, perché li riscal'da, e però sono del coñlore della notte ciòè neri e ne' paesi freddi ogni cosa è per l'opposìto.

112. Men born in hot countries love the night because it refreshes them and have a horror of light because it burns them; and therefore they are of the colour of night, that is black. And in cold countries it is just the contrary.

112. The sketch here inserted is in MS. II 3 55 b.
XVIII.

Naval Warfare.—Mechanical Appliances.—Music.

Such theoretical questions, as have been laid before the reader in Sections XVI and XVII, though they were the chief subjects of Leonardo's studies of the sea, did not exclusively claim his attention. A few passages have been collected at the beginning of this section, which prove that he had turned his mind to the practical problems of navigation, and more especially of naval warfare. What we know for certain of his life gives us no data, it is true, as to when or where these matters came under his consideration; but the fact remains certain both from these notes in his manuscripts, and from the well known letter to Ludovico il Moro (No. 1340), in which he expressly states that he is as capable as any man, in this very department.

The numerous notes as to the laws and rationale of the flight of birds, are scattered through several note-books. An account of these is given in the Bibliography of the manuscripts at the end of this work. It seems probable that the idea which led him to these investigations was his desire to construct a flying or aerial machine for man. At the same time it must be admitted that the notes on the two subjects are quite unconnected in the manuscripts, and that those on the flight of birds are by far the most numerous and extensive. The two most important passages that treat of the construction of a flying machine are those already published as Tav. XVI, No. 1 and Tav. XVIII in the "Saggio delle opere di Leonardo da Vinci" (Milan 1872). The passages—Nos. 1120—1125—here printed for the first time and hitherto unknown—refer to the same subject and, with the exception of one already published in the Saggio—No. 1126—they are, so far as I know, the only notes, among the numerous observations on the flight of birds, in which the phenomena are incidentally and expressly connected with the idea of a flying machine.

The notes on machines of war, the construction of fortifications, and similar matters which fall within the department of the Engineer, have not been included in this work, for the reasons given on page 26 of this Vol. An exception has been made in favour of the passages Nos. 1127 and 1128, because they have a more general interest, as bearing on
the important question: whence the Master derived his knowledge of these matters. Though it would be rash to assert that Leonardo was the first to introduce the science of mining into Italy, it may be confidently said that he is one of the earliest writers who can be proved to have known and understood it; while, on the other hand, it is almost beyond doubt that in the East at that time, the whole science of besieging towns and mining in particular, was far more advanced than in Europe. This gives a peculiar value to the expressions used in No. 1127.

I have been unable to find in the manuscripts any passage whatever which throws any light on Leonardo's great reputation as a musician. Nothing therein illustrates Vasari's well-known statement: Avvenne che morto Giovan Galeazzo duca di Milano, e creato Lodovico Sforza nel grado medesimo anno 1494, fu condotto a Milano con gran riputazione Lionardo al duca, il quale molto si dilettava del suono della lira, perchè sonasse; e Lionardo portò quello strumento ch'egli aveva di sua mano fabbricato d'argento gran parte, in forma d'un teschio di cavallo, cosa bizzarra e nuova, acciocchè l'armonia fosse con maggior tuba e più sonora di voce; laonde superò tutti i musici che quivi erano concorsi a sonare.

The only notes on musical matters are those given as Nos. 1129 and 1130, which explain certain arrangements in instruments.
III.  
DEL MOTO DEL MOBILE,—DEI COGNOSCERE QUÁTO IL NAVILO SI MOVE PER ORA.

...del cognoscere...
Il modo di Battista Alberti è fatto sopra la specie dov’uno spa.\textsuperscript{to} dio noto da vn'\textsuperscript{a} isola a un altra; \textsuperscript{22} Ma tale invento\textsuperscript{13} one no riesce, \textsuperscript{38} se nò a vn naviglio simile a quel \textsuperscript{36} dove è fatto tale \textsuperscript{37} specie, ma \textsuperscript{38} bisogna che sia \textsuperscript{39} col medesimo \textsuperscript{40} carico, \textsuperscript{41} e medesima situazione di vela, \textsuperscript{42} e medesime graziose d'onde; \textsuperscript{43} e \textsuperscript{44} il mio modo serve a ogni naviglio, sì di remi come vela, \textsuperscript{45} e pesci sono ghi, e stecce o grade, \textsuperscript{51} o lugo e alto, \textsuperscript{52} o basso, sempre serve.

Leic. \textsuperscript{254}

Come con ottrici l'esercito debbe passare i fumi a noto... Del modo del notare de' pesci; del modo \textsuperscript{3} del lor saltare fori delle acque, come far si uede a delfini, che par cosa maravigliosa formare salto sopra la cosa che non aspetta, anzi si fugge; Del notare delli animali di lunga figura, come anguille e simili; Del modo del notar contro alle coretì e grà cadute de' fumi; Del modo come notino li pesci di retòda figura; Come li animali che non anno lunga fessa non sà notare; Come tutti li altri animali naturalmente sà'no notare, acendo li piedi colle dita, saluò che l'omo; In che modo l'omo debbe inparare a notare; Del modo del riporarsi sopra delle acque; Come l'omo si debbe difenderede dalle reversigini over retrosi delle acque che lo tirano in fondo; Come l'omo ti'ratò in fondo abbia a cercare del moto riflesso, che lo gitti fori della profondita; Co'\textsuperscript{2}me si deve passaggiare colle 'braccia, come si deve notare riverscere; Come, e come non \textsuperscript{13} si può star sotto l'acque, se non quando si può ritenere lo alitare; Come molti stie'no con istruimento alquato sotto l'acque; Come e perchè io non scrivo il mio modo di \textsuperscript{22}star sotto l'acqua, quatto lo posso star sanza mangiare, e questo nò pubblico o diuolgo per le ma'tie nature delli omni, li quali vese'nero li assasiameti ne' fondi de' mari

\textsuperscript{22} Mattaile. 33. riescice. 35. acquel. 36. effatto. 37. esperienzia. 38. chesia. 39. chel. 40. chariclo. 45. dere. \textsuperscript{M'\textsuperscript{t}a"}. 47. a "g"eii. 48. cho. 49. essiia. 50. c'g'colo og兰ante stàr. 51. do olìuggio. 52. obbasso.

\textsuperscript{1114.} 1. ottrici all esserci. 2. pesci. 3. adalini. 4. fuge. 5. essimili De. 6. pesci. 7. noni. 8. cólles chellòmo riporarsi lorno sopra. 10. delle reversigini. 12. chelli tirano. 11. refresso . . che gitti. 12. passaggiare colle br. . . Come e non. 13. si postar . . quanto si po. 14. iscrivo. 15. quatto iposo . . magare ecuesto. 16. vese'bono. 17. sone . .

\textsuperscript{22} Leonardo does not reveal the method invented by him.

How an army ought to cross rivers by swimming with air-bags... How fishes swim[2]; of the way in which they jump out of the water, as may be seen with dolphins; and it seems a wonderful thing to make a leap from a thing which does not resist but slips away. Of the swimming of animals of a long form, such as eels and the like. Of the mode of swimming against currents and in the rapid falls of rivers. Of the mode of swimming of fishes of a round form. How it is that animals which have not long hind quartres cannot swim. How is it that all other animals which have feet with toes, know by nature how to swim, excepting man. In what way man ought to learn to swim. Of the way in which man may rest on the water. How man may protect himself against whirlpools or eddies in the water, which drag him down. How a man dragged to the bottom must seek the reflux which will throw him up from the depths. How he ought to move his arms. How to swim on his back. How he can and how he cannot stay under water unless he can hold his breath[13]. How by means of a certain machine many people may stay some time under water. How and why I do not describe my method of remaining under water, or how long I can stay without eating; and I do not publish nor divulge these by reason of the evil nature of men who would use them as

\textsuperscript{22} Compare No. 821.

L. 13—19 will also be found in Vol. I No. 1.
col ronpere 17 i navili in fondo, e sommer-
ggierli insieme colli omini che ui son dentro, e bêchê io insegni 18 dell' altri, quelli no
son di pericolo, perchè di sopra all'acqua
appariscì la bocca della canna, 19 onde
alitano, posta sopra li altri o sughero.

means of destruction at the bottom of the sea,
by sending ships to the bottom, and sinking
them together with the men in them. And
although I will impart others, there is no
danger in them; because the mouth of the
tube, by which you breathe, is above the
water supported on bags or corks[19].

Supposing in a battle between ships and
galleys that the ships are victorious by reason
of the high of their tops, you must haul the yard
up almost to the top of the mast, and at
the extremity of the yard, that is the end
which is turned toward the enemy, have
a small cage fastened, wrapped up below and
all round in a great mattress full of cotton

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mergierli ... ebice. 18. aparisse la bocha. 19. ossugero.

1115. 1. sara ... gagie. 2. si de [mettere] tirare ... somita. 3. abì ... itua ... che [apichata] sporta. 4. apichato va gagietta
fasciata ... diorno dino. 6. chol ... ella gagia. 7. opposita andera ... gagia de. 8. chaciare. 9. chessono ... ghilea ... 
daloposita. 10. contrapeso ... charicho ... gagia. 11. antena.
If you want to build an armada for the sea employ these ships to ram in the enemy's ships. That is, make ships 100 feet long and 8 feet wide, but arranged so that the left hand rowers may have their oars to the right side of the ship, and the right hand ones to the left side, as is shown at M, so that the leverage of the oars may be longer. And the said ship may be one foot and a half thick, that is made with cross beams within and without, with planks in contrary directions. And this ship must have attached to it, a foot below the
acudi'se e questo per forza di remi potrà
dato il primo colpo, tornare indietro, e
cò furia ricacciarsi inati e dare il colpo
secondo, e poi il terzo, e tati che rôpa
detto navilio.

1117. A method of escaping in a tempest and
shipwreck at sea.

Have a coat made of leather, which must
be double across the breast, that is having a
hem on each side of about a finger breadth.
Thus it will be double from the waist to
the knee; and the leather must be quite
air-tight. When you want to leap into the
sea, blow out the skirt of your coat
through the double hems of the breast;
and jump into the sea, and allow yourself
to be carried by the
waves; when you see no shore near, give
your attention to the sea you are in, and
always keep in your mouth the air-tube which
leads down into the coat; and if now and
again you require to take a breath of fresh
air, and the foam prevents you, you may
draw a breath of the air within the coat.

S. K. M. III. 254]

Se 'l mare si pesa sul suo fondo, e
omo, che giacesse sopra esso fondo e
avesse 1000 braccia d'acqua a doso, n'avrebbe a scoppiare.

If the weight of the sea bears on its bottom, On the gra-
A man, lying on that bottom and having
1000 braccia of water on his back, would
have enough to crush him.

C. A. 7. 19 1121.

D'andar sotto acqua;
Modo di caminare sopra l'acqua.

Of walking under water.

pesa. 2. grossea. 7. ecuesto . forza adi remi . idiroto. 8. richiacarsi.
1117. 2. dito. 7. dito. 8. dito. 3. aginochio essi sicuro dello. 4. bisognassi... 
visina. 6. ab. 7. per i... 8. bisognassi trare dellaria partly individuit; scinna ripesis. 8. boca.
1118. 2. dicsissi. 3. avessi 1000 br dace 4 ascapeare. 
1119. 2. chomia. 3. sop acq"a".

1117. Amoretti, Memorie Storiche, Tav. II. B. Fig. 5, gives the same figure, somewhat altered.


1119. The two sketches belonging to this passage
are given by Amoretti, Memorie Storiche. Tav. II,
Fig. 3 and 4.
Siccome per lo fiume ghiacciato uno homo corre 2 sanza mutazione di piedi, così vn carro fia 3 possibile fare che corra per se.

A definition as to why a man who slides on ice does not fall.

Man when flying must stand free from the waist upwards so as to be able to balance himself as he does in a boat so that the centre of gravity in himself and in the machine may counterbalance each other, and be shifted as necessity demands for the changes of its centre of resistance.

Remember that your flying machine must imitate no other than the bat, because the web is what by its union gives the armour, or strength to the wings.

If you imitate the wings of feathered birds, you will find a much stronger structure, because they are pervious; that is, their feathers are separate and the air passes through them. But the bat is aided by the web that connects the whole and is not pervious.

1120. The drawings of carts by the side of this text have no direct connection with the problem as stated in words.—Compare No. 1448, l. 17.

1121. An indistinct sketch accompanies the passage, in the original.
ON FLYING MACHINES.

To escape the peril of destruction.

 Destruction to such a machine may occur in two ways; of which the first is the breaking of the machine. The second would be when the machine should turn on its edge or nearly on its edge, because it ought always to descend in a highly oblique direction, and almost exactly balanced on its centre. As regards the first—the breaking of the machine—that may be prevented by making it as strong as possible; and in whichever direction it may tend to turn over, one centre must be very far from the other; that is, in a machine 30 braccia long the centres must be 4 braccia one from the other.

A parachute is here sketched, with an explanatory remark. It is reproduced on Tav. XVI in the Saggio, and in: Leonardo da Vinci als Ingenieur etc., Ein Beiträeg zur Geschichte der Technik und der induktiven Wissenschaften, von Dr. Hermann Grothe, Berlin 1874, p. 50.
ON MINING.

II27.

If you want to know where a mine runs, place a drum over all the places where you suspect that it is being made, and upon this drum put a couple of dice, and when you are over the spot where they are mining, the dice will jump a little on the drum at every blow which is given underground in the mining.

II28.

There are persons who, having the convenience of a river or a lake in their lands, have made, close to the place where they suspect that a mine is being made, a great reservoir of water, and have countermined the enemy, and having found them, have turned the water upon them and destroyed a great number in the mine.

FUOCO GRECO.

Take charcoal of willow, and saltpetre, and sulphuric acid, and sulphur, and pitch, with frankincense and camphor, and Ethiopian wool, and boil them all together. This
ON GREEK FIRE.

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derio di bruciare, che seguita il legniame sin sotto l'acque; 6 e se aggiugnervi in essa composizione vernice liquida, 7 e olio petrolio, e tremetina, e aciote forte, mischia 8ogni cosa isieme, e secca al sole o nel forno quâdo n'è trat'tol pane, e poi volta intorno alla stoppa di canapa o altra, 10 riducidola in forma rotonda, e ficcati da ogni pa'trte i chiodi acutissimi, solamete lascia i detta palla vn 12 buco come razzo; poi la copri di colofonio e di solfo;

13 Ancora questo foco appiccato in sommità d'una lunga asta, 11 la quale abbi uno bracci di putà di ferro acciò nò sia bruciato da detto foco, è bóno per evitare e proibire ifra le naui ostili, per 16 non essere soprafatti d'èpito;

17 Ancor gittati vasi di uetrio pieni di pegola sopra 18 li aversi navili, — itendenti li omni di quelli alla battaglia, — 19 e poi gittato direto simili palle accese àmo poteza a brucia 20 legniame.
ON MUSIC.

III0. Tymbals to be played like the monochord, or the soft flute.

III1. White and sky-blue cloths, woven in checks to make a decoration.

Sketch immediately below this. Line 6 is written as the side of the seventh sketch, and lines 7 and 8 at the side of the eighth. Lines 9—16 are at the bottom in the middle. The remainder of the text is at the side of the drawing at the bottom.

III0. In the original there are some more sketches, to which the text, from line 6, refers. They are studies for a contrivance exactly like the cylinder in our musical boxes.
XIX.


Vasari indulges in severe strictures on Leonardo’s religious views. He speaks, among other things, of his “capricci nel filosofar delle cose naturali” and says on this point: “Per il che fece nell’animo un concetto si eretico che e’ non si accostava a qualsi voglia religione, stimando per avventura assai più lo esser filosofo che cristiano” (see the first edition of ‘Le Vite’). But this accusation on the part of a writer in the days of the Inquisition is not a very serious one—and the less so, since, throughout the manuscripts, we find nothing to support it.

Under the heading of “Philosophical Maxims” I have collected all the passages which can give us a clear comprehension of Leonardo’s ideas of the world at large. It is scarcely necessary to observe that there is absolutely nothing in them to lead to the inference that he was an atheist. His views of nature and its laws are no doubt very unlike those of his contemporaries, and have a much closer affinity to those which find general acceptance at the present day. On the other hand, it is obvious from Leonardo’s will (see No. 1566) that, in the year before his death, he had professed to adhere to the fundamental doctrines of the Roman Catholic faith, and this evidently from his own personal desire and impulse.

The incredible and demonstrably fictitious legend of Leonardo’s death in the arms of Francis the First, is given, with others, by Vasari and further embellished by this odious comment: “Mostrava tuttavia quanto avea offeso Dio e gli uomini del mondo, non avendo operato nell’arte come si conveniva.” This last accusation, it may be remarked, is above all evidence of the superficial character of the information which Vasari was in a position to give about Leonardo. It seems to imply that Leonardo was disdainful of diligent labour. With regard to the second, referring to Leonardo’s morality and dealings with his fellow men, Vasari himself nullifies it by asserting the very contrary in several passages. A further refutation may be found in the following sentence from
the letter in which Melzi, the young Milanese nobleman, announces the Master's death to Leonardo's brothers: Credo siete certificati della morte di Maestro Lionardo fratello vostro, e mio quanto optimo padre, per la cui morte sarebbe impossibile che io potesse esprimere il dolore che io ho preso; e in mentre che queste mia membra si sosterranno insieme, io possedero una perpetua infelicità, e meritamente perchè sviscerato et ardentissimo amore mi portava giornalmente. È dolto ad ognuno la perdita di tal uomo, quale non è più in podestà della natura, ecc.

It is true that, in April 1476, we find the names of Leonardo and Verrocchio entered in the "Libro degli Uffiziali di notte e de' Monasteri" as breaking the laws; but we immediately after find the note "Absoluti cum condizione ut retamburentur" (Tamburini was the name given to the warrant cases of the night police). The acquittal therefore did not exclude the possibility of a repetition of the charge. It was in fact repeated, two months later, and on this occasion the Master and his pupil were again fully acquitted. Verrocchio was at this time forty and Leonardo four-and-twenty. The documents referring to this affair are in the State Archives of Florence; they have been withheld from publication, but it seemed to me desirable to give the reader this brief account of the leading facts of the story, as the vague hints of it, which have recently been made public, may have given to the incident an aspect which it had not in reality, and which it does not deserve.

The passages here classed under the head "Morals" reveal Leonardo to us as a man whose life and conduct were unfailingly governed by lofty principles and aims. He could scarcely have recorded his stern reprobation and unmeasured contempt for men who do nothing useful and strive only for riches, if his own life and ambitions had been such as they have so often been misrepresented.

At a period like that, when superstition still exercised unlimited dominion over the minds not merely of the illiterate crowd, but of the cultivated and learned classes, it was very natural that Leonardo's views as to Alchemy, Ghosts, Magicians, and the like should be met with stern reprobation whenever and wherever he may have expressed them; this accounts for the argumentative tone of all his utterances on such subjects which I have collected in Subdivision III of this section. To these I have added some passages which throw light on Leonardo's personal views on the Universe. They are, without exception, characterised by a broad spirit of naturalism of which the principles are more strictly applied in his essays on Astronomy, and still more on Physical Geography.

To avoid repetition, only such notes on Philosophy, Morals and Polemics, have been included in this section as occur as independent texts in the original MSS. Several moral reflections have already been given in Vol. I, in section "Allegorical representations, Mottoes and Emblems". Others will be found in the following section. Nos. 9 to 12, Vol. I, are also passages of an argumentative character. It did not seem requisite to repeat here these and similar passages, since their direct connection with the context is far closer in places where they have appeared already, than it would be here.
I.

PHILOSOPHICAL MAXIMS.

S. K. M. III. 64.6]

Io t'ubidisco, Signore, prima per l'armore che ragionevolmente portare ti debo, secondariamente che tu sai abbreviare o prolungare le uite ali omi.

II32.

I obey Thee Lord, first for the love I Prayers to God ought, in all reason to bear Thee; secondly (II32. II33) for that Thou canst shorten or prolong the lives of men.

II33.

A PRAYER.

Tu o Iddio ci vendi tutti li beni per prezio di fatica.

II34.

O admirable impartiality of Thine, Thou The powers of Nature first Mover; Thou hast not permitted that (II31-139) any force should fail of the order or quality of its necessary results.

II35.

La necissità è maestra della natura; Necessity is the mistress and guide of nature.

3 La necissità è tema e inventrice della natura è freno e regola eterna. Necessity is the theme and the inventress, the eternal curb and law of nature.

S. K. M. III. 49.4]

W. An. IV. 172.4]

Oratio.

Thou, O God, dost sell us all good things at the price of labour.

A. 24.4]

O mirabile givstitia di te, primo motore, tu non aì voluto màcare a nessuna potetìa l'ordine e qualità de' sua neciesari effetti.

II33. 1. sechondaria. 4. abbreviere. II33. 2. "ti" ci vende. 3. per pre. 4. fatica.

II34. 1. màchare a nessuna [creata chosa]. 2. "equalità" de' sua.

II35. 1. he maestra. 2. ettutrice. 3. ettema. 5. effrno.
1136. In many cases one and the same thing is attracted by two strong forces, namely Necessity and Potency. Water falls in rain; the earth absorbs it from the necessity for moisture; and the sun evaporates it, not from necessity, but by its power.

1137. Weight, force and casual impulse, together with resistance, are the four external powers in which all the visible actions of mortals have their being and their end.

1138. Our body is dependant on heaven and heaven on the Spirit.

1139. The motive power is the cause of all life.

1140. And you, O Man, who will discern in this work of mine the wonderful works of Nature, if you think it would be a criminal thing to destroy it, reflect how much more criminal it is to take the life of a man; and if this, his external form, appears to thee marvellously constructed, remember that it is nothing as compared with the soul that dwells in that structure; for that indeed, be it what it may, is a thing divine. Leave it then to dwell in His work at His good will and pleasure, and let not your rage or malice destroy a life—for indeed, he who does not value it, does not himself deserve it[19].

1136. 1. voltu. 2. medesima. 3. cosa. 4. tirata. 5. violètie. 6. necisità. 7. 8. aqua. 9. terru. 10. l’assorbie. 11. per necissità d’omor. 12. sole. 13. spectator. 14. l’acqua. 15. campd. 16. per necissità, ma per potètia.


1138. 30. Il. 31. corru. 32. nostro. 33. lo. 34. cieli. 35. on. 36. spirito.


1140. 41. che. 42. consideri. 43. in. 44. mi. 45. fati. 46. l’opre. 47. mirabil. 48. della. 49. sua. 50. suppo. 51. di. 52. vers. 53. di. 54. una. 55. per. 56. marauilhoso. 57. artifitio. 58. pensa. 59. essa. 60. per. 61. anima. 62. in. 63. trettu. 64. architettura. 65. e. 66. vera. 67. que. 68. essa. 69. ella. 70. cosa. 71. lascia. 72. abitare. 73. sua. 74. suo. 75. be’ne. 76. placito. 77. volere. 78. non. 79. la. 80. trettu. 81. vita. 82. chè. 83. ramète. 84. chi. 85. la. 86. stima. 87. non. 88. merita.

19. In MS. 15° is the note: chi nò stima la vita, non la merita.
II41. The soul can never be corrupted with the corruption of the body, but is in the body as it were the air which causes the sound of the organ, where when a pipe bursts, the wind would cease to have any good effect.

C. A. 58a: 180a]

Ogni parte à inclinatiò di ricógiugnersi al suo 3 tutto per fuggire dalla 4 sua imperfettione;

L'anima desidera stare 6 col suo corpo, perché senza 7 li strumèti organici di tal 8 corpo nulla può operare 9 nè sètère.

C. A. 75a: 219a]

Chi vuole vedere come l'anima abita nel suo 2 corpo, guardi come esso corpo vsa la 3 sua cotidiana abitazione, cioè se quella 4 è sanza ordine e confusa, disor- dinàto e còfuso fia il corpo tenvto dalla sua anima.

Br. M. 278 6]

Perchè vede piv certa la cosa l'occhio ne' sogni 2 che colla imaginatione, stando desto?

I sensi sono terrestri, la ragione sta 2 fuor di quelli, quàdo, còtenpla.

II46. Every action needs to be prompted by a motive.

To know and to will are two operations of the human mind.

Discerning, judging, deliberating are acts of the human mind.

II41. 1. chorrépere . . curutti . . maffa. 2. assimilitudine . . chassa del sono. 3. guassatôdisi . . chama.
II42. 4. tutto [6] per. 4. imperfectione. 6. chol. 7. organici.
II43. 1. vole . . chome. 2. chorro . . chone esso chorro. 3. choridiana . . secquella. 4. confusà . . chôfuso . . chorro.
II44. 2. dessto. 7. teresi. 2. for di quelli . . chôtémpla.
II45. 1. chescessercita. 3. cogniosciere . . operatione. 5. disciernere . . còsgliare.
II47. All our knowledge has its origin in our preceptions.

II48. Science is the observation of things possible, whether present or past; prescience is the knowledge of things which may come to pass, though but slowly.

II49. Experience, the interpreter between formative nature and the human race, teaches how that nature acts among mortals; and being constrained by necessity cannot act otherwise than as reason, which is its helm, requires her to act.

II50. Wisdom is the daughter of experience.

II51. Nature is full of infinite causes that have never occurred in experience.

II52. Truth was the only daughter of Time.

II53. Experience never errs; it is only your judgments that err by promising themselves effects such as are not caused by your experiments. Experience does not err; only your judgments err by expecting from her what is not in her power. Men wrongly complain of Experience; with great abuse they accuse her of leading them astray but they set

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1147. 1. pròpôsićia.
1148. 1. noti delle chessono possibile presente. 2. cose che pesi inese che posì uenire. 3. penitente.
1149. 1. inesperienza. 4. ella. 3. insegna. 8. cò. 11. chella ragiò "suotimone". 12. hoperare. 12. asegni.
1150. 1. dela. 2. sperienza la quale sperì. 3. èsa here the text breaks off.
1151. 2. insperienza.
1152. 1. verità sola fu. 2. glola.
1153. 1. vostri giudìti. 2. [tale] effetto l "tale" che in vostri . . . cussanti. 3. esesperienza . . . massol . . . vostri giudìti [i quali sa] prometa "desi". 5. attorto si laments . . . della "innocète" isperienza la quale con somme rampogne. 7. Ma lasciâno.
Experience aside, turning from it with complaints as to our ignorance causing us to be carried away by vain and foolish desires to promise ourselves, in her name, things that are not in her power; saying that she is fallacious. Men are unjust in complaining of innocent Experience, constantly accusing her of error and of false evidence.

1154. Instrumental or mechanical science is of all the noblest and the most useful, seeing that by means of this all animated bodies that have movement perform all their actions; and these movements are based on the centre of gravity which is placed in the middle dividing unequal weights, and it has dearth and wealth of muscles and also lever and counter-lever.

1155. Of mechanics.

Mechanics are the Paradise of mathematical science, because here we come to the fruits of mathematics.

1156. Every instrument requires to be made by experience.

1157. The man who blames the supreme certainty of mathematics feeds on confusion, and can never silence the contradictions of sophistical sciences which lead to an eternal quackery.

1158. There is no certainty in sciences where one of the mathematical sciences cannot be applied, or which are not in relation with these mathematics.
C. A. 75a: 219 a]

1159. Any one who in discussion relies upon authority uses, not his understanding, but rather his memory. Good culture is born of a good disposition; and since the cause is more to be praised than the effect, I will rather praise a good disposition without culture, than good culture without the disposition.

1160. Science is the captain, and practice the soldiers.

1161. Of the errors of those who depend on practice without science.

Those who fall in love with practice without science are like a sailor who enters a ship without a helm or a compass, and who never can be certain whither he is going.

1159. 1. laturita. 2. longieghno. 3. sonate. 4. laldare la cagió che l'effetto. 5. lalderai vn bono naturale. 6. literato.
1160. 1. ella pratica.
1161. 1—6 R. 1. errore. 2. pratica. 3. chessinnamora di pratica. 4. nochieri. 5. ebussola. 6. ciertera.
II.

M OR A L S.

1162.

Now you see that the hope and the desire What is life of returning home and to one's former state (1162. 1163) of returning home and to one's former state is like the moth to the light, and that the man who with constant longing awaits with joy each new spring time, each new summer, each new month and new year—deeming that the things he longs for are ever too late in coming—does not perceive that he is longing for his own destruction. But this desire is the very quintessence, the spirit of the elements, which finding itself imprisoned with the soul is ever longing to return from the human body to its giver. And you must know that this same longing is that quintessence, inseparable from nature, and that man is the image of the world.

1163.

O Time! consumer of all things; O envious age! thou dost destroy all things and devour all things with the relentless teeth of years, little by little in a slow death. Helen, when she looked in her mirror, seeing the withered wrinkles made in her face by old age, wept and wondered why she had twice been carried away.

1162. 1. On the margin: pro, meaning probably propositione. 2. lassperanza [del suo] el desidero 2. chis"o" assimilitudine "della farfalla alume" dell uomo. 3. chò chònuti ... chò festa aspetta. 5. chose. 6. disfasi. 7. Desidero e ne l [q] la quìte essenza. 8. peranima dello ... corpo. 10. chissopi ... quita essà. 11. chòpagna ... eiluome.

1163. 1. consumatore ... chose. 2. disstruggi ... chose. 3. consumate ... chose. 4. vecchura appocho appocho chis. 5. elena ... sìspecchiana. 6. leuzze grinzè. 7. oppèsa secho. 8. da volte. 9. consumatore ... chose. 10. lesouo chonsumate.
9 O tépo consumatore delle cose; e o invidiosa antichità, per la quale tutte le cose sono consumate!

O Time! consumer of all things, and O envious age! by which all things are all devoured.

1164.

Ogni danno lascia dispiacere nella ricordazione, salvo che l sommo danno, cioè la morte, che uccide essa ricordazione isieme colla vita.

Death.

Every evil leaves behind a grief in our memory; except the supreme evil, that is death, which destroys this memory together with life.

1165.

È di tato vilipèdio la bugia, che s'ella dicesse bene già cose di Dio, ella toglie gratia a sua deità, ed è di tato eccellèzia la verità, che s'ella laudasse cose minime ella si fano nobili;

4 Sanza dubbio tal proportione è dalla verità alla bugia, qual è dalla luce alle tenebre, ed è essa verità in se di tanta eccellèzia che, ancora ch'ella s'estenda sopra vnili e basse materie, sanza comparazione ella eccede le incertezze e bugie

The knowledge of past times and of the places on the earth is both an ornament and nutriment to the human mind.

1166.

L'un caccia l'altro.

3 Per questi quadretti s'intende la vita e li studi umani.

One pushes down the other. By these square-blocks are meant the life and the studies of men.

1167.

La cognitiò del tépo preterito e del sito della terra è ornamenti e cibo delle menti umane.

The knowledge of past times and of the places on the earth is both an ornament and nutriment to the human mind.

1168.

È di tato vilipèdio la bugia, che s'ella dicesse bene già cose di Dio, ella toglie gratia a sua deità, ed è di tato eccellèzia la verità, che s'ella laudasse cose minime ella si fano nobili;

4 Sanza dubbio tal proportione è dalla verità alla bugia, qual è dalla luce alle tenebre, ed è essa verità in se di tanta eccellèzia che, ancora ch'ella s'estenda sopra vnili e basse materie, sanza comparazione ella eccede le incertezze e bugie

To lie is so vile, that even if it were in speaking well of godly things it would take off something from God's grace; and Truth is so excellent, that if it praises but small things they become noble. Beyond a doubt truth bears the same relation to falsehood as light to darkness; and this truth is in itself so excellent that, even when it dwells on humble and lowly matters, it is still infinitely above uncertainty and lies, disguised in high and
estese so'pra li magni e altissimi discorsi, perché la mètore nostra, ancora ch'ell'abbia la bugia pel quito clemento, non resta però che la verità delle cose nò sia di sommo nutrimento dellè intelletti fini, ma non di uaga bundi ingegni;

13 Ma tu che viu di sogni, ti pioncìon più le ragioni soffistiche e barerie de' pallaji nelle cose gràdi e incerte, che le certe naturali e nó di tata alta e somma.

C. A. 175 a; 190 a]

A torto si lamètìa omini della fuga del tempo, incolpando quello di troppa vèlocità, nò s'accorgìèdo quell' essere di bastevole trasito, ma bona mèmoria, di che la natura ci à dotati, ci fa che sogni cosa lungamète passata ci pare essere presente.

C. A. 111 a; 345 a]

Acquista cosa nella tua giovètù arresta il danno della tua vecchiezza; — e se tu intèdi la vecchiezza aver per suo cibo la sa-piètìa, adoperati in tal modo in giovètù che tal vecchiezza nò machi il nùtrimeto.

C. A. 223 d; 671 d]

1 L'acquisto di qualiche cognizione è scèpre vitile allo intelletto, perché potrà sccacciare da se le cose inutili e riserva-le buone;

5 perchè nessuna cosa si può amare necoliare, se prima nó si à cognitiò di quella.

Tr. 32]

1 Siccome... As a day well spent procures a happy sleep, so a life well employed procures a happy death.

chella... chose... soma. 12. ingegni ingeni. 13. mattu. 15. piace. 16. ragiò soffistiche. 18. palari. 21. delle corte.

1169. 3. choll.

1170. 2. incolpando... tropa... sarchiòedo. 4. ci fa [parere] "ché", 5. chosa.

1171. 1. chosa... goventu. 2. cheresta il. 3. chiera [ovr o chettu massulli la tu]. 4. [a vecchiezza]—essettu. 6. govi. 7. chetal vecchia.

1172. 1. chognitione. 3. schiaciare dasse le chose inutil. 4. re le. 5. chosa. 6. chognitiò.

1173. 1. sicchome... dallieto.
The water you touch in a river is the last of that which has passed, and the first of that which is coming. Thus it is with time present. Life if well spent, is long.

Just as food eaten without caring for it is turned into loathsome nourishment, so study without a taste for it spoils memory, by retaining nothing which it has taken in.

On Mount Etna the words freeze in your mouth and you may make ice of them. Just as iron rusts unless it is used, and water putrifies or, in cold, turns to ice, so our intellect spoils unless it is kept in use. You do ill if you praise, and still worse if you reprove in a matter you do not understand. When Fortune comes, seize her in front with a sure hand, because behind she is bald.

It seems to me that men of coarse and clumsy habits and of small knowledge do not deserve such fine instruments nor so great a variety of natural mechanisms as men of speculation and of great knowledge; but merely a
MORALS.

1179-1183.

ceua il cibo, e donde esso esca, ch’è in vero altro che un transito di cibo non sò da essere giudicati, perché niente mi pare che essi participino di spetie vmana altro, che la voce e la figura, e tutto il resto è assai manco che bestia.

S. K. M. III. 179

Ecco alcuni che non altramente che trâ sito di cibo e avmètatori di sterico e rienpitori di destri chiamarsi debono, perché per loro non altro nel modo o pure alcuna virtù in opera si mette, perché di loro altro che pieni destri non resta.

C. A. 153b, 455d

Il massimo ingâno dell’omini è nelle loro opinioni.

Tr. 56

La stoltitia è scudo della vergogna, come impròtitudine della povertà glorificata.

Tur. 17d

La ciecca ignorâza così ci còduce cò effetto de’ lascivi sollazzi

La virtù è vero nostro bene ed è vero premio del suo possessore; lei nò si può perdere, lei nò ci abbandona, sack in which their food may be stowed and whence it may issue, since they cannot be judged to be any thing else than vehicles for food; for it seems to me they have nothing about them of the human species but the voice and the figure, and for all the rest are much below beasts.

1179.

Some there are who are nothing else than a passage for food and augmentors of excrement and fillers of privies, because through them no other things in the world, nor any good effects are produced, since nothing but full privies results from them.

1180.

The greatest deception men suffer is from their own opinions.

1181.

Folly is the shield of shame, as un-readiness is that of poverty glorified.

1182.

Blind ignorance misleads us thus and delights with the results of lascivious joys.

Because it does not know the true light.

Vain splendour takes from us the power of being... behold! for its vain splendour we go into the fire, thus blind ignorance does mislead us. That is, blind ignorance so misleads us that...

O! wretched mortals, open your eyes.

1183.

That is not riches, which may be lost; virtue is our true good and the true reward of its possessor. That cannot be lost; that never deserts us, but when life leaves us. As

5. sacho [da cibo] dose. 6. esca... giudicati. 7. chella voce. 18. ella... estutto eretto... manco che bessia. 1179. 1. ecci... chè altro chétrâ. 3. chò... "e riepàtorj di destri" chiamarsi. 4. loro... "altro nel modo o pure" alchuna. 6. pieni e desstr.

1180. 2. de nelloro oppennioche.

1181. 1. esschudo... chome. 2. grorificato.

1182. 1. cicchà... chosi ci chòduce. 2. e chô... lascivi sollazzi. 3. chonosciere. 4. chonosciere. 6. b... vedi fùcho andiano. 7. li ciche ignorâza... intal modo chòduce. 8. coe chome cichà... ignorâza ci chòduce. 9. che.

1183. 1. richeza... chessi. 4. lascia. 5. elle esterne. 6. isspesso lasciano choniscorno. 7. esbeffato iloro.
se prima la uita nò ci lascia; 3 le robe e le esterne diuitie · senpre le tieni 6 có timore; spesso lasciano · con scorno 7 e sbefiato · il loro possessor perde do lor possessione.

to property and external riches, hold them with trembling; they often leave their possessor in contempt, and mocked at for having lost them.

Ogni omo desidera far capitale per 2 dare a medici destruttori di uite, adunque debono essere richi; 3 L' uomo à grande discorso, del quale la più parte 4 è vana e falsa, li animali l' anno piccolo, ma è veri e vero, e meglio è la piccola certezza che la grà 6 bugia.

Every man wishes to make money to give it to the doctors, destroyers of life; they then ought to be rich. 2 Man has much power of discourse which for the most part is vain and false; animals have but little, but it is useful and true, and a small truth is better than a great lie.

Chi p' in possiede p' debbe 2 temere di no perdere.

He who possesses most must be most afraid of loss.

Chi uuole essere ricco in 5 di 2 e impic- cato in vn anno.

He who wishes to be rich in a day will be hanged in a year.

E questo uomo à vna somma 2 pazzia cioè che sépre stëta per 3 non stëtare, e la uita a lui 4 fugie sotto speranza di gode'are i beni con somma fatica ac'quistati.

That man is of supreme folly who always wants for fear of wanting; and his life flies away while he is still hoping to enjoy the good things which he has with extreme labour acquired.

Se tu · avessi · il corpo secódo la virtù · tu · nò capresti · in questo mòdo; 3 Tu cresci i reputatione come il pane · i mano a' putti.

If you governed your body by the rules of virtue you would not walk on all fours in this world.

Saluatico è quel che si salua.

Savage he is who saves himself.

1184. 2. medici "destruttori di inte" adauge . esse. 4. picholo. 5. verso . ella pichola certezza.
1185. 1. ci p' in possiede. 2. no.
1186. 1. richo mòdi. 2. empichato avn.
1187. 1. uomo . somma. 2. paza. . chesopre. 3. istitute ella uita seli. 5. soma fatica a. 6. quisitati
1188. 1. settu . capresti. 3. crescedi.
1189. 1. medici "destruttori di inte" adauge . esse. 4. picholo. 5. verso . ella pichola certezza.
1184. 2. Compare No. 856.
1188. The first sentence is obscure. Compare Nos. 825. 826.
II90.

Non si debbe desiderare lo impossibile.

II91.

We ought not to desire the impossible.

Ask counsel of him who rules himself well. Justice requires power, insight, and will; and it resembles the queen-bee.

He who does not punish evil commands it to be done.

He who takes the snake by the tail will presently be bitten by it.

The grave will fall in upon him who digs it.

II92.

The man who does not restrain wantonness, allies himself with beasts.

You can have no dominion greater or less than that over yourself.

He who thinks little, errs much.

It is easier to contend with evil at the first than at the last.

No counsel is more loyal than that given on ships which are in peril. He may expect loss who acts on the advice of an inexperienced youth.

II93.

Where there is most feeling, there is the greatest martyrdom;—a great martyr.

II94.

The memory of benefits is a frail defence against ingratitude.

Reprove your friend in secret and praise him openly.

Be not false about the past.

1190. The writing of this note, which is exceedingly minute, is reproduced in facsimile on PL. XLI No. 5 above the first diagram.

VOL. II.
COPERAZIONE DELLA PATIETIA.


S. K. M. II.2 214a


II.2 126

La invidia offende colla fitta ?infamia, cio? col detrarre, la qual cosa spav?ta la virt?.

L. 0*

Decipimur votis et tempore fallimur et mos deridet curas; anxia vita nihil.

III.06

[La pavra nascie p? tosto ? che altra cosa.]

C. A. 754; 2104

Siccome l’animosita ? pericolo di vita, cosi la paura ? sicurezza di quella;
2 Le minacce sol sono armi dello minacciato;
4 Dov’?ntra la u?tura, la invidia vi pone lo assedio e lo cobatte, e dond’ella si parte, vi lascia il dolore e p?timeto;
5 Raro cade chi ben camina;

II95. A SIMILE FOR PATIENCE.

Patience serves us against insults precisely as clothes do against the cold. For if you multiply your garments as the cold increases, that cold cannot hurt you; in the same way increase your patience under great offences, and they cannot hurt your feelings.

II96. To speak well of a base man is much the same as speaking ill of a good man.

II97. Envy wounds with false accusations, that is with detraction, a thing which scares virtue.

II98. We are deceived by promises and time disappoints us?

II99. Fear arises sooner than any thing else.

I200. Just as courage imperils life, fear protects it.

Threats alone are the weapons of the threatened man.

Wherever good fortune enters, envy lays siege to the place and attacks it; and when it departs, sorrow and repentance remain behind.

He who walks straight rarely falls.

II98. 2. The rest of this passage may be rendered in various ways, but none of them give a satisfactory meaning.
6. Mal’è se laudi e peggio se riprendi la cosa, dico se bene tu non la intendi;
7. Mal fai se laudi e peggio se tu riprendi la cosa quado bene tu non la intendi.

It is bad if you praise, and worse if you reprove a thing, I mean, if you do not understand the matter well.
It is ill to praise, and worse to reprimand in matters that you do not understand.

1201. Words which do not satisfy the ear of the hearer weary him or vex him, and the symptoms of this you will often see in such hearers in their frequent yawns; you therefore, who speak before men whose good will you desire, when you see such an excess of fatigue, abridge your speech, or change your discourse; and if you do otherwise, then instead of the favour you desire, you will get dislike and hostility.

And if you would see in what a man takes pleasure, without hearing him speak, change the subject of your discourse in talking to him, and when you presently see him intent, without yawning or wrinkling his brow or other actions of various kinds, you may be certain that the matter of which you are speaking is such as is agreeable to him &c.

1202. The lover is moved by the beloved object as the senses are by sensible objects; and they unite and become one and the same thing. The work is the first thing born of this union; if the thing loved is base the lover becomes base.

When the thing taken into union is perfectly adapted to that which receives it, the result is delight and pleasure and satisfaction.
When that which loves is united to the thing beloved it can rest there; when the burden is laid down it finds rest there.

1203. There will be eternal fame also for the inhabitants of that town, constructed and enlarged.

1203. These notes were possibly written in preparation for a letter. The meaning is obscure.
Tutti i popoli obbediscono e sò messi da lor magniati, e essi magniati si colle-gano e costringono coi signori per 2 vie: o per sanguinità, o per roba: sanguini-tà, quàdo i lor figlioli sono a similitudine di stalle; sicurità è pegno della lor dubi-tata fede; roba, quàdo tu farai a ciascu d’essi èmurare vna casa o 2 dentro alla tua città, della quale lui ne tragga qualsìe’entrate e trarrà... 10 città. cinque mila case có trenta mila abitatori, e digregrai tanta cògregatione di popolo che a simili-tudine di capre l’è adosso all’altro stanno, e piëdo ogni parte di fetore e si fanno similitudine di pestilète morte;

E la città si fà di bellezza còpagnia del suo nome e a te vile di dati e fama etterna del suo crescimètò.

Ash. II. 13o]

Per mäteneri il dono principàl di natura cioè libertà, trovo modo da ofìfèdere e difèdere stàte assediati dali abitiosi tiràni, e prima dirò del sito mvràle, e àcòra per che i popoli possino mäteneri i loro boni e giusti signori.

All communities obey and are led by their magnates, and these magnates ally themselves with the lords and subjugate them in two ways: either by consanguinity, or by fortune; by consanguinity, when their children are, as it were, hostages, and a security and pledge of their suspected fidelity; by property, when you make each of these build a house or two inside your city which may yield some revenue and he shall have... 10 towns, five thousand houses with thirty thousand inhabitants, and you will disperse this great congregation of people which stand like goats one behind the other, filling every place with fetid smells and sowing seeds of pestilence and death;

And the city will gain beauty worthy of its name and to you it will be useful by its revenues, and the eternal fame of its aggrandizement.

To preserve Nature’s chiepest boon, that is freedom, I can find means of offence and defence, when it is assailed by ambitious tyrants, and first I will speak of the situation of the walls, and also I shall show how communities can maintain their good and just Lords.

3 Tutti i popoli obbediscono e sò messi da lor magniati, e essi magniati si colle-gano e costringono coi signori per 2 vie: o per sanguinità, o per roba: sanguinità, quàdo i lor figlioli sono a similitudine di stalle; sicurità è pegno della lor dubitata fede; roba, quàdo tu farai a ciascu d’essi èmurare vna casa o 2 dentro alla tua città, della quale lui ne tragga qualch’entrate e trarrà... 10 città. cinque mila case có trenta mila abitatori, e digregrai tanta cògregatione di popolo che a similitudine di capre l’è adosso all’altro stanno, e piëdo ogni parte di fetore e si fanno semèza di pestilète morte;

11 E la città si fà di bellezza còpagnia del suo nome e a te vile di dati e fama etterna del suo crescimètò.

1204. Compare No. 1266.
POLEMICS.—SPECULATION.

G. 47.]

O speculatore del le cose, non ti laudare 3 di conoscere le cose 4 che ordinariamente per se medesima 6 natura 7 conduce; 8 Ma rallegrati di conoscere il fine 10 di quelle cose che 11 son disegnate dalla 12 mente tua.

S. K. M. II. 67.]

O speculatori dello continuo moto, quanti vani disegni in simile cerca avete creati! 3 accoppagniatevi colli cercatori dell'oro.

C. A. 756; 2198]

I bugiard interpreti di natura affermano l'argièto viuo, essere comune semèza a tutti i metalli, 4 no si ricordato che la 2 natura varia le semèze secondo la diversità delle cose che essa vole produrre al modo.

C. 1025.]

Oh! speculators on things, boast not of knowing the things that nature ordinarily brings about; but rejoice if you know the end of those things which you yourself devise.

S. 1206.]

Oh! speculators on perpetual motion how many vain projects of the like character you have created! Go and be the companions of the searchers for gold.

J. 1207.

The false interpreters of nature declare that quicksilver is the common seed of every metal, not remembering that nature varies the seed according to the variety of the things she desires to produce in the world.

1205. 1. hos spechulatori. 2. chos. 3. laldare. 4. conoscire. 6. per sua [natu] "ordin". 7. [ralmente] chonduce. 8. dicho. 9. nonsiere. 10. chos.

1206. 1. spechulatori. 2. cierche ave creati. 3. acoppagniatevi. 4. cierchator.

1207. 1. interpreti .. chovene .. atutti .. richordido chella. 2. sechido .. chos .. produre.

1206. Another short passage in MS. I, referring also to speculators, is given by Libri (Hist. des Sciences math. III, 228): Sicché voi speculatori non vi fidate dell'autor che anno sol col immaginatione voluto farsi inter-preti tra la natura e l'omo, ma sol di quelli che non col cieni della natura, ma cogli effet della sue esperienze anno esercitati i loro ingegni.
POLEMICS.

1208.

And many have made a trade of delusions and false miracles, deceiving the stupid multitude.

1209.

Pharisees—that is to say, friars.

1210.

Abbreviators do harm to knowledge and to love, seeing that the love of any thing is the offspring of this knowledge, the love being the more fervent in proportion as the knowledge is more certain. And this certainty is born of a complete knowledge of all the parts, which, when combined, compose the totality of the thing which ought to be loved. Of what use then is he who abridges the details of those matters of which he professes to give thorough information, while he leaves behind the chief part of the things of which the whole is composed? It is true that impatience, the mother of stupidity, prizes brevity, as if such persons had not life long enough to serve them to acquire a complete knowledge of one single subject, such as the human body; and then they want to comprehend the mind of God in which the universe is included, weighing it minutely and mincing it into infinite parts, as if they had to dissect it!

Oh! human stupidity, do you not perceive that, though you have been with yourself all your life, you are not yet aware of the thing you possess most of, that is of your folly? and then, with the crowd of sophists, you deceive yourselves and others, despising the mathematical sciences, in which truth dwells and the knowledge of the things included in them. And then you occupy yourself with miracles, and write that you possess information of those things of which the human mind is incapable and which cannot be proved by any instance from nature. And you fancy you have wrought miracles when you spoil a work of some

1208. 2. feci bot. 6. inga. 10. ne sì afopera cognoscitore de loro ingàri essigil posiano.

1210. 1. abbreviatori...opre...fanno ingiuria. 2. cognizione [concosia che] e allo. 3. concosia chellamore...effioli. 4. ella [cogni] mare. 5. ettano. 7. feruiide certera nasscie. 8. intégrale...pa. 9. te. 10. conpongano...quella. 11. sa che. 12. abbreviare. 13. parte. 15. chellui lassci indirieto. 16. magor. 17. chellia. 19. chellalda...chomessse. 21. chelli seruisii. 22. da "sol" parlicature. 24. ano abbracciare...nelle. 26. minvanzo. 27. parte...lavessino anatomiare. 28. [e delle chose che] o. 29. tu [chettu] chettu se. 31. chettu. 32. coe...pazza [vole] e volli. 33. i conilla...inganazer. 34. slezando. 35. se nella. 36. còtègano e vói. 39. posso. 40. naturale letiti. 41. tu guusto. 42. spechialalivo. 43. chettu.

1209. Compare No. 837, ll. 54—57, No. 1296 (p. 363 and 364), and No. 1305 (p. 370).
quando tu aì quasto vna 44 opera d’alcuno ingreggio, speculativo, e no 43 t’avesi che tu cadi nel medesimo errore, 44 che fa quello che denuda la piatta dell’orna3mento de’ sua rami, pieni di fronde, miste co’ odori fiori o frutti, . . . . 48 come fece Giv49sino, abbreuiatore delle storie scritte da Trog0 Pópeo, il quale scrisse ornatamente tutt1 li eccellenti fatti della sua antichi, li quali e8 rà pieni di mirabilissimi ornamenti; e così 55 compose vna cosa ignuda, ma sol degna d’in5genni inpatienDi, li quali pare lor perder 55 tanto di temp0, quanto quello è che è adoperato vt5mète, cioè nelli studi delle opere di nature e delle 57 cose vmane; Ma stieno questi tali in compa5gna delle bestie; Nelli lor cortigiani sieno cani e 59 i altri animali pié di rapina e accompagnianni 60 con loro correndo sempre dietro . . . . , e seguita-61 no l’ incetè animali che có la fame alli tem82pi delle gùi nevi ti uengono alle case, dimanda63tori limosina come lor tutore.

C. A. 1875; 592a]

O matematici fate lume a tale er3rote!
3 Lo spirito non a voce, perché dòvè voce 4 è corpo, e dove è corpo e occupa-5 ti di lòco, il quale impedisce all’occhio il 6 uedere delle cose poste dopo tale loco; 7adunque tal corpo empie di se tutta 8 la circustante aria, cioè colle sua s8petie.

B. 4a]

No può essere voce, dove non è movi-mèto e percussione d’aria; 2 nò può essere percussione d’essa aria, doue non è stru-mèto; 3 nò può essere struètro incorporeo; essèndo così, vno spirito nò può avere né voce nè forma nè forza, 5 e se piglierà corpo, non potera penetrare nè entrare; doue li usi sono serrati; 7 e se alcuno di-ciesse; per aria cogregata 8 e ristretta isìeme lo spirito piglia i corpi 9 di uarie forme, e specular mind, and do not perceive that you are falling into the same error as that of a man who strips a tree of the ornament of its branches covered with leaves mingled with the scented blossoms or fruit . . . . . [48] as Justinus did, in abridging the histories written by Trogus Pompeius, who had written in an ornate style all the worthy deeds of his forefathers, full of the most admirable and ornamental passages; and so composed a bald work worthy only of those impatient spirits, who fancy they are losing as much time as that which they employ usefully in studying the works of nature and the deeds of men. But these may remain in company of beasts; among their associates should be dogs and other animals full of rapine and they may hunt with them after . . . . , and then follow helpless beasts, which in time of great snows come near to your houses 1asking’ alms as from their master . . . .

1211. 48. Giulio, Marcus Junianus Justinus, a Roman historian of the second century, who compiled an epitome from the general history written by Trogus Pompeius, who lived in the time of Augustus. The work of the latter writer no longer exist.
Delli discorsi vmani stoltissimo è da essere riputato quello, il qual s'astède all'alchimia, partoritrice delle cose semplici e naturali; Ma è tanto più degna di riprensione che l'alchimia, quanto ella non partorisce alcuna cosa se no simile a se, cioè bugia; il che non intervienne nella alchimia, la quale è ministra trice de' semplici prodotti della natura, il quale vistio fatto esser no può ? da essa natura, perché in lei non sono stru- mèti organici colli quali essa possa operare quel che adopera l'uomo mediante le mani, che in tale vistio 9 a fatti i vetri ecc.; ma essa negromàzia, stendardo ovvero bandiera 10 volante,ossa dal uèto, è guida trice della stolta moltitudine, la quale 11 al continuo testimonia collo abbaismatò d'infinite effetti di tale 12 arte; e uano épiu i libri, affermando che l'incìt e spiriti adoperino 13 e sanza lingua parlino, e sanza strumèti organici, sàza i quali 14 parlar no' se può, parlino, e portino gravissimi pes, facino tépestare 15 e piovere, e che li omini si còvertino il gatto, lupi e altre bestie, 16 benchè in bestia prima étà' quelli che tal cosa affermano;

17 È cierto, se tale negromàzia fusse in essere, come dalli bassi ingiugni è creduto, 18 nessuna cosa è sopra la terra che al danno e seruito dell'omo fusse di tanta valitudine, perché se fus'vse vero, che in tale arte si avesse potètia di far turbare la tràquilla serenità dell'arri 19, convertendo quella in notturn aspetto, e far le corrusioni o venti con spavètlevoli toni e folgori scorretti infra le tenebre, e con ipetuosi venti ruinare together, a spirit may take bodies of various forms and by this means speak and move with strength—to him I reply that when there are neither nerves nor bones there can be no force exercised in any kind of movement made by such imaginary spirits.

Beware of the teaching of these specu lators, because their reasoning is not confirmed by experience.

1213. Of all human opinions that is to be reputed the most foolish which deals with the belief in Necromancy, the sister of Alchemy, which gives birth to simple and natural things. But it is all the more worthy of reprehension than alchemy, because it brings forth nothing but what is like itself, that is, lies; this does not happen in Alchemy which deals with simple products of nature and whose function cannot be exercised by nature itself, because it has no organic instruments with which it can work, as men do by means of their hands, who have produced, for instance, glass &c. but this Necromancy the flag and flying banner, blown by the winds, is the guide of the stupid crowd which is constantly witness to the dazzling and endless effects of this art; and there are books full, declaring that enchantments and spirits can work and speak without tongues and without organic instruments — without which it is impossible to speak — and can carry heaviest weights and raise storms and rain; and that men can be turned into cats and wolves and other beasts, although indeed it is those who affirm these things who first became beasts.

And surely if this Necromancy did exist, as is believed by small wits, there is nothing on the earth that would be of so much importance alike for the detriment and service of men, if it were true that there were in such an art a power to disturb the calm serenity of the air, converting it into darkness and making corrusioni or winds, with terrific thunder and lightnings rushing through the darkness, and with violent
Polemics.

Delli spiriti.

2 Abiàno insin qui diretto a questa faccia detto, come la definitio dello spirito è una potestà congiunta al corpo, perché se storms overthrowing high buildings and rooting up forests; and thus to oppose armies, crushing and annihilating them; and, besides these frightful storms may deprive the peasants of the reward of their labours. — Now what kind of warfare is there to hurt the enemy so much as to deprive him of the harvest? What naval warfare could be compared with this? I say, the man who has power to command the winds and to make ruinous gales by which any fleet may be submerged,—surely a man who could command such violent forces would be lord of the nations, and no human ingenuity could resist his crushing force. The hidden treasures and gems reposing in the body of the earth would all be made manifest to him. No lock nor fortress, though impregnable, would be able to save any one against the will of the necromancer. He would have himself carried through the air from East to West and through all the opposite sides of the universe. But why should I enlarge further upon this? What is there that could not be done by such a craftsman? Almost nothing, except to escape death. Hereby I have explained in part the mischief and the usefulness, contained in this art, if it is real; and if it is real why has it not remained among men who desire it so much, having nothing to do with any deity? For I know that there are numberless people who would, to satisfy a whim, destroy God and all the universe; and if this necromancy, being, as it were, so necessary to men, has not been left among them, it can never have existed, nor will it ever exist according to the definition of the spirit, which is invisible in substance; for within the elements there are no incorporeal things, because where there is no body, there is a vacuum; and no vacuum can exist in the elements because it would be immediately filled up. Turn over.

W. An. II. 242 a]

1214.

Of spirits.

We have said, on the other side of this page, that the definition of a spirit is a power conjoined to a body; because it cannot

\[\text{22 lì alti edifici, e diradicare le selue, e con quelle percuotere li eserciti, e quelli ron-pèdo e atterrando, e oltr'a questo le dannose tenpest, privando li cultori del premio delle lor fatiche, — o qual modo di guerra può essere, che con tanto dan no possa offendere il suo nemico di aver potestà di privarlo delle sue raccolte? qual bae taglia marittima può essere che si assomigli a quella? dico lui che comanda alli vèti e fa le fortunate ruvinose e sommergitrici di qual unche armata, — cierto quel che co màda a tali inpetuosi potetie sarà signore delle popoli, e nessuno vma ingiennio potrà resistere alle sue dannose forze; Li occulti tesori e gie mene, riposte nel corpo della terra, fierno a costui tutti manifesti; nessun serrame o fortezza inespugnabili sarà quelle che salvar possino al cuno senza la voglia di tal negromate; Questo si farà portare per l'aria dall'oriente all'occidente e per tutti li oppositi aspetti dell'universo; Ma perchè mi voglio più oltre estendere quale che è quella cosa che per ta le artefici far nò si possa? quasi nessuna, eccetto il levarsi la morte; ad diunque è concluso in parte il danno e la utilità che in tale arte si contene, essè do vera; e s'ella è vera, perché non è restata infra li omini che tanto la desiderano, non avèdo riguardo a nessuna deità? e so, che infiniti c'è che, per soddisfare a vn suo appetito, rine rebbero l'ido cò tutto l'universo; e s'ella non è rimasta infra li omini, essendo a lui tanto necessaria, essa nò fu mai, nè mai è per dovere essere, per la definitio dello spirito, il quale è invisibile in corpo; e dentro alli elementi non sono cose incor poree, perché dove non è corpo, è vacuo, e il vacuo nò si da d'estro alli omini, perché subito sarebbe dall'elemento riempito; volta carta.}

\[\text{2 Abiàno insin qui diretto a questa faccia detto, come la definitio dello spirito è una potestà congiunta al corpo, perché per se}

\[\text{dichiarle le piante "selue" e chon. perchoteri, eccelli. 23. otridiquesto... tenpesse... chioti. 23. guerra po... chon. 25. nemicho aver potessa... richolte... bs. 26. po... chessi... acquella dicho... chomada. 27. effa... essomerigrici. 28. chomada atuli. 29. resistere... ocholi. 30. giene... chorpo... achosata... nessu. 31. fortezza [chef] inespugnabili... chesalvar. 32. chuno. 33. Boriente... opolii aperesii. 34. vi maio più oltre assestando... chosa che pera. 36. choncluso "di parte" li ella... chonici. 37. sessa... non e restata infrafill... chetta deside. 38. essol che infiniel ciene... sadiisfare. 39. ruinebbero... chô... essella. 40. allu tanta (?)... mai nemmai. 41. chorpo. 42. none chose incorporee... chorpo e vacuo... vacuo.}

\[\text{1214. acquessa... decto. 3. chome... spirito [e vn onome nich]. 4. chongiunta. 5. alchuna... lochale. 6. essetu... reggiba}

\[\text{VOl. II.}]

\[\text{Q Q} \]
Se lo spirito tiene corpo infrà li 20 elementi.

30 Abbài provato, come lo spirito non può per se stare infrà 35 elementi senza corpo, né per se si può mouere per moto volontario, se non è allo in sù; Ma al presente diremo coèsmec, pighiando corpo d'aria tale spirito, è neciesùario che s'inonda infra essa aria, perché, s'elli stesse nunto, 35 e sarebbe separato e caderebbe alla generatiò d'aria; e 36 come di sopra è detto; addunque è necessario che, a volere 37 restare infra l'aria, che esso s'inonda in una qualità d'aria; e 38 se si mista coll'aria, ells seguita due inconvenienti, cioè 39 che elli leuifica quella qualità del'aria dove esso si mista, e 40 per la qual cosa l'aria leuificata per se uola in alto, move of its own accord, nor can it have any kind of motion in space; and if you were to say that it moves itself, this cannot be within the elements. For, if the spirit is an incorporeal quantity, this quantity is called a vacuum, and a vacuum does not exist in nature; and granting that one was formed, it would be immediately filled up by the rushing in of the element in which the vacuum had been generated. Therefore, from the definition of weight, which is this—Gravity is an accidental power, created by one element being drawn to or suspended in another—it follows that an element, not weighing anything compared with itself, has weight in the element above it and lighter than it; as we see that the parts of water have no gravity or levity compared with other water, but if you draw it up into the air, then it would acquire weight, and if you were to draw the air beneath the water then the water which remains above this air would acquire weight, which weight could not sustain itself by itself, whence collapse is inevitable. And this happens in water; wherever the vacuum may be in this water it will fall in; and this would happen with a spirit amid the elements, where it would continuously generate a vacuum in whatever element it might find itself, whence it would be inevitable that it should be constantly flying towards the sky until it had quitted these elements.

As to whether a spirit has a body amid the elements.

We have proved that a spirit cannot exist of itself amid the elements without a body, nor can it move of itself by voluntary motion unless it be to rise upwards. But now we will say how such a spirit taking an aerial body would be inevitably melted into air; because if it remained united, it would be separated and fall to form a vacuum, as is said above; therefore it is inevitable, if it is to be able to remain suspended in the air, that it should absorb a certain quantity of air; and if it were mingled with the air, two difficulties arise; that is to say: It must rarely that portion of the air with which it mingles; and for this cause the rarefied air must fly up of itself and will not
e non resta 41 infra l'aria più grossa di lei; e oltre a questo tal virtù 42 spirituali sparsa si disunisce e altera sua natura, per la qual 43 cosa esso maca della prima virtù; aggiungesi vn 3° incò 4 veniente, e questo è, che tal corpo d'aria, preso dallo spirito, è 44 sottoposto alla penetratio de' venti, li quali al continuo disi 46 niscono e stracciano le parti vnite dell'aria, quelle rivolgiendo e raggirando infra l'altra aria; adunque lo spirito, in tale

remain among the air that is heavier than itself; and besides this the subtle spiritual essence disunites itself, and its nature is modified, by which that nature loses some of its first virtue. Added to these there is a third difficulty, and this is that such a body formed of air assumed by the spirits is exposed to the penetrating winds, which are incessantly surging and dispersing the united portions of the air, revolving and whirling amidst the rest of the atmosphere; therefore the spirit which is infused in this

aria infuso, sarebbe smebrato overo sbranato e rotto insieme collo sbranameto dell'aria, nella qual s'infuse.

SE LO SPIRITO, AVÉDO PRESO CORPO 4 D'ARIA, SI PUÒ PER SE MOVERE O NO.

5 impossibile è che lo spirito, infuso a una qualità d'aria, possa movere essa aria; e questo si manifesta per la passata dove dice 1 lo spirito leucifica quella qualità dell'aria, 8 nella quale esso s'infonde; adunque tale aria 9 si levera in alto sopra l'altra aria, e sarà moto fatto dall'aria per la sua leuità e nò per moto volontario dello spirito, e sì se tale aria si scontra nel ueto per la 3ª di questo, essa 12 aria sarà mossa dal ueto e nò dallo spirito in lei infuso.

SE LO SPIRITO PUÒ PARLARE O NO.

14 Volendo mostrare, se lo spirito può parlare o no, è necies 45 sario in prima definire che cosa e uoce, e come si gienet 46 ra; e diremo in questo modo: la vocie è movimentato d'aria conficcato in corpo denso, e l'altro corpo 18 conficcato nell'aria che è il medesimo, la qual cò 49 ricazione di denso con raro condensa il raro e fatti resis 45 tetà, e ancora il uelocio raro nel tardo raro si condensa 22 no l'uno e l'altro ne contatti, e fanno suono e grandissimo strappito; è il suono ovvero murmorio fatto dal raro 53 che si move nel raro có medi-

air would be dismembered or rent and broken up with the rending of the air into which it was incorporated.

AS TO WHETHER THE SPIRIT, HAVING TAKEN THIS BODY OF AIR, CAN MOVE OF ITSELF OR NOT.

It is impossible that the spirit infused into a certain quantity of air, should move this air; and this is proved by the above passage where it is said: the spirit rarefies that portion of the air in which it incorporates itself; therefore this air will rise high above the other air and there will be a motion of the air caused by its lightness and not by a voluntary movement of the spirit, and if this air is encountered by the wind, according to the 3rd of this, the air will be moved by the wind and not by the spirit incorporated in it.

AS TO WHETHER THE SPIRIT CAN SPEAK OR NOT.

In order to prove whether the spirit can speak or not, it is necessary in the first place to define what a voice is and how it is generated; and we will say that the voice is, as it were, the movement of air in friction against a dense body, or a dense body in friction against the air,—which is the same thing. And this friction of the dense and the rare condenses the rare and causes resistance; again, the rare, when in swift motion, and the rare in slow motion condense each other when they come in contact and make a noise and very great uproar;

43. chosa...macha...agnugesci. 44. ecuesto he chetat. 45. sottoposto...venenat.0...chostiuo. 46. gisscano essascianno le parte. 47. ragriando infrallaltra...osspirito in tale 7.

1215. 1. issmebrato...sbranato et. 2. chollashbranameito. 3. sello...aveto...chorpo...po pfr...omo. 5. impossibile che chello. 6. ecuesto. 7. losspirito leuificha. 9. essara. 11. essetale...questo. 13. sello spirito po...omo. 14. mustrare sello. 15. chosa...chome. 16. questo modo. 17. confrigata in chorpo...chorpo. 18. confrigato...19. freghato...chon...chodensa...effasi. 20. ated e anchora. 21. ellatro...chostnti effanno sono. 22. sono ovér...facto...raro [nel ra]. 23. [ro] chessi...chò...chome. 24. fima...soni infrallaria. 25. raro có raro ecuando.
Ogni qualità continua intellettualmente è divisibile in infinito;

1[Infra le] grandezze - delle - cose - che sono infra noi - l'essere - del nulla tiene - il principio - e la sua - 2[causa] - de' suoi - effetti - e' interposta - infra - le - cose - che non è - l'essere - , e la sua -

and the sound or murmur made by the rare moving through the rare with only moderate swiftness, like a great flame generating noises in the air; and the tremendous uproar made by the rare mingling with the rare, and when that air which is both swift and rare rushes into that which is itself rare and in motion, it is like the flame of fire which issues from a big gun and striking against the air; and again when a flame issues from the cloud, there is a concussion in the air as the bolt is generated. Therefore we may say that the spirit cannot produce a voice without movement of the air, and air in it there is none, nor can it emit what it has not; and if desires to move that air in which it is incorporated, it is necessary that the spirit should multiply itself, and that cannot multiply which has no quantity. And in the 4th place it is said that no rare body can move, if it has not a stable spot, whence it may take its motion; much more is it so when an element has to move within its own element, which does not move of itself, excepting by uniform evaporation at the centre of the thing evaporated; as occurs in a sponge squeezed in the hand held under water; the water escapes in every direction with equal movement through the openings between the fingers of the hand in which it is squeezed.

As to whether the spirit has an articulate voice, and whether the spirit can be heard, and what hearing is, and seeing; the wave of the voice passes through the air as the images of objects pass to the eye.

1216. Compare No. 916.
6 essentia · risiede · apresso · del tempo · infra 'l preterito e 'l futuro, e nulla possiede del presente; Questo nulla 8 à la sua · parte equale · al tutto · e 'l tutto · alla parte · e 'l divisibile · allo indissolubile ·; e tal somma · produce nella 10 sua partizione come nella multiplicatione, 11 e nel suo sommare · quanto nel sottrare, come si dimostra 12 apresso degli aritmetici dello suo 10° carattere che rap'13 presenta esso nvillo; E la podestà sua non si stende infra 14 le cose di natura.] 15[Quello che è · detto · niente · si ritrova solo nel tempo · e nelle 16 parole · nel tempo si trova · infra 'l preterito e 'l futuro, 17 e nulla ritiene del presente · e così infra le parole delle co'18 se che si dicono · che non sono o che sono impossibili.] 19 Apresso · del tempo e' nulla · risiede infra 'l preterito e 'l futuro, 20 e niente possiede del presente · e apresso di natura e' s'ae'21 compagna infra le cose impossibili · onde per quel ch'è 22 detto · e' non a l' essere; 23 Imperocché doue fusse 24 il nvilla, sarebbe dato l' uacuo.

ESEMPIO DELLA SAETTA FRA NUVOLI.

25[O potente e già animato' strumento dell'artificiosa natura, 26 te nò valèdeo le tue grà forze ti còuiene abbadonare la tràquilula vita e obbedire alla legie, 27 che Iddìo e 'l tèpo diede a la gienitrec natura.] 28 O quàte volte furono vedute le ipavrite schiere 29 de' delfini e de' grà tomni fugire dal inpià tua furia, 30 e tu, che... 31 fulminando gienerasi nel mare subita tèpesta con grà busse e sommersione di navili co grà'32 de' odamèto, èpièdeo gli scoperti liti degli ipavriti e sbigo'33 tìti pesci, toglièndosi à te per lasciato mare rimasi in loco divenivan supercheria e 34 abbondante preda de' vicini popoli; sottrare. 12. aritmetici della sua 10° caratta che re. 13. Ella ... nòstistende. 15. Quello che'che. 16. preterito hel. 17. infralle. 18. chesi dicono ... chesonno impossibile. 20. possiede ... apresso. 21. infralle ... impossibile. 23. fusii.

1217. 1. essèplo ... nuvoll. 2. chòuene 'abandonare la tràquilula vita' obbedire. 3. chel che ... die. 4. natura a tette nò uale. 5. [[[ ]] haggifghi arbì schiène cholle qualti tu seguìfsàdò la tuaj. 6. [pieda aprìvà sól chavi 'vonvetre" aprendo chò 9 pes]. 8. dallini ... tua 'tua' furia e echupare. 9. etu che chol veloce tramne laie cholla forci eluì choda. 10. funminando gienera ne... chè ... somersione ... chè ... scoperè ... eslaghò ... pesel ... atte ... loccho ... diveni... supercheria (0). 13. bedante píeda. 14. o tèpo chonsumatore delle chose ątere volgèdole. 15. da ite] alle strate
O tepo, velocie predatore delle create cose, quanti rò, quanti popoli aì tu disfatti, e quìte mutationi di stati e vari casi sono seguite dopo che la mara vigiliosa forma di questo pesce qui morì per le caverne e ritorte interiora; ora disfatto dal tepo patiète giacci i questo chiuso loco; colle spolpate e ignive ossa àì fatto armadura e sostegno al sopra posto mòte.

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O time, swift robber of all created things, how many kings, how many nations hast thou undone, and how many changes of states and of various events have happened since the wondrous forms of this fish perished here in this cavernous and winding recess. Now destroyed by time thou liest patiently in this confined space with bones stripped and bare; serving as a support and prop for the superimposed mountain.
del creare e fare cötin'ue vite e forme, per-
ché cogni'oscie che sono accresciméto della
sua terrestre matería, 6 è volonterosa e piv
presta col suo creare che 'l tepo col cò-
sumare; e però à ordinato che molti ani-
uali sieno cibo l'uno dell'altro; e nò sos-
disfaciédo questo a simile desiderio, e' spesso
9 mada fuor cierti avelenati e pestiléti
vapori sopra le grà mpli'cázioni e có-
gregazioni d'animali, e massime sopra gli
omini, che fanno 11'gáde accrescimento, per-
ché altri animali 12 nò si cibano di loro, e
tolte via le cagioni màcherànno li effetti;
13 adunque questa terra cerca di măcare di
sua vita, desiderá 14 la contínua mpli-
i cazione; per la tua assegniata e demon-
strata 15 ragione spesso li effetti sommigliano
le loro cagioni; gli animali so'96 no esélo
della vita modiale.

piv vite sopra la terra che perche. 5. o'scie chesono accrescimento. 6. prestas chol.. chol chò. 8. sosdisfaciéd o quasato
assimile.. esspresso. 9. vapori "e pestiléite chonta va pessta" sopra. 10. chazioni e chò gregazioni .. famo. 11. accres-
15. somigliano .. chazioni. 16. delu.
Humorous Writings.

Just as Michaelangelo’s occasional poems reflect his private life as well as the general disposition of his mind, we may find in the writings collected in this section, the transcript of Leonardo’s fanciful nature, and we should probably not be far wrong in assuming, that he himself had recited these fables in the company of his friends or at the court festivals of princes and patrons. Era tanto piacevole nella conversazione — so relates Vasari — che tirava a sé gli animi delle genti. And Paulus Fovius says in his short biography of the artist: Fuit ingenio valde comi, nitido, liberali, vultu autem longe venustissimo, et cum elegantiae omnis deliciarumque maxime theatralium mirificus inventor ac arbiter esset, ad lyramque scito caneret, cunctis per omnem ac tum principibus mire placuit. There can be no doubt that the fables are the original offspring of Leonardo’s brain, and not borrowed from any foreign source; indeed the schemes and plans for the composition of fables collected in division V seem to afford an external proof of this, if the fables themselves did not render it self-evident. Several of them—for instance No. 1279—are so strikingly characteristic of Leonardo’s views of natural science that we cannot do them justice till we are acquainted with his theories on such subjects; and this is equally true of the ‘Prophecies’.

I have prefixed to these quaint writings the ‘Studies on the life and habits of animals’ which are singular from their peculiar aphoristic style, and I have transcribed them in exactly the order in which they are written in MS. H. This is one of the very rare instances in which one subject is treated in a consecutive series of notes, all in one MS., and Leonardo has also departed from his ordinary habits, by occasionally not completing the text on the page it is begun. These brief notes of a somewhat mysterious bearing have been placed here, simply because they may possibly have been intended to serve as hints for fables or allegories. They can scarcely be regarded as preparatory for a natural history; rather they would seem to be extracts. On the one hand the names
of some of the animals seem to prove that Leonardo could not here be recording observations of his own; on the other hand the notes on their habits and life appear to me to dwell precisely on what must have interested him most—so far as it is possible to form any complete estimate of his nature and tastes.

In No. 1293 lines 1—10, we have a sketch of a scheme for grouping the Prophecies. I have not however availed myself of it as a clue to their arrangement here because, in the first place, the texts are not so numerous as to render the suggested classification useful to the reader, and, also, because in reading the long series, as they occur in the original, we may follow the author's mind; and here and there it is not difficult to see how one theme suggested another. I have however regarded Leonardo's scheme for the classification of the Prophecies as available for that of the Fables and Fests, and have adhered to it as far as possible.

Among the humorous writings I might perhaps have included the ‘Rebusses’, of which there are several in the collection of Leonardo's drawings at Windsor; it seems to me not likely that many or all of them could be solved at the present day and the MSS. throw no light on them. Nor should I be justified if I intended to include in the literary works the well-known caricatures of human faces attributed to Leonardo—of which, however, it may be incidentally observed, the greater number are in my opinion undoubtedly spurious. Two only have necessarily been given owing to their presence in text, which it was desired to reproduce: Vol. I page 326, and Pl. CXXII. It can scarcely be doubted that some satirical intention is conveyed by the drawing on Pl. LXIV (text No. 688).

My reason for not presenting Leonardo to the reader as a poet is the fact that the maxims and morals in verse which have been ascribed to him, are not to be found in the manuscripts, and Prof. Uzielli has already proved that they cannot be by him. Hence it would seem that only a few short verses can be attributed to him with any certainty.
STUDIES ON THE LIFE AND HABITS OF ANIMALS.

II. 561

**Amore di uirtù.**

8 Cardellino è uno uccello il quale si dice che, essendo esso portato di nanzi a un infermo che, se il detto infermo deve morire, questo uccello lì volta la testa per lo còtrario e mai lo riguarda, e se esso infermo deve scampare, questo uccello mai l’abandona di uista, anzi è causa di leuarli ogni malattia; e similmente è l’amore di uirtù; nó guarì da mai cosa vile, né trista; anzi di mora sempre in cose oneste e virtuosìse, e rimpianta in cor gioitile a si similitudine degli uccielli nelle uerdi selue sopra i fioriti rami; e si dimostra piv esso amore nelle auersità che nelle prosperità, faciédo come il lume che piv risplède dove trova piv tenebroso sito.

II. 564

**Invidia.**

2 Del nibbio si leggie, che quand’esso uede i sia figlioli nel nido esser di troppa grassezza, che per invidia egli becca loro le coste e tiégli sanza màgiare.

II. 1220.

**The Love of Virtue.**

The gold-finch is a bird of which it is related that, when it is carried into the presence of a sick person, if the sick man is going to die, the bird turns away its head and never looks at him; but if the sick man is to be saved the bird never loses sight of him but is the cause of curing him of all his sickness.

Like unto this is the love of virtue. It never looks at any vile or base thing, but rather clings always to pure and virtuous things and takes up its abode in a noble heart; as the birds do in green woods on flowery branches. And this Love shows itself more in adversity than in prosperity; as light does, which shines most where the place is darkest.

II. 1221.

**Envv.**

We read of the kite that, when it sees its young ones growing too big in the nest, out of envy it pecks their sides, and keeps them without food.
HUMOROUS WRITINGS.

ALLEGREZZA.

?L'allegrezza è appropriata al gallo, che d'ogni piccola cosa si rallegra e canta con varie scherzeti movimenti.

TRISTEZZA.

11 La tristezza s’assomiglia al corbo, il quale, quand’è uede i suoi nati figlioli esser bia chi, che per lo gráde dolore si parte co tristo rammarichio, gli abadona e nò gli pasce. 15 isino che non gli vede alquate poche è nere.

PACE.

2 Del castoro si legge che, quand’è perseguitato, conoscecido essere per la virtù de’ suoi medicinali testiculi, esso nò postèdo pìg fuggire, si ferma, e per auere pace coi cacciatori coi suoi taglieti detti si spicca i testiculi e li lascia a sua nimici.

IRA.

10 Dell’orso si dice che, quand’è va alle case, delle api per torre loro il mele, esse api cominciando a pugierlo, che lui lascia il mele e corre alla vendetta, e vole dosi có tutte quelle che lo mordono ve dicare, có nessuna si uedica, in modo che la sua ira si cóuerte in rabbia, e gittatosi 17 in terra colle mani e coi piedi inaspràdo indarno da quelle si difende.

GRATITUDINE.

2 La virtù della gratitudine si dice essere piv nelli uccielli detti upupa, i quali, conoscicido il beneficio della ricievuta vita e nvtrimético dal padre e dalla lor madre, quand’è uedo no vechi fanno loro vno uido e li covano e li nutriscono, e cavà loro col becco le vecchie e triste penne, e 10 có cierbe erbe li rèdano la uista, 15 in modo che ritornano in prospértà.

CHEERFULNESS.

Cheerfulness is proper to the cock, which rejoices over every little thing, and crows with varied and lively movements.

SADNESS.

Sadness resembles the raven, which, when it sees its young ones born white, departs in great grief, and abandons them with doleful laments, and does not feed them until it sees in them some few black feathers.

PEACE.

We read of the beaver that when it is pursued, knowing that it is for the virtue [contained] in its medicinal testicles and not being able to escape, it stops; and to be at peace with its pursuers, it bites off its testicles with its sharp teeth, and leaves them to its enemies.

RAGE.

It is said of the bear that when it goes to the haunts of bees to take their honey, the bees having begun to sting him he leaves the honey and rushes to revenge himself. And as he seeks to be revenged on all those that sting him, he is revenged on none; in such wise that his rage is turned to sadness, and he fings himself on the ground, vainly exasperating, by his hands and feet, the foes against which he is defending himself.

GRATITUDE.

The virtue of gratitude is said to be more [developed] in the birds called hoopoes which, knowing the benefits of life and food, they have received from their father and their mother, when they see them grow old, make a nest for them and brood over them and feed them, and with their beaks pull out their old and shabby feathers; and then, with a certain herb restore their sight so that they return to a prosperous state.

8. pichola chesa . . . ecc. 9. colüri essercrzati. 10. tristeza. 11. tristeza sasomiglia al corb. 14. rammar. 15. nógli . . . puc. 1222. 3. le. 3. còossicidé. 5. fogere. 7. sispicha . . . eii lasscia assua. 11. ave. 12. ave lo coñisciato a pügierë o di lui lasci. 13. cor. 14. chello moridano. 15. imodo chella. 17. tero chelle mani eco . . . inispi. 18. dacquel. 1223. 1. [pascicrida] over graditudine. 3. detti spèca. 4. conoscicido . . . nvtrimético. 6. ueda. 7. fano . . . eii. 8. eii nextriscano. 9. bucho . . . triste. 10. chë . . . rèdano. 11. imodo. 13. rosso si passie . . . essenpe.
THE LIFE AND HABITS OF ANIMALS.

AVARITIA.

13 Il rospo si pascie di terra e sempre sta macro, perché non si satia; tanto è il timore che essa terra no li manchi.

AVARICE.

The toad feeds on earth and always remains lean; because it never eats enough;—it is so afraid lest it should want for earth.

INGRATITUDINE.

2 I coloroni sono assimigliati alla ingratitude, inperocchè quando sono in età che non abbino piov bisognio d'essere cibati, cominciano a 6 colbattere col padre; e no finisce 7 essa pugnia insino a tato che 8 caccia il padre e togli la moglie 9 facendo la sua.

INGRATITUDE.

Pigeons are a symbol of ingratitude; for when they are old enough no longer to need to be fed, they begin to fight with their father, and this struggle does not end until the young one drives the father out and takes the hen and makes her his own.

CRUELITÀ.

11 Il basilisco è di tanta crudeltà che, quando colla sua venenosa vista no può occidere li animali, si volta all'erbe 14 e le piante, e fermadi in quelle la sua 15 vista le fa seccare.

CRUELTY.

The basilisk is so utterly cruel that when it cannot kill animals by its baleful gaze, it turns upon herbs and plants, and fixing its gaze on them withers them up.

LIBERALITÀ.

2 Dell'aquila si dice che non à mai si grà 3 fame-, che non lasci parte della sua 4 preda a quelli vecchegli che gli son 5 d'intorno, i quali, no potèdosi per se 6 pasciere, è necessario che sieno cor pregigatori d'essa aquila, perchè in tal modo si cibano.

LIBERALITY.

It is said of the eagle that it is never so hungry but that it will leave a part of its prey for the birds that are round it, which, being unable to provide their own food, are necessarily dependent on the eagle, since it is thus that they obtain food.

CORRITTONE.

10 Quando il lupo va ascentito intorno a qualche stallo di bestiame, e che per caso 12 oscia pogo il piede in fallo in modo facci 13 strepito, egli si morde il pié per correggere se da tale errore.

DISCIPLINE.

When the wolf goes cunningly round some stable of cattle, and by accident puts his foot in a trap, so that he makes a noise, he bites his foot off to punish himself for his folly.

LUSINGHE OVER SIRENE.

2 La sirena si dolcemètè cätè che adormèta i marinari, e essa 5 mòta sopra i navi e occide li aadormètati marinari.

FLATTERERS OR SYRENS.

The syren sings so sweetly that she lulls the mariners to sleep; then she climbs upon the ships and kills the sleeping mariners.
HUMOROUS WRITINGS. [1227. 1228.]

Prudentia.

La formica per naturale còsiglio provide la state per lo uerno, uccidéndo le racolte semèze, perché nó rié nasceso, e di quelle al tempo si pascono.

Pazzia.

Il bo salvatico avedo in odio il color rosso, i cacciatori vestono di rosso il pedale d'una piata, e esso bo corre a quella e co gran furia v'inchioda le cortine, onde i cacciatori l'uccidono.

Giustitia.

E' si può assimigliare la uirtù della giustitia allo rè delle api, il quale ordiné e dispone ogni cosa co ragione, impero ch'è alcune api sono ordinate andare per fiori, altre ordinate a lavorare, altre a coltivare le olle vespe, altre a leuare le sporcite, altre a accopagnare e corteggiare il loro rè; e quai dò è vecchio e sàza ali, esse lo portano, e se ui vna maca di suo offtio, sàza alcuna remissione è punita.

Veritá.

Benchè le pernici rubino l'ova all'al'tra, nòdimeno i figlioli natì d'esse ova senpre ritornano alla lor uera madre.

Fidelità over lealtà.

Le grù son tanto fedeli e leali al loro rè chè la notte, quado lui dorme, alcune vîño dintorno al prato per guardare da lògga; altre ne stanno dapresso e tengono vno sasso ciascuna in piè, che se l'ì son'no le uncesse, essa pietra caderebbe e fa'rebbe tal romore, ch'essi ridestarébbero; e a altre vi sono che insieme intorno al rè dor'mono, e ciò fanno ogni notte scabïadosi, acciò chè loro rè nò uogliono macare.

Prudenza.

The ant, by her natural foresight provides in the summer for the winter, killing the seeds she harvests that they may not germinate, and on them, in due time she feeds.

Folly.

The wild bull having a horror of a red colour, the hunters dress up the trunk of a tree with red and the bull runs at this with great frenzy, thus fixing his horns, and forthwith the hunters kill him there.

JUSTICE.

We may liken the virtue of Justice to the king of the bees which orders and arranges every thing with judgment. For some bees are ordered to go to the flowers, others are ordered to labour, others to fight with the wasps, others to clear away all dirt, others to accompany and escort the king; and when he is old and has no wings they carry him. And if one of them falls in his duty, he is punished without reprieve.

Truth.

Although partridges steal each other's eggs, nevertheless the young born of these eggs always return to their true mother.

FIDELITY, OR LOYALTY.

The cranes are so faithful and loyal to their king, that at night, when he is sleeping, some of them go round the field to keep watch at a distance; others remain near, each holding a stone in his foot, so that if sleep should overcome them, this stone would fall and make such noise that they would wake up again. And there are others which sleep together round the king; and this they do every night, changing in turn so that their king may never find them wanting.

1227. deligni. 3. ave. 4. chosa . ipero. 5. alcuna ave. 6. almon. 7. chilbotere cholle vespe. 8. sporcitia. 9. accopagnare e corteggiare lovee. 10. es-sàza. 11. esse . màcha. 14. benchelle.

1228. 5. alta. 2. allorer. 5. chells. 5. etseguano. 6. sasso [per] ciascuna . chesselsa. 7. vincessi . chalerde effa. 8. rebe . ridesterebbero. 9. chimione . are. 10. mano . fano. 11. acio chilorore nò ègli à màchare. 13. torma disega.

16. ieccaditori beccidano.
La volpe quando vede alcuna torre di uccelli, subito si gitta in tera in modo colla bocca aperta che par morta, e essi uccelli le uogliono beccare la lingua, e essa gli piglia la testa.

La talpa è li ochi molto piccoli, e sempre sta sotto terra e tanto vive, quanto essa sta occulto, e come viene alla luce subito more perchè si fa nota; così la bugia.

Il lione mai teme, anzi có forte animo pugna có fiera battaglia contro la mol'titudine de' cacciatori, sempre cercado offendere il primo che l'offese.

La lepre sempre teme, e le foglie che cadono dalle piante per autunno sempre la tengono in timore, e l'imp delle volte in fuga.

Il falcone nò preda mai, se non uccelli grossi, e prima si lascierebbe morire che si cibasse de' piccoli, o che mangiasse carne fetida.

In questo vitio si legge del pavone esserli più che altro animale sottoprosto, perchè sempre contempla in nella bellezza della sua coda, quella allargato in fortuna di rota e col suo grido trae a se la uista de' circustàti animali;

E questo è l'ultimo vitio che si possa vincere.

The fox when it sees a flock of herons or magpies or birds of that kind, suddenly slings himself on the ground with his mouth open to look as he were dead; and these birds want to peck at his tongue, and he bites off their heads.

The mole has very small eyes and it always lives under ground; and it lives as long as it is in the dark but when it comes into the light it dies immediately, because it becomes known;—and so it is with lies.

The lion is never afraid, but rather fights with a bold spirit and savage onslaught against a multitude of hunters, always seeking to injure the first that injures him.

The hare is always frightened; and the leaves that fall from the trees in autumn always keep him in terror and generally put him to flight.

The falcon never preys but on large birds; and it will let itself die rather than feed on little ones, or eat stinking meat.

As regards this vice, we read that the peacock is more guilty of it than any other animal. For it is always contemplating the beauty of its tail, which it spreads in the form of a wheel, and by its cries attracts to itself the gaze of the creatures that surround it.

And this is the last vice to be conquered.
Constantia.

2. Alla costantia s'assimiglia la fenice, la quale intédendo per natura la sua renovazione, è costante a sostenere le cuo- centi s'flammne le quali la cosuman, e poi di novo rinasce.

Incostantia.

8. Il rondone si mette per la incostantia, il quale sempre sta in moto per no sopporta'are alcuno minimo disagio.

Téperanza.

12. Il camello è il piv. lussurioso animale che sia, e andrebbe mille miglia diritto a vna camella, e se vsasse cotinvo co la madre o so'role, mai le tocca; tató si sa be téperare.

Intéperanza.

2. Il liocorno overo unicorno per la sua intéperanza e no saperi uiciere per lo di- letto che à delle donzelle dimetica la sua ferocità e salutichesse; ponendo da cato ogni sospetto va alla sedente donzella e se le adormèta in grebo, e i cacciatori in tal modo lo pigliano.

VMilità.

10. Dell'umilità si uede somma sperietia nello agnello, il quale si sottomette a ogni animale; e quado per cibo son dati ai incarcereati leoni, a quelli si sottomettono come alla propria madre, in modo che spesse volte si è visto i lioni non li volere occidere.

Superbia.

2. Il falconé per la sua alterigia e super- bia vole signoriereggiare e soprafare tutti li altri pecioli che sono di rapina, e sempre desidera essere solo, e spesse volte si è veduto il falcone assaltare l'aquila, regina dell'eccioli.
Astinencia.

9 Il salutatico asino quâdo va alla 10fonte per bere e trova l'acqua intorbidata, non avrà mai si grâ sete, che no 11s'astèga di bere, e aspetti ch'essa acqua 12si richiari.

Gola.

15 Il vulture è tanto sottoposto alla gola che andrebbe mille miglia per mangiare d'una carogna, e per questo seguita li escercit.

Abstinence.

The wild ass, when it goes to the well to drink, and finds the water troubled, is never so thirsty but that it will abstain from drinking, and wait till the water is clear again.

Gluttony.

The vulture is so addicted to gluttony that it will go a thousand miles to eat a carrion [carcase]; therefore is it that it follows armies.

Casità.

2 La tortora no fa mai fallo al suo co-pagnio, 3 e se l'uno morce, l'altro osserva perpetua ca'sità e non si posa mai su ramo verde e no 5beue mai acqua chiara.

Chastity.

The turtle-dove is never false to its mate; and if one dies the other preserves perpetual chastity, and never again sits on a green bough, nor ever again drinks of clear water.

Lussuria.

7 Il pipistrello per la sua sfrenata lussuria no osserva alcuno universale modo di lussuria, anzi maschio có maschio, 10fe-mina có femina, siccome a caso si trovano insieme, vsano il lor coito.

Unchastity.

The bat, owing to unbridled lust, observes no universal rule in pairing, but males with males and females with females pair promiscuously, as it may happen.

Moderanza.

13 L'ermellino per la sua moderàtia nò màgìa 14 se non vna sola volta il di, e prima si lascia piâtghire dae cacciatori che volere fugire 18 nella infangata tana, 17 per nó maculare la sua giëtella.

Moderation.

The ermine out of moderation never eats but once in the day; it will rather let itself be taken by the hunters than take refuge in a dirty lair, in order not to stain its purity.

Aquila.

8 L'aquila, quâdo è vechia, vola tâto 3 in alto, che abbruccia le sue penne, e nâtura cosente che si rinou in giovetù, 2 cadendo nella poca acqua;

6 È se i sua nati nò possono tenere la uista nel sole;— nò li pasce di nessuno uccello, 8 che nó vole morire; non s'accostano trouova. 11 non ara . sede. 12 aspetti . acqua. 13. siriscirà. 15. la volture ettranto sotto posto. 16. andrebbero mile miglia [all] per. 17. per que seguita.

1234. 1. cassita. 3. esseltuno. 4. enou. 7. palpisistrello . . isfrenata. 9. masscio có maschio. 10. siccome achaso. 14. sevna . . lassela. 15. giare a cadorari. 17. giëtella.

1235. 3. abruccia . pene. 4. chesai. 5. cadè nella poca acqua. 6. ese . . nò posso tenere. 7. pasce nessuno viel . . morire

1235. 5. 6. The meaning is obscure.

Vol. II.

SS
al suo nido gli animali che forte la tema no, ma essa a lor no noce, senpre lascia ri- manete della sua preda.

**LUMERPA,—FAMA.**

12 Questa nascie nell'Asia Maggiore, e splende si forte che togle le sue òbre, e morendo 15 no perde esso lume, e mai li cadono giu le penne, e la penna che si spicca p'no 17 luce.

**THE PELICAN.**

This bird has a great love for its young; and when it finds them in its nest dead from a serpent's bite, it pierces itself to the heart, and with its blood it bathes them till they return to life.

**THE SALAMANDER.**

This has no digestive organs, and gets no food but from the fire, in which it constantly renews its scaly skin.

**THE CAMELEON.**

This lives on air, and there it is the prey of all the birds; so in order to be safer it flies above the clouds and finds an air so rarefied that it cannot support the bird that follows it.

At that height nothing can go unless it has a gift from Heaven, and that is where the chameleon flies.

**ALEPO PESCE.**

Alepo no uive fori dell’acqua.

**THE ALEPO, A FISH.**

The fish alepo does not live out of water.

**STRUZZO.**

Questo couerte il ferro in suo nutrimeto; cova l’uova colla vista; 6 per l’arme de’ capitani. 7

**THE OSTRICH.**

This bird converts iron into nourishment, and hatches its eggs by its gaze;—Armies under commanders.
CIGNO.

9 Cignio è candido senza alcuna macchia, è dolcemète canta nel mo^1^rire, il qual câto termina la vita.

CICOGNA.

13 Questa, beuèdo la salsa acqua, cac-cia da se il mâle; se troueva la có^1^pagnia in fullo, l'abandona; e quàdo è vecchia, i sua figlioli la covano e pa/spono, infìnhè more.

1238.

CICALA.

2 Questa col suo canto fa tacere il cucco, more nell'olio, e resucita nello aceto, câta per li ardèti caldi.

PIPISTRELLO.

6 Questo dov'è piv luce piv si fa òrobo, e come piv guarda il sole più s'acciacea; pel uittio che nó può stare dov'è la vi^1^tù.

PERNICE.

11 Questa si trasmuta di femina i maschjo, e dimètica il primo sesso, e fura per òuida l'oua al'altre, e le coua, ma i nati segui^1^tano la uera madre.

RÓDINE.

10 Questa colla celidonia lumina i sua ciechi nati.

1239.

OSTRIGA.—PEL TRADMÈTO.

2 Questa, quàdo la luna è piena, s'apre tutta, e quàdo il gràcio la vede, détro le gietta qualche sasso o festuca, e questa nó si può riserrare, òde è cibo d'esso gràchio; così fa, chi apre la bocca a dire il suo segreto, che sì fa preda dello indiscreto auditore.

The Swan.

The swan is white without any spot, and it sings sweetly as it dies, its life ending with that song.

The Stork.

This bird, by drinking saltwater purges itself of distempers. If the male finds his mate unfaithful, he abandons her; and when it grows old its young ones brood over it, and feed it till it dies.

The Grasshopper.

This silences the cuckoo with its song. It dies in oil and revives in vinegar. It sings in the greatest heats.

The Bat.

The more light there is the blinder this creature becomes; as those who gaze most at the sun become most dazzled.—For Vice, that cannot remain where Virtue appears.

The Partridge.

This bird changes from the female into the male and forgets its former sex; and out of envy it steals the eggs from others and hatches them, but the young ones follow the true mother.

The Swallow.

This bird gives sight to its blind young ones by means of celandine.

The Oyster.—For treachery.

This creature, when the moon is full opens itself wide, and when the crab looks in he throws in a piece of rock or seaweed and the oyster cannot close again, whereby it serves for food to that crab. This is what happens to him who opens his mouth to tell his secret. He becomes the prey of the treacherous hearer.
BASILISCO.—CRUDELÀ.

9 Questo è fuggito da tutti i serpèti; la donò a loro per lo mezzo della ruta cobbate con essi e si l'uccide.

L'ASPIDO.

14 Questo porta nel'eti, la subita morte e per nò sentire l'inciatì, colta coda si stoppa li orecchi.

H. l 15.0

DRAGO.

2 Questo lega le gäbe al liofante e quel la cade adosso, e l'uno e l'altrìo more, e morèdu fa sua vëdetta.

VIPERA.

6 Questa nel suo accoppiare apre la bocca, e nel fine strignie dèti e amazza il marito, poi i figlioli in corpo cres civiti straccià no il uètre e occidono la madre.

SCORPIONE.

11 La saliùa sputa a digivno sopra dello scorpiione e l'occide; à similitudine dell'as- similàdella gola, che tôle via e cura le malatie che da essa gola dipedono, e a1 pre la strada alle virtù.

H. l 17.0

COCODRILLO. IPORESIA.

2 Questo animale piglia l'òmo e subito l'uccide poichè l'à morso con lamètèvoile voce e molse lacrime, lo piàgie, e finito il lamèto crudemète lo diuora; così fa l'ipocrito che per ogni lieue cosa s'empie il uiso di lagrime; mostràdo un cor di tigro e rablègrasi nel core dell'altrui male cò piàtosò volto.

BOLLA.

12 La bolla fugge la luce del sole, e se pure per force vè' tevuta, si gòfà tata, che s'ascoìde la testa in basso, e privasi d'essì razzi; così fa chi è nimico della chiara e lucieòète virtù, che nò può se nò con gòfati animo forzatamète starle davàti.

H. l 16.0

THE BASILISK.—CRUELTY.

All snakes flee from this creature; but the weasel attacks it by means of rue and kills it.

THE ASP.

This carries instantaneous death in its fangs; and, that it may not hear the charmer it stops its ears with its tail.

THE DRAGON.

This creature entangles itself in the legs of the elephant which falls upon it, and so both die, and in its death it is avenged.

THE VIPER.

She, in pairing opens her mouth and at last clenches her teeth and kills her husband. Then the young ones, growing within her body rend her open and kill their mother.

THE SCORPION.

Saliva, spit out when fasting will kill a scorpion. This may be likened to abstinence from greediness, which removes and heals the ills which result from that gluttony, and opens the path of virtue.

THE CROCODILE. HYPOCRISY.

This animal catches a man and straightforward kills him; after he is dead, it weeps for him with a lamentable voice and many tears. Then, having done lamenting, it cruelly devours him. It is thus with the hypocrite, who, for the smallest matter, has his face bathed with tears, but shows the heart of a tiger and rejoices in his heart at the woes of others, while wearing a pitiful face.

THE TOAD.

The toad flies from the light of the sun, and if it is held there by force it puff itself out to much as to hide its head below and shield itself from the rays. Thus does the foe of clear and radiant virtue, who can only be constrainedly brought to face it with puffed up courage.
1242.—The Caterpillar.—For Virtue in General.

The caterpillar, which by means of assiduous care is able to weave round itself a new dwelling place with marvellous artifice and fine workmanship, comes out of it afterwards with painted and lovely wings, with which it rises towards Heaven.

The Spider.

The spider brings forth out of herself the delicate and ingenious web, which makes her a return by the prey it takes.

1243.—The Lion.

This animal, with his thundering roar, rouses his young the third day after they are born, teaching them the use of all their dormant senses and all the wild things which are in the wood flee away. This may be compared to the children of Virtue who are roused by the sound of praise and grow up in honourable studies, by which they are more and more elevated; while all that is base flies at the sound, shunning those who are virtuous. Again, the lion covers over its foot tracks, so that the way it has gone may not be known to its enemies. Thus it beseems a captain to conceal the secrets of his mind so that the enemy may not know his purpose.

1244.—The Tarantula.

The bite of the tarantula fixes a man's mind on one idea; that is on the thing he was thinking of when he was bitten.

The Screech-owl and the Owl.

These punish those who are scoffing at them by pecking out their eyes; for nature has so ordered it, that they may thus be fed.

1242. Two notes are underneath this text. The first: *netumina chosa e da temere piu che la sova fana* is a repetition of the first line of the text given in Vol. I No. 695.

H. 178]  
BRUCO.—DELLA VIRTÙ IN GENERALE.

Il bruco, che mediante l'esercitato studio di tessere con mirabile artificio e sottile lavoro intorno a se, fa la nova abitazione, escie poi fori di quella colle dipinte e belle ali, co' quelle levandosi inverso il cielo.

RAGNIO.

Il raggio, partorisce fori di se l'arte fitiosa e maestrevole tela, la quale riede per benifizio la presa preda.

LIONE.

Questo animale col suo tonante grido desta i suoi figli del dopo il terzo giorno nati, apre dì a quelli tutti li adorménti sési, e tutte le fiere, che nella selva sono, fuggono.

Puossi assimigliare a figlioli della virtù, che mediante il grido delle lode si svegliano e crescono per li studi onorevoli che sempre piov ginalza, e tutti i tristi a esso grido fuggono ciesságosi dai virtuosi.

Ancora il leone copre le sue pedate, perché nò s'intenda il suo viaggio per i nimici; questo sta al capitano a chiare i segreti del suo animo, aci접e il nimico nò cognosca i suoi tratti.

TARÀTA.

Il morso della tarâta màtiene l'omo nel suo proponimento, cioè quello che pensano quâdo fu morso.

DUGO E CIVETTA.

Questi gastigano i loro schernitori privádoli di uista, chè così à ordinato a la natura, perché si cibino.
Huma. eri.

**Leofante.**

Il gràde elefante à per natura quel che raro negli omni si truova, cioè pro-bità, prudètia, equità e osservàvità e reli-gione, imperoché, quàdo la luna si rivona, questi vanno ai fûvmi e quivi purgàdosi solennemète sì lauano, e così salutato il planeta ritornano alle selve; E quàdo sono ammalati, stando supini, gittàno l erbe verso il cielo, quasi com’èse sacrificare volessìno; sotterrano li de’ quàdo per vecchiezza gli cadono; de’ sua due dèti l uno adopera a cauare le radici per ci-barsi; all’altro còsera la pùta per cò-battere; quàdo sono superati da caccia-tori, e chè la stàchezza gli uîce per cotali dèti l elefanti, quelle trattenì, con esse si ricomprano.

**The Elephant.**

The huge elephant has by nature what is rarely found in man; that is, Honesty, Prudence, Justice, and the Observance of Religion; inasmuch as when the moon is new, these beasts go down to the rivers, and there, solemnly cleansing themselves, they bathe, and so, having saluted the planet, return to the woods. And when they are ill, being laid down, they fling up plants towards Heaven as though they would offer sacrifice. —They bury their tusks when they fall out from old age.—Of these two tusks they use one to dig up roots for food; but they save the point of the other for fighting with; when they are taken by hunters and when worn out by fatigue, they dig up these buried tusks and ransom themselves.

**Huma.**

Sono di leni menti e conoscì si percìoli; se esso troua l’omo solo e smarrito, piacevolmète lo rimette nella perduta strada, se troua le pedate dell’omo prima che vedà l’omo; esso teme tememète, sìe si ferma e soffia, mostràdolo ali altri elefanti, e fanno schiera e vanno assenti-mète.

Questi vanno sempre a schiere, e l’ultimò vecchio va inàzi, e l’ècodo d’ètà resta l’ultimo, e così chiudono la schiera; temono vergognia, non vanno il co’ se nè di notte di nascosto, e nò torìnano dopo il coito all’armèti, se prima nò lauano nel fume; nò còbattono le femine, come gli altri animali; ed è tato demète, che mal vuolòteri per na’noce ai me potenti di se, e sco’tàdosi nella sua via e gregsi delle pecore

**Huma.**

colla sua mano le pone da parte per non le pestare, coi piedi, nè mai noce se nò sono provocati; quàdo son ca’duti nella fossa, gli altri có rami, terra e sassi ri-piono la fossa, in modo che alzano il fondo, it puts them aside with its trunk, so as not to trample them under foot; and it never hurts any thing unless when provoked. When one has fallen into a pit the others fill up the pit with branches, earth and stones, thus
THE LIFE AND HABITS OF ANIMALS.

1248. 1249.

Che esso facil'mente rimòti; temono forte
lo stridore de'porci e fugono indirìeto; e
nò fa mäco danno poi coi piedi a sua 10 che
a nimici; dilettiasi de'fumi, e sempre vano
vagabùdi intorno 15 quelli, e per lo gra pâso
nò possono 17 notare; diuorano le pìetre, e
trò'chi deli alberi sono loro gratissimo cibo;
15 anno in odio i ratti; le mosche si dilettano
16 del suo odore e posàdosi li adosso,
quello 17 arraspa la pelle, e fa le pieghe
strette, e l'uccide.

1248.

Quando passano i fiumi, mädano 2 i figli-
oli diverso il calar dell'acqua, e quando
loro inverso l'erta ronpo 4 il rapido corso
dell'acqua, aciocchè 1 il core non le menasse
via; il drago 6 se li gitta sotto il corpo,
colla 7 coda l'andoda le gâbe, coll'alle 8 e
colle braccia anche li tigme le coste 9 e col
dentì lo scanna, el fiofante 10 li cade adosso
o il drago scoppia, 11 e così colla sua morte
del nemico 12 si uedica.

1249.

When they cross rivers they send their
young ones up against the stream of the
water; thus, being set towards the fall, they
break the united current of the water so that
the current does not carry them away. The
dragon slings itself under the elephant's body,
and with its tail it ties its legs; with its wings
and with its arms it also clings round its
ribs and cuts its throat with its teeth, and
the elephant falls upon it and the dragon
is burst. Thus, in its death it is revenged
on its foe.

Serpète.

3 Il serpète, grandissimo animale, 4 quando
vede alcuno uciello per l'aria, 5 tira a se
si forte il fiato che si tira 6 gli ucielli in
bocca; Marco, 7 Regulo, consile dello eser-
cito Romano, fu col suo esercito da un simile
animale assalito e quasi roto, il qua 1 a le
animale, essendo morto per una machina
11 movale, fu misurato 123 piedi, cioè 15 64
braccia e 11/2; avazava colla testa tutta 13 le
piâte di una selu.

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the elephant falls upon it and the dragon
is burst. Thus, in its death it is revenged
on its foe.

The Dragon.

These go in companies together, and
they twine themselves after the manner of
roots, and with their heads raised they cross
lakes, and swim to where they find better
pasture; and if they did not thus combine

1249.

they would be drowned, therefore they
combine.

The Serpent.

The serpent is a very large animal.
When it sees a bird in the air it draws in
its breath so strongly that it draws the birds
into its mouth too. Marcus Regulus, the
consul of the Roman army was attacked,
with his army, by such an animal and
almost defeated. And this animal, being
killed by a catapult, measured 123 feet,
that is 64 1/2 braccia and its head was high
above all the trees in a wood.

9. dano pocho piedi. 10. dilettasi fiumi. 11. essèpre ... intorna. 12. quelgli ... possì. 13. abberi soloro. 15. a/va.
17. arapa ... esfale piège strettì lucide.
1248. 4. inatio (?) corso dellicqua. 6. nelle menasse via; 7. cholla. 7. lanoda ... chollale. 8. cholle bre anche. 9. e cho
denti. 10. drago sciopa. 11. sacoppagnìan ... essì. 15. ratìci. 16. troua. 17. essecchio si viusser.
1249. 1. anegerebbono. 3. gràndissimo. 5. asse ... chessì. 6. bochaa. 7. càstulo. 8. ma fu chod ... da vusìe. 10. macìo'na'.

H.1 20.8] 1248.

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Boi.

13 Questa e grà biscia, la quale cò se mede22sima si aggruppa alle ganbe della vacca in modo do nò si mova, poi la tetta in modo che quasi 18 la dissecca; di questa specie a tepo di Claudio 19 iperatore nel mota Vaticano ne fu morta

The Boa(?)

This is a very large snake which entangles itself round the legs of the cow so that it cannot move and then sucks it, in such wise that it almost dries it up. In the time of Claudius the Emperor, there was killed, on the Vatican Hill,

1250.

One which had inside it a boy, entire, that it had swallowed.

The Macl.—Caught when asleep.

This beast is born in Scandinavia. It has the shape of a great horse, excepting that the great length of its neck and of its ears make a difference. It feeds on grass, going backwards, for it has so long an upper lip that if it went forwards it would cover up the grass. Its legs are all in one piece; for this reason when it wants to sleep it leans against a tree, and the hunters, spying out the place where it is wont to sleep, saw the tree almost through, and then, when it leans against it to sleep, in its sleep it falls, and thus the hunters take it. And every other mode of taking it is in vain, because it is incredibly swift in running.

1251.

The Bison which does injury in its flight.

This beast is a native of Paeonia and has a neck with a mane like a horse. In all its parts it is like a bull, excepting that its horns are in a way bent inwards so that it cannot butt; hence it has no safety but in flight, in which it flings out its excrement to a distance of 400 braccia in its course, and this burns like fire wherever it touches.

Lions, Pards, Panthers, Tigers.

These keep their claws in the sheath, and never put them out unless they are on the back of their prey or their enemy.
THE LIFE AND HABITS OF ANIMALS.

THE LIONESS.

When the lioness defends her young from the hand of the hunter, in order not to be frightened by the spears she keeps her eyes on the ground, to the end that she may not by her flight leave her young ones prisoners.

THE LION.

This animal, which is so terrible, fears nothing more than the noise of empty carts, and likewise the crowing of cocks. And it is much terrified at the sight of one, and looks at its comb with a frightened aspect, and is strangely alarmed when its face is covered.

THE PANTHER IN AFRICA.

This has the form of the lioness but it is taller on its legs and slimmer and long bodied; and it is all white and marked with black spots after the manner of rosettes; and all animals delight to look upon these rosettes, and they would always be standing round it if it were not for the terror of its face;

THE TIGER.

This beast is a native of Hyrcania, and it is something like the panther from the various spots on its skin. It is an animal

1252. 1254.

1232. 1234.

1232. 2. teribile. 3. chello... vote carette. 4. essimile... retteme. 6. cressta. 7. effore invilisce. 11. eüoga. 12. etturna biiacha e punegiata. 15. starebò ditorno. 16. fussi... terbilita.
1233. 1. conosciéddo ascosi. 2. eili. 3. sasurano e fannosi. 4. bellezza. 8. battriani. 9. arabi i solo. 13. chellusato esse. 14. uiajio... sibito. 15. alo. 16. ciare.
1234. 2. na-scel. 3. lehe simile. 5. cacia. 6. trouva... [la sua ta] i sua. 8. leva [ecque] essubito. 10. tera. 12. cholle...

TT

VOL. II.
spauotevole velocità; il caccia'tore quād trov... veloce cau...; la pantera tor'ènado trov... in ter... ne... quali vededosì... e raspado colle zāpe scuopre... l'in-ganno, òde mediate l'odore de' figli... se-guita il cacciatore, e quād esso caccia'tore vede la tigra, lascia... de'figlioli,... e questa lo piglia, e portalo al nido;... subito rigivgne esso cacciatore, e fa... rude,...

H. 24 o-

il simile insino a tāto ch'essso mōta in barca.

CATOLEA.

4 Questo nascì... in Etiopia... al fonte... Nigricapo; è animale nò troppo... grande,... è pīgla in tutte le mēbra,... e al capo di tata grā'dezza... che malagievomètë... lo port-a,... in modo che... sempre... sta... chinato... in-verso... la terra,... altrimenti... sarebbe... di so... peste... alli omini... perché qualunque... è veduta da sua... ocli... subito... more.

BASILISCO.

13 Questo... e... nella provincia... Cire-naica e... nò è... maggiore... che... dita e à... in capo... vna machia bianca a similitudine di diadema;... col fisico... caccia... ogni ser-pête,... a similitudi... er... di serpe,... ma nò si... move... tortore... anzi... manritto... dal mezzo... in... ; dice... che nvo... a questo... essendo... morto... con vn... aste... da vno... che... era... a... cavallo... che... suo... ven... dis... super... capo,... e nò che... il... omo... ma il cavallo... mori;... è... la piâte... e... no... solamë... quale... che... tocca... ma... quelle... do... soffia... ; seccà... l'erbe... spezza... sas-

H. 24 7.

di questi... essendo... morto... con... aste... da vno... che... era... a... cavallo... che... suo... ven... dis... super... capo,... e nò che... il... omo... ma il cavallo... mori;... è... la piâte... e... no... solamë... quale... che... tocca... ma... quelle... do... soffia... ; seccà... l'erbe... spezza... sas-

1255. Leonardo undoubtedly derived these remarks as to the Catoblepas from Pliny, Hist. Nat. VIII. 21 (al. 32): Apud Hesperios Aetoliaeos fons est Niger (different readings), at plerique existimaverunt, Nili caput — — Juxta haec hinc vera appellatur catoblepas, modina aliquinque, ceterique membris iners, caput tum tum pro-grave aegre fereat; alias internicio humani generis, omnibus svo...
THE LIFE AND HABITS OF ANIMALS.

1257. 1258.

DONNOLA OVER BELLULA.

8 Questa trovado la tana del basilisco, coll’ odore della sua sparsa orina l’uccide; l’odore della quale orina acora spesse volte 11 essa donola occide.

CERASTE.

13 Questo anno quattro piccoli corni mobili; 11 onde quando si ugliano cibare, nascoda 12 sotto le foglie tutta la persona, saltando esso coricicina, le quali movendo pare 17 agli ucielli quelli essere piccoli uermi che scherzino, o de subito si calano per beccar 19; e questa subito s’avviluppa loro in cier 20 echi ed esse li diuora.

1257.

AMPHESISIENE.

2 Questa a due teste, l’una nel suo loco, l’altra nella coda, come se nò bastasse che 4 da uno solo loco gittasse il veneno.

IACULO.

6 Questa sta sopra le piante, e si lancia come 7 dardo; e passa a trauerso le fere, e l’uccide.

ASPIDO.

9 Il morso di questo animale non a rimento, 12 se nò di subito tagliare le parti morse; Questo si pestifero animale a tale affettione nella sua copagna che sempre vanno accopagnati, 13 chè se per disgrazia l’uno di loro è morto, l’altro con incredibile velocità seguita l’ucri 20 ditore, ed è tanto attento e sollecito alla vedetta, che vicie ognij difficoltà; passando ogni esser 17 cito, solo il suo nemico ciera offendere; 15 e passa ogni spatio, e nò si può schiarlo, se nò 19 col passare l’acque e có velocissima fuga; 20 a li ochi idetro e gradi orecchi, e piv lo move l’udito che l’uedere.

1258.

ICHEUMONE.

2 Questo animale è mortale nemico all’aspidio; 3 nasce in Egitto, e quanto vede presso al suo sito alcuno aspidio, subito corre alla litta ove fango del Nilo, e có quello 6 tutto s’infanga, e poi risceco dal


1257. 1. amphisibene. 2. testate. 3. bassastasi. 4. da solo loco. 6. essi. 7. attuere le fere ellucide. 11. atuale. 12. se sempre... acopagnati. 13. cheseper. 14. luci. 15. essolceto. 16. difficila. 18. scifarlo. 20. laldoro.

1258. 1. ichneumone. 3. nassae. 4. aspido. 5. lita... echö. 6. riescche. 7. così sechefa li. 8. assimilitudine. 9. coraza...
sole, di no’vo di fango s’inbretta; e così seguitando l’u doopo l’altro si fa tre o 4 veste a similitudine 9 di corazza, e dipoi assalta l’aspido, e bé co’10 testa co quello in modo che, tolto il tipo, 11 se li caccia in-gola e l’ammega.

Crocodillo.

12 Questo nasce nel Nilo, à 4 piedi, vit’11ve in terra e in acqua, né altro terrestre 13 animale si trova sanza lingua che questo; 16 e solo morde mo vedà la maschera di sopra; 17 cresce insino in 40 piedi, è unghiatò, 18 armato di corame, atto a ogni colpo; el di 19 sta in terra, e la notte in acqua; questo, 20 cibito di pesci, s’adormicà sulla riva del 21 Nilo colla bocca aperta e l’uccelio detto trochilo, piccolissimo vecielio, subito li 2 corre alla bocca e, saltatoli fra denti 3 dentro, c’è fora’leva beccando il rimaso 4 cibo; e così stuzzicàdolo co dilettèvole 5 voluttà lo inuita aprire tutta la bocca, 6 e così s’adormica; questo veduto 7 dal incennone subito si li glacia in bocca, 8 e foratoli lo stomaco e le budelle finalmente 9 l’uccide.

Delfini.

11 La natura à dato tal cognizione alli animali che, oltre allo conoscere la lor co- 13 moditatio, conoscono la incomodità del nimico; onde intede il delfino quatro 15 vaga; il taglio delle sue penne, posteli 16 sulla schiena, e quato sia tenera la pàcia 17 del cocodrillo; onde nel lor cabattere se li 18 caccia sotto e tagliai la pàcia, e così 19 l’uccide.

Il cocodrillo è terribile a chi fugge e vilisimò a chi lo caccia.

H. 1 264]

IPPOFOTAMO.

2 Questo quando si sente aggravato va 3 cercando le spine, o dove sia i rima- nestiti di tagliati canneti, e li tâto frega una

traspira, 10 tenza . . . imodo chetto, 11 caca . . . ella nege, 13 nasce . . . piedi nve vi. 14 ce in terra e in aq“a” 15 [e suo] ne . . . terrete. 15 checzquesto. 16 massiella, 17 cressie . . . vogliato, 18 . . . [vestite] “armato” di . . . atto ogni. 18 ella notte. 19 pesci. 20 bocha . . . ellucielo.

1260. 1. hippopotamo. 2. agravato. 3. cercando . . . sia. 4. caneti cli. 5. chauato . . . chelli . . . cola lita. 6. risaldada. 7. lúgia. 8. ciglare

HUMOROUS WRITINGS.

[1259. 1260.

1259.

THE HIPPOPOTAMUS.

This beast when it feels itself over-full goes about seeking thorns, or where there may be the remains of canes that have been

itself in the sun, smears itself again with mud, and thus, drying one after the other, it makes itself three or four coatings like a coat of mail. Then it attacks the asp, and fights well with him, so that, taking its time it catches him in the throat and destroys him.

THE CROCODILE.

This is found in the Nile, it has four feet and lives on land and in water. No other terrestrial creature but this is found to have no tongue, and it only bites by moving its upper jaw. It grows to a length of forty feet and has claws and is armed with a hide that will take any blow. By day it is on land and at night in the water. It feeds on fishes, and going to sleep on the bank of the Nile with its mouth open, a bird called

THE DOLPHIN.

Nature has given such knowledge to animals, that besides the consciousness of their own advantages they know the disadvantages of their foes. Thus the dolphin understands what strength lies in a cut from the fins placed on his chine, and how tender is the belly of the crocodile; hence in fighting with him it thrusts at him from beneath and rips up his belly and so kills him.

The crocodile is a terror to those that flee, and a base coward to those that pursue him.
ve'na che la taglia, e causato il sangue, che li 6bisognia, colla litta s'infanga, e risalta alla 7piaggia; à forma quasi come cavallo; l'uglia, 8fessa, coda torta, e dèti di ci-ghiale; collo có 9crini la pelle; nò si può passare •, se nò si bat'ognia; pascesi di piâte ne'câpi, entravi 11allo dirieto, accio-chè pare ne sia uscito.

**Ibis.**

13Questo à similitudine colla cicogna, e quan'14do si sente ammalato, épie il gozzo d'acqua, 15e col becco si fa vn clistero.

**Cerut.**

17Questo quando si sente morso dal rango 18detto falangio · má gia de' grachì, e si libera 19di tale veneno.

11.1 27o]

**Lucerte.**

2 Questa quàdo còbatte colle serpi 3mangia la cicerbita; e só libere.

**Rondine.**

5 Questa rende il vedere alli orbiti 6fi-glioli col sugo della celidonia.

**Bellula.**

8 Questa quando caccia ai ratti, má gia 9prima · della · ruta.

**Cinghiale.**

11 Questo medica · i sua · mali mangiàdo 12della · edera.

**Serpe.**

14 Questa quàdo si uol renovare, gitta il 15vechio scoglio, comiciádosi dalla testa; 16ruttasi in vn di e vna notte.

**Partera.**

18 Questa, poiché le sono · uscite l'in-teriûra, 19ancora conbatte coi cani e cac-ciatori.

split, and it rubs against them till a vein is opened; then when the blood has flowed as much as he needs, he plasters himself with mud and heals the wound. In form he is something like a horse with long haunches, a twisted tail and the teeth of a wild boar, his neck has a mane; the skin cannot be pierced, unless when he is bathing; he feeds on plants in the fields and goes into them backwards so that it may seem, as though he had come out.

**The Ibis.**

This bird resembles a crane, and when it feels itself ill it fills its craw with water, and with its beak makes an injection of it.

**The Stag.**

These creatures when they feel themselves bitten by the spider called father-long-legs, eat crabs and free themselves of the venom.

**The Lizard.**

This, when fighting with serpents eats the sow-thistle and is free.

**The Swallow.**

This [bird] gives sight to its blind young ones, with the juice of the celandine.

**The Weasel.**

This, when chasing rats first eats of rue.

**The Wild Boar.**

This beast cures its sickness by eating of ivy.

**The Snake.**

This creature when it wants to renew itself casts its old skin, beginning with the head, and changing in one day and one night.

**The Panther.**

This beast after its bowels have fallen out will still fight with the dogs and hunters.

9. si po passare. 10. passesi ... biade. 11. vuscito. 13. assimiltudine ... ciguogna eopp•'i. 14. amalato ... il coro dacies. 15. e chel bochô ... crioterio. 18. falange ... grâci essi.

1261. 2. colla lucerte serp. 3. essê. 5. alli unorbi ... 6. chol. 7. belola. 16. mvtsi avdi ... noce. 18. poichêle sono vscite lenteriora.
CAMELEONTE.

2 Questo piglia sempre il colore della cosa donde si posa; onde insieme colle frodi 4 dove si posano, spesso dali elefanti sò diuorati.

CORBO.

6 Questo quando à ucciso el cameleonte 7 si purga coll’alloro.

THE CHAMELEON.

This creature always takes the colour of the thing on which it is resting, whence it is often devoured together with the leaves on which the elephant feeds.

THE RAVEN.

When it has killed the Chameleon it takes laurel as a purge.

DELL’ANTIUEDERE.

5 Il gallo nò cátà, se prima 3 volte nò batte 6 l’alie; il papagalo nel mutarsi pe’rami 7 nò mette i piè, dove non à prima 8 messo il becco; 9 il uoto nascie quand’è speràza more.

10 Il moto seguita il ciètro del peso.

MODERANZA.

Il’ermelino príma morire che imbrat-tarsi.

MADONELLA.

The cock does not crow till it has thrice flapped its wings; the parrot in moving among boughs never puts its feet excepting where it has first put its beak. Vows are not made till Hope is dead.

Motion tends towards the centre of gravity.

MAGNANIMITÀ.

Il falcone nò píiglia se nò vecelli grossi, e príma 3more che màgiare carne di nò bona odore.

The falcon never seizes any but large birds and will sooner die than eat [tainted] meat of bad savour.
II.

FABLES.

Favola.  

An oyster being turned out together with other fish in the house of a fisherman near (1265–I'270),
the sea, he entreated a rat to take him to the sea. The rat purposing to eat him
brought him to the sea. He entreated a rat to take him to the sea. The rat
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purposing to eat him

A Fable.  

The thrushes rejoiced greatly at seeing a man take the owl and deprive her of liberty,
tying her feet with strong bonds. But this owl was afterwards by means of bird-lime
the cause of the thrushes losing not only their liberty, but their life. This is said
for those countries which rejoice in seeing their governors lose their liberty, when by that
means they themselves lose all succour, and remain in bondage in the power of their en-
mies, losing their liberty and often their life.

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1265.  2. lostriga . . . collì al . . 5. ce al mare . . . fato . 7. sera . 8. essilo . . . ellucide.
1266.  2. rallegrogono . . . chellomo . . 3. elle . . . choforri . 4. usciò . . . chausa . . . far perde . 5. mala . 6. chessì ralegrà . . . mgai.
7. perdano il soccorso . 8. nemicho . . . espesse.
2 Dormèdò il cane sopra la pelle d'un castrone, vna delle sua 3 pulci, sentèdò l'odore della vinta lana, gividò quello dovesse essere loco di migliore vita e pip sicura da denti e unghie del cane, che passierò del cane; e sanza altri pensieri abbandonò il cane, e lientrata 4 infrà la folta lana, cominciò có somma fattica a volere 7 traspassare alle radici de' peli; la quale impresa dopo molto 8 sudore trovò esser uana, perché tali peli erano tanto spessi che quasi si toccavano, e nò u era spatio dove la pulci potesse saggiare 10 tal pelle; ode' dopo lugo travagliò e fatica cominciò a vole 11 re ritornare al suo cane, il quale essendo già partito, fu 12 costretta dopo lugo pètimeto e amari piatti a morirsi di fame.

2 Non si còtentando il uano e vagabudo parpaglione 3 di potere comodevolmente volare per l'aria, 4 vinto dalla dilettovole fiamma della câdela, delipérò volare in quella; e l suo giocòdo movimèto fu cagione di subita tristità, imperochè in detto 7 lume si consumarono le sottili ali che l parpaèglione misero cadotto tutto bruciato a piè del 9 candeliere; dopo molto pianto e pèttime 10 -to si rascigò le lagrime dai bagnati ochi, e levato il uiso in alto disse: o falsa luce, 12 qualsì come me debi tu avere ne passà 13 ti tempi avere misrabilìetè inganatì e se 14 pure volevo vedere la luce, nò doveu' io con o 15 sciere il sole dal falso lume dello spurco sevo?

17 Trovando la scimia vno nido di piccoli 18 vcelli, tutta allegra appressatasi a quelli, e quali sentìdo già da volare, ne potè solo pigliare il minore; essèdo pieno d'allegranza con esso in mano, se n'andò al suo 21 ricetto; e comiciato a cosiderare

A Fable.

A dog, lying asleep on the fur of a sheep, one of his fleas, perceiving the odour of the greasy wool, judged that this must be a land of better living, and also more secure from the teeth and nails of the dog than where he fed on the dog; and without farther reflection he left the dog and went into the thick wool. There he began with great labour to try to pass among the roots of the hairs; but after much sweating had to give up the task as vain, because these hairs were so close that they almost touched each other, and there was no space where fleas could taste the skin. Hence, after much labour and fatigue, he began to wish to return to his dog, who however had already departed; so he was constrained after long repentance and bitter tears, to die of hunger.

A Fable.

The vain and wandering butterfly, not content with being able to fly at its ease through the air, overcome by the tempting flame of the candle, decided to fly into it; but its sportive impulse was the cause of a sudden fall, for its delicate wings were burnt in the flame. And the hapless butterfly having dropped, all scorched, at the foot of the candlestick, after much lamentation and repentance, dried the tears from its swimming eyes, and raising its face exclaimed: O false light! how many must thou have miserably deceived in the past, like me; or if I must indeed see light so near, ought I not to have known the sun from the false glare of dirty tallow?

A Fable.

The monkey, finding a nest of small birds, went up to it greatly delighted. But they, being already fledged, he could only succeed in taking the smallest; greatly delighted he took it in his hand and went to his abode; and having begun to look at the
questo veccelotto, lo cominciò a baciare; e per lo sviscerato amore tanto, lo baciò, e rivolse, e strinse che ella gli tolse la uva; è detta per quelli che per no gastigare i figlioli capita no male.

C. A. 668; 200[4]

FAVOLA.

2 Stando il topo assediato in vna piccola sua abitazione dalla donnola, la quale co' cotivna vigilanza attèdea alla sua disfazione, e' per uno piccolo spiraculo riguardava il suo grà pericolo; intrattanto venne la gatta, e subito prese essa donnola, e Madame l'ebbe duorata; 7 allora il ratto, fatto sacrificio a Giove d'alqueate sua noci, ringratì sommamente la sua deità, e uscito fori dalla sua buca a possedere la già persa libertà, della quale subito in sieme colla vita fu dalle feroci unghie de' denti della gatta privato.

C. A. 668; 201[4]

FAUOLA.

2 La formaia trovato vno grando di miglio, il grando sedendosi preso da qualche gridò: se mi fai tato piacere di lasciar fuiere al mio desiderio del nasciere, io ti rederò di mei medesimi; e così fu fatto.

2 Trovato il raggio vno grappolo d'uove, il quale per la sua dolcezza era molto visitato da avvi e diuere qualità di mosche, li parve avere trovato loco molto comodo al suo inganno; e calò tosi giù per lo suo sottile filo, e èrato nella noia abitazione di ogni giorno facièdosi alli spiraculi, fatti dalli interuali de' grani dell' uoe, assaltaua come ladrone i miseri animali che da lui non si guardauano; e passati alquanti giorni il undemiator colse essa uva e, messa coll' insegna, con quelle fu pigiata; e così l'unà fu laccio e inganno dello ingaènator raggio, come delle ingannate mosche.

22 Addornètatosi l'asino sopra il ghiaccio d'ù profondo, e il suo calore dissolve esso ghiaccio, e l'asino sott' acqua a mal suo danno si destò e subito annegò.

A FABLE.

A rat was besieged in his little dwelling by a weasel, which with unwearied vigilance awaited his surrender, while watching his imminent peril through a little hole. Meanwhile the cat came by and suddenly seized the weasel and forthwith devoured it. Then the rat offered up a sacrifice to Jove of some of his store of nuts, humbly thanking His providence, and came out of his hole to enjoy his lately lost liberty. But he was instantly deprived of it, together with his life, by the cruel claws and teeth of the lurking cat.

A FABLE.

The ant found a grain of millet. The seed feeling itself taken prisoner cried out to her: "If you will do me the kindness to allow me accomplish my function of reproduction, I will give you a hundred such as I am." And so it was.

A Spider found a bunch of grapes which for its sweetness was much resorted to by bees and divers kinds of flies. It seemed to her that she had found a most convenient spot to spread her snare, and having settled herself on that with her delicate web, and entered into her new habitation, there, every day placing herself in the openings made by the spaces between the grapes, she fell like a thief on the wretched creatures which were not aware of her. But, after a few days had passed, the vintager came, and cut away the bunch of grapes and put it with others, with which it was trodden; and thus the grapes were a snare and pitfall both for the treacherous spider and the betrayed flies.

An ass having gone to sleep on the ice over a deep lake, his heat dissolved the ice and the ass awoke under water to his great grief, and was forthwith drowned.
A falcon, unable to endure with patience the disappearance of a duck, which, flying before him had plunged under water, wished to follow it under water, and having soaked his feathers had to remain in the water while the duck rising to the air mocked at the falcon as he drowned.

The spider wishing to take flies in her treacherous net, was cruelly killed in it by the hornet.

An eagle wanting to mock at the owl was caught by the wings in bird-lime and was taken and killed by a man.

The water finding that its element was the lordly ocean, was seized with a desire to rise above the air, and being encouraged by the element of fire and rising as a very subtle vapour, it seemed as though it were really as thin as air. But having risen very high, it reached the air that was still more rare and cold, where the fire forsook it, and the minute particles, being brought together, united and became heavy; whence its haughtiness deserting it, it betook itself to flight and it fell from the sky, and was drunk up by the dry earth, where, being imprisoned for a long time, it did penance for its sin.

A Fable.

The razor having one day come forth from the handle which serves as its sheath and having placed himself in the sun, saw the sun reflected in his body, which filled him with great pride. And turning it over in his thoughts he began to say to himself: "And shall I return again to that shop from which I have just come? Certainly not; such splendid beauty shall not, please God, be turned to such base uses. What folly it would be that could lead me to shave the lathered beards of rustie peasants and perform such menial service! Is this body destined for such work? Certainly not. I will hide myself in some retired spot and

A Falcon.

Il falcone, no potendo sopportare co' patetica 22 il nascodere che fa l' anitra, fu gièdo se le dinazi 28 e entrado sotto l' acqua, volle, come quelle, sott' acqua 29 seguitare, e bagnatosi le penne rimase in essa 30 acqua; e l'anitra, leuatasi in aria, schernè 32 il falcone 33 che annegava.

22 Il raggio, volendo pigliare la mosca co sue 32 false reti, fu sopra quelle dal calabrone 34 crudelmete morto.

32 Volendo l'aquila schernire il gufo, rimase 36 coll' alie inpaniata, e fu dall' omo presa e morta.

S. K. M. III. 536]

Trovandosi l' acqua nel superbo mare, suo elemèto, le vene voglia di mòtare sopra l' aria, e còfortata dal foco elemèto, releuatasi i sottile vapore, 8 quasi parea della sottigliezza dell' arise; mòtata in alto givnse ifra l' aria pivo sottile e fredda, dove fu abadona'ta dal foco, e i piccoli granicoli, 8 sendo ristretti, già s'uniscono e fa'nosì pesanti, ove cadèdo la superbia 10 si còuerte in fuga, e cade dal cielo. 12 òde poi fu bevuta dalla secca terra, 12 dove lìgo tèpo incarcierata 13 fece penitèia del suo peccato.

C. A. 1726; 5166]

Vasciendo vn giorno il rasoo di quel manico, col quale si fa givania a se medesimo, 3 e postosi al sole, vide il sole spechiaro nel suo corpo; della qual cosa prese somma gloria, e rivolto col pensiero indirieto, cominciò cò seco medesimo a dire: Or tornerò io 5 piv a quella bottega della quale novamète uscito sono? cierto no; no piacca alli Dei che 6 si splendida bellezza caggia in tata viltà d' animo! che pazzia sarebbe quella, la qual mi coulducesse a madere le insaponate barbe de' rustici villani e fare mecaniche operationi? 8 è questo corpo da simili eserciti? cierto
no; Io mi voglio nascondere in qualche
oculto loco, e li cò tranquillo riposo passare
mia vita; E così nascosto per alquati mesi,
vìn giorno ritornato all'aria e uscito fori
della sua guaina, vide se essere fatto a si-
militudine d'una ruginète sega, e la sua
superfitie non ui spechiare piv lo splenditè
sole; 12 cò vano pètimeto indarn lo in-
rimperabile danno, con seco dicièdo; e
quanto 12 meglio era esercitare col barbiere
il mio perduto taglio di tata sottilità; dov'e
la lustrante 11 superfitie; cierto la fastitiosa
brutta rugine l' à consumata!
15 Questo medesimo accade nelli ingegni
che in scibio dello esercito si danno al-
oito; 16 I quali a similitudine del sopra
detto rasjo perdon la tagliente sua sot-
tilità, 17 e la rugine della ignoranza guasta
la sua forma.

Fauola.

19 Vna pietra novamète per l'acque sco-
perta di bella gràdezza si staua sopra vn
cierto loco rilevato, 20 dove terminava un
dilettevole boschetto sopra vna sassosa
strada in cò pagina d'erbe, di uari fiori di
diversi colori ornate, e vedea 22 la grà
somma della pietre che nella a se sotto
23 posta strada collocate erano; le uennè
desiderio di là giv lasciarsi ca'dere, dicièdo
è co seco; che fo io qui cò queste erbe?
io voglio cò que 25 ste mie sorelle in copagnia
abitare; e giv lasciatosi cadere infra
26 le desiderate copagnie finì suo volubile
corso; e è stata alquato co 27 micicò a essere
dalle rote de' carri, dai piè de' ferrati ca-
valli, e de 28 viandittì a essere in continuo
travaglio; chi la volta, quello la pesta 29 va;
anca una volta se leuava alcuno pezzo, quado
stava coperta da fa 30 go o stero di qualche
anima, e in vano riguardava il loco dò-
de partita s'erà in nel loco della solletaria
e tranquilla pace;

31 Così accade a quelli che dalla vita
soletaria còtenativa voglio 3 no venir abit-
tare nelle città infra i popoli pieni d'infiniti
mali.

A Fable.

A stone of some size recently uncovered by
the water lay on a certain spot some-
what raised, and just when a delightful grove
ended by a stony road; here it was sur-
rounded by plants decorated by various
flowers of divers colours. And as it saw the
great quantity of stones collected together
in the roadway below, it began to wish it could
let itself fall down there, saying to itself: "What
have I to do here with these plants? I want to
live in the company of those, my sisters." And
letting itself fall, its rapid course ended
among these longed for companions. When
it had been there sometime it began to find
itself constantly toiling under the wheels of
the carts the iron-shoed feet of horses and
of travellers. This one rolled it over, that
one trod upon it; sometimes it lifted itself a
little and then it was covered with mud or
the dung of some animal, and it was in vain
that it looked at the spot whence it had come
as a place of solitude and tranquill place.
Thus it happens to those who choose to
leave a life of solitary contemplation, and
come to live in cities among people full of
infinite evil.
C. A. 668; 201 [a]

1273.

Le fiamme, già, aveano durato nella fornice 3 de' bichieri, e veduto a se avvicinarsi vna 4 candela in vn bello e lustrante candeliere, con gran desiderio si forzuzano accostarsi a quella; infrà la quale, vna, lasciato el suo naturale 7 corso e tiratasi dentro a vno voto stizzo, dove 8 si pascieva e vsscrita forì d'una piccola fessura 9 alla cadelà, che vicina l'era, si 10 gittò e có somma gelosità e ingordigia quella 11 diuorando quasi a fine la condusse; e volendo ripà 12 rare al prolongameto della sua vita, indar 13 tò tornare alla fornice, donde partita s'era, 11 perché fu costretta morire, le mazze insieme 15 colla cadelà, ode al fine có piato e pétimeto 15 in fastidioso fumo si convertì, lasciàdo 17 tutte le sorelle in splendente e lúga vita e bellezza.

C. A. 668; 201 [b]

1274.

Trovandosi alquanta poca neve 2 appiccata alla sommità d'un sasso, il quale 3 era collocato sopra la stremà al'tezza d'una altissima montagna; e raccolò in se la imagnazion, cominciò con quella 6 a considerare e infa se dire: Or no son io ò da essere givdicata altera e superba, avere 6 me piccola dramma di neve posto in si al'to loco? e sopportare che tanta quàtità di neve, 15 quanta di qui per me essere veduta può, stia 17 pip bassa di me? certo la mia poca quàtità non merita questa altezza, ché bene posso per 13 testimonazà della mia piccola figura conoscere 4 re quello che l'ole fecie ieri alle mia con- 15 spagine, le quali in poche ore dal sole furo' 16 no disfatte 4 e questo interjume per essersi 17 posto pip alto che a loro no si richiedea; io vo' 18 glio fugire l'ira del sole e abbassarmi, e trovare 15 loco l'òueniètè alla mia paru quità, e gittatasi in baso e comiciata a disciderc rotttà 21 dall'alte spiaggè super l'altra neve, quato pip ciercò 22 loco basso, pip crebbe sua quàtità in

A small patch of snow finding itself clinging to the top of a rock which was lying on the topmost height of a very high mountain and being left to its own imaginings, it began to reflect in this way, saying to itself: "Now, shall not I be thought vain and proud for having placed myself—such a small patch of snow—in so lofty a spot, and for allowing that so large a quantity of snow as I have seen here around me, should take a place lower than mine? Certainly my small dimensions by no means merit this elevation. How easily may I, in proof of my insignificance, experience the same fate as that which the sun brought about yesterday to my companions, who were all, in a few hours, destroyed by the sun. And this happened from their having placed themselves higher than became them. I will flee from the wrath of the sun, and humble myself and find a place befitting my small importance." Thus, flinging itself down, it began to descend, hurrying from its high home on to the other snow; but the more it sought a low place
modo che, terminato il suo corso sopra uno colle, si trovò di nò quasi minor grădezza che 'l colle che essa sostenea; e fu l’ultima che in quella state dal sole disfatta fusse; detta per quelli che s’umiliano, son esaltate.

Avèdo il ciedro desiderio di fare uno bello e grăde frutto in nella sommità di se lo mise in esecuzione có tutte le forze del suo omore; il quale frutto cresciuto fu cagione di fare declinare la elevata e diritta cima.

Il persico avèdo jvidia alla gră qualità delle frutti visti fare al noce suo vicino, deliberato fare il simile, si caricò de' sua in modo tale che l’peso di detti frutti lo tirò diradicato e roto alla piana.

Il noce mostrando se per una strada ai viandanti la ricchezza de'sua frutti, ogni omo lo lapidaua.

Il fico stădo senza frutti, nessuno lo riguardava; volendo col fare essi frutti essere laudato dali estinti, fu da quelli piegato e roto.

Standing il fico vicino all’olmo, e riguardando i sua tami essere senza frutti e avere ardimeto di tenere il sole a sua acerbì frutti có răpognie gli disse: o olmo, non ai tu vergogna a ‘sta di năzi? ma aspetti che mia figlioli sieno in matura età, e vedrai dove ti troverai! i quali figlioli poi maturati, capitădovi una squadra di soldati, fu da quelli per torre iufrutti tutto lacera e diramato e.

The cedar, being desirous of producing a fine and noble fruit at its summit, set to work to form it with all the strength of its sap. But this fruit, when grown, was the cause of the tall and upright tree-top being bent over.

The peach, being envious of the vast quantity of fruit which she saw borne on the nut-tree, her neighbour, determined to do the same, and loaded herself with her own in such a way that the weight of the fruit pulled her up by the roots and broke her down to the ground.

HUMOROUS WRITINGS.

rotto; il quale stàdo poi così 24 stirpiato delle sue mèbra, l’olmo lo dimàdò dicè 25 do: o fico quìato era il meglio a stare senza figlioli 26 che per quelli venire in si misera-bile stato!

S. K. M. III. 45[6]

La piàta si dole del Palo 2 seco e vecchio che se l’era 3 posto al lato e de’pali 4 secchi che la circundano;

5 L’ù lo mètiene diritto, 6 l’altrò lo guarda dalla 7 triste cópagna.

C. A. 66 π, 2002]

FAVOLA.

2 Trovàdosi la noce essere della cornacchia 3 portata sopra vn alto campanile, e per 4 vna fessura, doue caddè, fu liberata dal mortale 5 suo becco; pregò 6 esso muro per quella gratia che Dio lì aveva dato del essere tanto 7 eminètè e magnio e ricco di si belle càpane e di tèto 8 onorevole suono ch’ella dovesse soccorrere, 9 poi ch’ella non avea potuta cadere sotto 10 verdi rami del suo vecchio padre, e essere nella grassa 11 sa terra, ricoperta dalle sue cadèti folgie, non la 12 volesse lui abandonare, 13 jperò ch’ella, trovàdosi 13 nel becco della 14 sìera corua, 14 vòto, che scappàdo da essa voleua finire la uiùta 15 sua in un piccolo buco; alle quali parole 15 il muro, mosso a òpassione, fu cotèno ricettàr272a nel loco ov’era caduta; e infra poco tèpo 15 la noce cominciò aprirsi e mettere le radici infra 19 le fessure delle pietre, e quelle allargare, e gittàre 20 i rami fori della sua caverna; e quelli 21 in breve leuati sopra lo edifìcio, e ingrossate le 22 ritore radici, cominciò aprire i mvrì e ca23 aùre le antiche pietre de’ loro 24 uchi lochi; allo 25 a ra muro tardi e indarno pianse la cagione del suo danno; 26 e in breve aprì e rovinà grà parte delle sua mèbra.

1276. 2 seco 3 ede [pall] 4 sech chello.

1277. The plant complains of the old and dry stick which stands by its side and of the dry stakes that surround it.

One keeps it upright, the other keeps it from low company.

A FABLE.

A nut, having been carried by a crow to the top of a tall campanile and released by falling into a chink from the mortal grip of its beak, it prayed the wall by the grace bestowed on it by God in allowing it to be so high and thick, and to own such fine bells and of so noble a tone, that it would succour it, and that, as it had not been able to fall under the verdurous boughs of its venerable father and lie in the fat earth covered up by his fallen leaves it would not abandon it; because, finding itself in the beak of the cruel crow, it had there made a vow that if it escaped from her it would end its life in a little hole. At these words the wall, moved to compassion, was content to shelter it in the spot where it had fallen; and after a short time the nut began to split open and put forth roots between the rifts of the stones and push them apart, and to throw out shoots from its hollow shell; and, to be brief, these rose above the building and the twisted roots, growing thicker, began to thrust the walls apart, and tear out the ancient stones from their old places. Then the wall too late and in vain bewailed the cause of its destruction and in a short time, it wrought the ruin of a great part of it.

1276. 2. secco. 3. ede pa[ll] 4. sech chello.

FAVOLA.

Il rovistico, sendo stimolato nell’una sottile rami ripieni di novelli frutti, pregò quella che, poiché lei li toglieva e sua diletto frutti, il merlo non le privasse delle foglie, le quali lo difendevano dai cocciati razi del sole, e che, colla cortiglia vonghi non la scorticasse e sussistesse della sua tenera pelle. Alla quale la merla con vilani rapogne rispose: o taci salutando sterpe, non sai che la natura tant’è fatto produrre questi frutti per mio notrimeto: no vedui che sci al modo per servirmi di tale cibo? no sai, vilano, che tu farai in nella prossima iuernata notrimeto e cibo del suo? le quali parole ascoltate dal albero patiètemete, non sa: lacrime, infna poco tempo il merlo preso dalla ragna, e colti de rami per fare gabbia per incarcerare esso merlo toccò infra l’altro rami al sottile rovistico a fare lege minimi della gabbia, le quali vedo essere causa della persa libertà del merlo, rallegratasi mosse tale parole: O merlo, io sono qui non acora consumata, come dicivei, del foco; prima vedrò te prigione, che tu me brugiatà.

A FABLE.

The privet feeling its tender boughs loaded with young fruit, pricked by the sharp claws and beak of the insolent blackbird, complained to the blackbird with pious remonstrance entreating her that since she stole its delicious fruits she should not deprive it of the leaves with which it preserved them from the burning rays of the sun, and that she should not divest it of its tender bark by scratching it with her sharp claws. To which the blackbird replied with angry upbraiding: "O, be silent, uncultured shrub! Do you not know that Nature made you produce these fruits for my nourishment; do you not see that you are in the world [only] to serve me as food; do you not know, base creature, that next winter you will be food and prey for the Fire?" To which words the tree listened patiently, and not without tears. After a short time the blackbird was taken in a net and boughs were cut to make a cage, in which to imprison her. Branches were cut, among others from the pilant privet, to serve for the small rods of the cage; and seeing herself to be the cause of the Blackbird's loss of liberty it rejoiced and spoke as follows: "O Blackbird, I am here, and not yet burnt by fire as you said. I shall see you in prison before you see me burnt."

FAVOLA.

Veduto il lavoro e mirto. tagliare il pero, con alta voce gridarono: O pero, ove vai tu? ov’é la superbia che avei quando tu avevi i tua. maturi frutti? ora no ci farai tu obra colle tue folte chiome.; Allora il pero rispose: io ne vedo l’agricola che mi taglia e mi porterà alla bottega d’ottimo scultore, il quale mi farà con su’ arte pigliare la forma di Giove Idio, e sarà dedicato nel tempio e degli omini adornato invece di Giove; e tu ti metti il pito a rimanere spesso storiata e pelata de tua rami, i quali mi sieno dali omni per onorarmi poste d’intorno.

A FABLE.

The laurel and the myrtle, seeing the pear tree cut down cried out with a loud voice: "O pear-tree! whither are you going? Where is the pride you had when you were covered with ripe fruits? Now you will no longer shade us with your mass of leaves." Then the pear-tree replied: "I am going with the husbandman who has cut me down and who will take me to the workshop of a good sculptor who by his art will make me take the form of Jove the god; and I shall be dedicated in a temple and adored by men in the place of Jove, while you are bound always to remain maimed and stripped of your boughs, which will be placed round me to do me honour."
HUMOROUS WRITINGS.

[1279]

Favola.

31 Vedéddo il castagno. "Vi védi le spade ? " " Sì, è vero. Vedi i suoi rami e di quelli spiccava i maturi frutti. I quali metteva nell' aperta bocca difiacidoli e diseradoli coi duri deti, crogliaendo i lunghi rami, e' co spregevole mormorio disse: 31 O fico! Quato sei tu mé di me obbligato alla natura! Vedi come 31 in me ordino serratì mi mia dolci figlioli, prima vestiti di sottile cänmica, sopra la quale è posta la dura e foderata pelle, e no co31 sè tetandosi di tanto benificarnì chell' à fatto loro la forte abitazione, e soppà quella fondò acuta e folte spine, acioché le 31 mani dell'omo nò mi possino invoce; Allora il fico comècio insieme coi suoi figlioli a ridere, e ferme le risa disse: 31 co nosoci l'omo essere di tale ingiennio che lui ti sappi col31 le pertiche e pietre e sterpi, tratti infra i tua rami, farti povero 31 de tua frutti, e quelli caduti posta coi piedi o coi sassi, a modo 31 che i frutti tua escina straciati e storiati fora dell'armata 31 casa; e io sono có diligèza tocco dalle mani, e no come te da bastoni e da sasso.

A Fable.

The chestnut, seeing a man upon the fig-tree, bending its boughs down and pulling off the ripe fruits, which he put into his open mouth destroying and crushing them with his hard teeth, it tossed its long boughs and with a noisy rustle exclaimed: "O fig! how much less are you protected by nature than I. See how in me my sweet offspring are set in close array; first clothed in soft wrappers over which is the hard but softly lined husk; and not content with taking this care of me, and having given them so strong a shelter, on this she has placed sharp and close-set spines so that the hand of man cannot hurt me." Then the fig-tree and her offspring began to laugh and having laughed she said: "I know man to be of such ingenuity that with rods and stones and stakes flung up among your branches he will bereave you of your fruits; and when they are fallen, he will trample them with his feet or with stones, so that your offspring will come out of their armour, crushed and maimed; while I am touched carefully by their hands, and not like you with sticks and stones."
diligentemente rizza sua rami in uerso il cielo aspettando qualche amichevole viciolo, che li fusse al disiderio mezzano; 17'fra quali veduta a se vicina la sgarza disse inverso 19 di quella, o gitele viciolo, per quello soccorso 20 che a questi giorni da mattina ne' mia rami trovasti, 21 qual'd' affamato, crudelc e rapace falcone ti voleva diuorare, 22 e per quelli riposi che sopra me spesso ai 23 vsato quado 24 l'ali tua s'ripous ciocedano, e per quegli piacice 5'ri che infra detti mia rami scherzado colle te cöpagnie 26 ne' tua amoreggiamenti a vsato, jo ti prego che tu truovi, 27 la zucca, e inpetri da quella alquate delle sue semèze; 28 e di a quelle che nate ch'elle fierno, c'io le trattero no 29 altrame, che se del mio corpo giontera l'ausse; 30 e simili mete una tutte quelle parole, che di simile int'ione persuasione sieno, bench' e te, maestra de' linguaggi, insegnare non bisognia; e se questo 33 farai, Io sono cöctta di ricuere il tuo nido sopra 34 il nascimento de' mia rami; insieme colla tua fa 35 miglia senza pagameto d'alciu fatto; allora la sgarza fatto e fermato alquati capitoli de novo col salice, e masima che bische o faine sopra se mai non accettasse, 36 alzato la coda e bassato la testa e gittatasi dal ramo 37 rede il suo peso all'alì, e quelle batteo sopra 38 la fugitiva aria, ora qua, ora in la curiosamete col timo della coda disirizzadosi, peruenne a una zucca e cò bel saluto 39 e alquate bone parole inpetro le dimandate semèze; 40 e condotte al salice fu con lieta ciera ricevuta; e rapato alquato col pi terreno vicino al salice, 41 col becco in cierchio a esso essi granii piatto, li quali 42 in breve tèpo cresciendo comiciarono collo accrescimento e aprimeto de' sua 43 rami a occupare tutti i rami del salice, e colle sue 44 grà foglie a toglierle la bellezza del sole e del cielo; e no 46 bastado tato male, seguendo le zucche comiciarono, per discòcio preso a tirare le cime de' teneri rami inverso la te 45 rtra con strane torture e disaggio di quelli.

she awaited eagerly some friendly bird who should be the mediator of her wishes. Presently seeing near her the magpie she said to him: "O gentle bird! by the memory of the refuge which you found this morning among my branches, when the hungry cruel falcon wanted to devour you, and by that repose which you have always found in me when your wings craved rest, and by the pleasure you have enjoyed among my boughs, when playing with your companions or making love—I entreat you find the gourd and obtain from her some of her seeds, and tell her that those that are born of them I will treat exactly as though they were my own flesh and blood; and in this way use all the words you can think of, which are of the same persuasive purport; though, indeed, since you are a master of language, I need not teach you. And if you will do me this service I shall be happy to have your nest in the fork of my boughs, and all your family without payment of any rent." Then the magpie, having made and confirmed certain new stipulations with the willow,—and principally that she should never admit upon her any snake or polecot, cocked his tail, and put down his head, and flung himself from the bough, throwing his weight upon his wings; and these, beating the lictering air, now here, now there, bearing about inquisitively, though his tail served as a rudder to him, he came to a gourd; then with a handsome bow and a few polite words, he obtained the required seeds, and carried them to the willow, who received him with a cheerful face. And when he had scraped away with his foot a small quantity of the earth near the willow, describing a circle, with his beak he planted the grains, which in a short time began to grow, and by their growth and the branches to take up all the boughs of the willow, while their broad leaves deprived it of the beauty of the sun and sky. And not content with so much evil, the gourds next began, by their rude hold, to drag the ends of the tender shoots down towards the earth, with strange twist and distortion.
Allora scontò, e indarno crollandosi per fare da se esse zuche cadere, e indarno vaneggiando alquātī giorni in simile inganno, perché la bona e forte collegatione tal pesosiero negava, vedendo passare il uèto; a quello racomandandosi, e quello soffiò forte; allora s’a perse il uccio e voto gābo del salice in 2 parti insino alle sue radici; e caduto in 2 parti indarno planse se me desimo, e conobbe che era nato per non aver mai bene.

Then, being much annoyed, it shook itself in vain to throw off the gourd. After raving for some days in such plans vainly, because the firm union forbade it, seeing the wind come by it commended itself to him. The wind flew hard and opened the old and hollow stem of the willow in two down to the roots, so that it fell into two parts. In vain did it bewail itself recognising that it was born to no good end.
A priest, making the rounds of his parish on Easter Eve, and sprinkling holy water in the houses as is customary, came to a painter's room, where he sprinkled the water on some of his pictures. The painter turned round, somewhat angered, and asked him why this sprinkling had been bestowed on his pictures; then said the priest, that it was the custom and his duty to do so, and that he was doing good; and that he who did good might look for good in return, and, indeed, for better, since God had promised that every good deed that was done on earth should be rewarded a hundred-fold from above. Then the painter, waiting till he went out, went to an upper window and flung a large pail of water on the priest's back, saying: "Here is the reward a hundred-fold from above, which you said would come from the good you had done me with your holy water, by which you have damaged my pictures."

When wine is drunk by a drunkard, that wine is revenged on the drinker.
Wine, the divine juice of the grape, finding itself in a golden and richly wrought cup, on the table of Mahomet, was pushed with pride at so much honour; when suddenly it was struck by a contrary reflection, saying to itself: "What am I about, that I should rejoice, and not perceive that I am now near to my death and shall leave my golden abode in this cup to enter into the soul and fetid caverns of the human body, and to be transmuted from a fragrant and delicious liquor into a soul and base one. Nay, and as though so much evil as this were not enough, I must for a long time lie in hideous receptacles, together with other fetid and corrupt matter, cast out from human intestines." And it cried to Heaven, imploring vengeance for so much insult, and that an end might henceforth be put to such contempt; and that, since that country produced the finest and best grapes in the whole world, at least they should not be turned into wine. Then Jove made that wine drunk by Mahomet to rise in spirit to his brain; and that in so deleterious a manner that it made him mad, and gave birth to so many follies that when he had recovered himself, he made a law that no Asiatic should drink wine, and henceforth the vine and its fruit were left free.

As soon as wine has entered the stomach it begins to ferment and swell; then the spirit of that man begins to abandon his body, rising as it were skywards, and the brain finds itself parting from the body. Then it begins to degrade him, and make him rave like a madman, and then he does irreparable evil, killing his friends.
JESTS AND TALES.

Franciscan begging Friars are wont, at certain times, to keep fasts, when they do not eat meat in their convents. But on journeys, as they live on charity, they have license to eat whatever is set before them. Now a couple of these friars on their travels, stopped at an inn, in company with a certain merchant, and sat down with him at the same table, where, from the poverty of the inn, nothing was served to them but a small roast chicken. The merchant, seeing this to be but little even for himself, turned to the friars and said: "If my memory serves me, you do not eat any kind of flesh in your convents at this season." At these words the friars were compelled by their rule to admit, without cavil, that this was the truth; so the merchant had his wish, and eat the chicken and the friars did the best they could. After dinner the messmates departed, all three together, and after travelling some distance they came to a river of some width and depth. All three being on foot—the friars by reason of their poverty, and the other from avarice—it was necessary by the custom of company that one of the friars, being barefoot, should carry the merchant on his shoulders: so having given his wooden shoes into his keeping, he took up his man. But it so happened that when the friar had got to the middle of the river, he again remembered a rule of his order, and stopping short, he looked up, like Saint Christopher, to the burden on his back and said: "Tell me, have you any money about you?"—"You know I have," answered the other, "How do you suppose that a Merchant like me should go about otherwise?" "Alack!" cried the friar, "our rules forbid us to carry any money on our persons," and forthwith he dropped him into the water, which the merchant perceived was a facetious way of being revenged on the indignity he had done them; so, with a smiling face, and blushing somewhat with shame, he peaceably endured the revenge.
Facetia.

2 Vno volendo provare colla autorità 3 di Pitagora, come altre volte lui era 4 stato al modo, e vno nò lasciava 5 finire il suo ragionamèto, allor costui 6 disse a questo tale: è per tale segniale che 7 io altre volte ci fussi stato, io mi ricordò che tu eri invidiano; allora costui 9 sentèdosi morderc colle parole gli 10 confermò essere vero, che per questo 11 trassegno lui si ricordava che questo 12 tale era stato l’asino che gli portava la 13 farina.

Facetia.

15 Fu dimàdato vn pittore perché; facSeqc 16 lui de’ figure si belle che erà cose morte, 17 per che causa esso avesse fatti i figlioli 18 si brutti; allora il pittore rispose che le 19 pitture le fecie di di, e i figlioli di notte.

A JEST.

A man wishing to prove, by the authority of Pythagoras, that he had formerly been in the world, while another would not let him finish his argument, the first speaker said to the second: “It is by this token that I was formerly here, I remember that you were a miller.” The other one, feeling himself stung by these words, agreed that it was true, and that by the same token he remembered that the speaker had been the ass that carried the flour.

A JEST.

It was asked of a painter why, since he made such beautiful figures, which were but dead things, his children were so ugly; to which the painter replied that he made his pictures by day, and his children by night.

C. A. 1285: 426]

Vno vede vn grànde spada al lato a vn altro, e’ dice: o poverello ell’è grà tepo chiaro 2 t’ò veduto legato a questa arme, perché nò ti disleghi, avèd le mani disciolte, 3 e possiedi libertà? al qual costui rispose: questa è cosa nò tua, anzi è vecchia; questo sentèdosi morderc rispose: io ti conosco sapere si poche cose in questo mòdo ch’io credevo che ogni di ualgata cosa a te fusse per nova.

C. A. 1286: 914a]

Vno lasciò lo usare con uno suo amico, 2 perché quello spesso li diceva male delle amici sua; il quale lasciato amico 4 vn di dolendosi collo amico e dopo il molto dolersi lo pregò, ch’elli di cèsse quale fusse 6 la cagione, che lo auesse fatto dimenicare 7 tanta amicitia; al quale esso rispose: jo 8 non voglio più usare con teco.

C. A. 1287: 916a]

A man saw a large sword which another one wore at his side. Said he “Poor fellow, for a long time I have seen you tied to that weapon: why do you not release yourself as your hands are united, and set yourself free?” To which the other replied: “This is none of yours, on the contrary it is an old story.” The former speaker, feeling stung, replied: “I know that you are acquainted with so few things in this world, that I thought anything I could tell you would be new to you.”

C. A. 3906: 914a]

Vno lasciò lo usare con uno suo amico, 2 perché quello spesso li diceva male delle amici sua; il quale lasciato amico 4 vn di dolendosi collo amico e dopo il molto dolersi lo pregò, ch’elli di cèsse quale fusse 6 la cagione, che lo auesse fatto dimenicare 7 tanta amicitia; al quale esso rispose: jo 8 non voglio più usare con teco.

1285. 2. cholla alturia. 3. pictagora. 4. lasciava . . . chostui. 6. acquesto. 7. cifussi. 8. chettu . . . chostui. 9. cholle. 11. richardua. 12. chelli. 15. pittore. 17. chaua . . . auessi. 18. rispose chelle. 19. figlio.
1286. 2 acquesto . . . dislegi [è sta liber] avèd . . . disciolte. 3. costui rispose. 4. rispasse . . . conosco . . . chose . . . questo. 5. chosa atte fussi.
1287. 1. lascio . . . amicho. 2. rispasse. 3. lasciato amicho [a del]. 4. cholla amicho. 5. diciessi . . . fussi. 6. chagione chello auessi . . . dimèrichare. 7. rispasse. 8. no . . . chounscheo. 9. noão. 10. amicho. 11. zòbìa chome me astare trista.
JESTS AND TALES.

1288.

Vno disputàdo e vantàdosi di sapere fare molti vari e bellì gèchi, vn altro de' circostanti disse: jo so fare 12 vno gioco - il quale farà trarre le brache a chi a me parìra; il primo vantatore, trovandosi senza brache, 13 disse - che a me non le sarai trarre e vo'dare vn pajo de calze; il proponente d'esso gioco accettato 4 lo invitò - in pro muto pív paja de brache, e trassele nel umolo - al mettitore delle calze, e vinse il pegno.

12 Vno disse a vn suo conosciète: tu ài tutti li ochi trasmutati in strano colore; Quello li rispose intervenirli 'spesso, ma tu no ci ài posto cura; - e quádo t'adùnie questo? - rispose l'altro: ogni volta, che mia' ochi vedono j'l tuo viso sfrano - per la violenza ricevuta da si grà dispiacire - subito s'imphililidisono - e nvtano in istra colore;

8 Vno disse a un altro: tu ài tutti li occhi mutati in istra colore; Quello li rispose egli è perché i mia' ochi vedono j'ìl tuo viso strano.

10 Vno disse che in suo paese nacievano le piv strane cose del modo; l'altro rispose: tu che sei vi na'tto, confermi ciò esser uero - per la stranezza della tua brutta presenza.

1089.

Dispreggiaìo uno vecchio publicamente vn giovane mostràdo auda'cemète nò temer quello, onde il giovane li rispuose che la sua liùga, ètà li facieva migliore scudo che la lingua o la forza.

13 Acquegli. 11 ndi "piv" insieme para. 14 siano .. tire tu .. chome. 15 tu. 16 chome.
1288. 1. disputàdo . circhustanti 2. gioco trarre. 3. jh no disse .. nle sarai .. parodi chalze .. gioco aciètato. 4. etrassele .. chalze. 4. conossèti .. trasmutati in instanso chalze. 6. chura ecqueido .. oni .. vegano. 7. sinphilidiso cano .. chole. 8. eligie .. vegano. 9. nascieva .. chose .. ui sena. 11. confermi .. straneza.
1289. dispregiaìo 1 vecchio .. mostràdo alda. 3. schudo chella lingha.

1288. The joke turns, it appears, on two meanings of trarre and is not easily translated.
Facietia.

2Sendo uno infermo in articulo di morte, esso sentì battere la porta, e domandato vno de' suoi serui chi era che batteva l'uscio, esso seruo rispose esser vna che si chiamava madonna Bona; allora l'infermo alzato le braccia al cielo ringraziò Dio con alta voce; poi disse ai serui che lasciassino venire presto questa, accioché potesse vedere vna donna "bona inazi che esso morisse, imperocché in sua vita mai ne vide nessuna.

A JEST.

A sick man finding himself in articulo mortis heard a knock at the door, and asking one of his servants who was knocking, the servant went out, and answered that it was a woman calling herself Madonna Bona. Then the sick man lifting his arms to Heaven thanked God with a loud voice, and told the servants that they were to let her come in at once, so that he might see one good woman before he died, since in all his life he had never yet seen one.

Facietia.

2Fu detto a vno che si levasse dal letto, perchè già era levato il sole; E lui rispose: se io avessi a fare tanto viaggio e facende quanto lui, ancora io sarei già levato, e però avendo a far si poco camino, ancora non mi voglio levare.

A JEST.

A man was desired to rise from bed, because the sun was already risen. To which he replied: "If I had as far to go, and as much to do as he has, I should be risen by now; but having but a little way to go, I shall not rise yet."

Vno vedendo vna femina parata a tener ta'vola in giostra guardò il tavolaccio e gridò vedendo la sua lancia: oimè quest'è troppo pic'col lavorante a si grà bottega.

A JEST.

A man, seeing a woman ready to hold up the target for a jousting match, exclaimed, looking at the shield, and considering his spear: "Alack! this is too small a workman for so great a business."

1290. Inscrive... rispose. 6. eres... chissi chiamav. 8. rigrazia. 9. chellisi. 11. potessi. 12. bessomorissi. 13. iperoche
1291. chissi levassi. 3. del... hera. 4. Ellai. 5. affare... viago. 6. "e facende" quanto. 7. avdo affa. 8. anchora no. 9. mi
vo levare.
1292. ingostra... tavolacco. 3.lassua... tropo pi. 4. assi... bottega.
IV.

PROPHECIES.

C. A. 143 a. 46 a]

1293.

THE DIVISION OF THE PROPHECIES.

First, of things relating to animals; secondly, of irrational creatures; thirdly of plants; fourthly, of ceremonies; fifthly, of manners; sixthly, of cases or edicts or quarrels; seventhly, of cases that are impossible in nature [paradoxes], as, for instance, of those things which, the more is taken from them, the more they grow. And reserve the great matters till the end, and the small matters give at the beginning. And first show the evils and then the punishment of philosophical things.

(Of Ants.)

These creatures will form many communities, which will hide themselves and their young ones and victuals in dark caverns, and they will feed themselves and their families in dark places for many months without any light, artificial or natural.

1293. Lines I—51 are in the original written in one column, beginning with the text of line II. At the end of the column is the programme for the arrangement of the prophecies, placed here at the head: Lines 56—79 form a second column, lines 80—97 a third one (see the reproduction of the text on the facsimile Pl. CXVIII).

Another suggestion for the arrangement of the prophecies is to be found among the notes 55—57 on page 357.

YY
[Dell'api.]

17 E a molti altri sarà tolate le mnvizioni e lor cibi, 18 e crudelmente da giecio sanza ragione saranno 19 sommese e annegate; o giustizia di Dio 20 perché nò ti desti a vedere così malmenare e tua 21 creati?

[Delle pecore vacche 22 e capre e simili.]

23 A innumerali saran tolti i loro piccoli figli 25 sì e quelli scarnati 26 e crudelissimameti squartati.

[Delle noci e vlue e ghia 28 de e castagnie e simili.]

29 Molti figlioli da spietate bastona 30 te fieno tolti dalle propie braccia delle lor 31 madri e gittati in terra e poi lacerati.

[De'fanciulì che stanno 32 legati nelle fascie.]

33 O città marine, io vedo in uoi i nostri cità 34 dini così femine come maschi stretamente dai forti legami colle braccia e ganbe esser legi 35 gati da gente che non intenderanno i nostri 36 guarni, e solui potrete sfogare li nostri dolori e per 37 duta libertà mediante i lagrimesi piú 38 ti e li sospiri e lamento, e infra uoi medesimi, chè chi vi lega, non v'interenda, nè voi loro intenderete.

[Delle gatte che mágiano i topi.]

44 A voi città dell'Africa si uedrà i uostri nati essere 45 squarciati nelle propie case de' crudelissimi e ra 46 paci animali del paese vostro.

[Delli asini bastonati.]

48 O natura, perchè ti sei fatto 49 partiale, facciédoti ai tua figli d'alcuna pietosa 50 e benignia madre, ad' altri crudelissima e spia 51 ta matrigna? io vedo i tua figlioli esser dati in al 52 trui seruità sanza mai benifi- tio alcuno, e in lo 53 squarciato de' fatti benifi 54 ti esser pagati 55 di grádissimi martiri, e spedere sempre la lo 56 r vita in benifi- tio del suo mal fattore.

(Of Bees.)

And many others will be deprived of their store and their food, and will be cruelly submerged and drowned by folks devoid of reason. Oh Justice of God! Why dost thou not wake and behold thy creatures thus ill used?

(Of Sheep, Cows, Goats and the like.)

Endless multitudes of these will have their little children taken from them ripped open and flayed and most barbarously quartered.

(Of Nuts, and Olives, and Acorns, and Chesnuts, and such like.)

Many offspring shall be snatched by cruel thrashing from the very arms of their mothers, and flung on the ground, and crushed.

(Of Children bound in Bundles.)

O cities of the Sea! In you I see your citizens—both females and males—tightly bound, arms and legs, with strong withes by folks who will not understand your language. And you will only be able to assuage your sorrows and lost liberty by means of tearful complaints and sighing and lamentation among yourselves; for those who will bind you will not understand you, nor will you understand them.

(Of Cats that eat Rats.)

In you, O cities of Africa your children will be seen quartered in their own houses by most cruel and rapacious beasts of your own country.

(Of Asses that are beaten.)

[48] O Nature! Wherefore art thou so partial; being to some of thy children a tender and benign mother, and to others a most cruel and pitiless stepmother? I see children of thine given up to slavery to others, without any sort of advantage, and instead of remuneration for the good they do, they are paid with the severest suffering, and spend their whole life in benefitting those who ill treat them.

48. Compare No. 845.
(Delli omini che dormono nell'asse d'alberi.)

57 Li omini dormiranno e mägiaranno e abiteranno 58 infra li alberi nell'este selve e campagne.

(De' cristiani.)

81 Molti che tengono la fede del figlio-8lo e sol fan tempi nel nome 8 della madre.

(Of Men who sleep on boards of Trees.)

Men shall sleep, and eat, and dwell among trees, in the forests and open country.

(De' cristiani.)

81 Molti che tengono la fede del figlio-8lo e sol fan tempi nel nome 8 della madre.

(Of Christians.)

Many who hold the faith of the Son only build temples in the name of the Mother.

(De' cristiani.)

81 Molti che tengono la fede del figlio-8lo e sol fan tempi nel nome 8 della madre.

(Of Food which has been alive.)

[84] A great portion of bodies that have been alive will pass into the bodies of other animals; which is as much as to say, that the deserted tenements will pass into the inhabited ones, furnishing them with good things, and carrying with them their evils. That is to say the life of man is formed from things eaten, and these carry with them that part of man which dies ...

C. A. 1436; 406.6]

(De' cibi stato animato.)

84 Gran parte de' corpi animati 8 passerà pe' corpi degli altri animali, 86 cioè le case disabitate passerà 87 in pezzi per le case abitate, dan88 do a quella vite, e portà89 do così seco i suoi danni, 96 cioè la uita dell'omo si fa dalle cose 97 mägiate-, le quali portà con se92 co la parte dell'omo ch' è morta ...
HUMOROUS WRITINGS.

C. A. 3624; 11430.

(Dell auaro.)

Molti fieno quelli che con ogni studio e sollecitudine seguiranno, con furia quella cosa che sempre li a spaccatati, nò conoscedo la sua malignità.

(Delli omini che, quàto pív inuechiano, piv si fanno avarì, chè ausèdòsi a star poco dovrebbero farsi liberali.)

Vedansi a quelli, che son giudicati di piv speriètta e giudítio, quanto egli anno me bisogno delle cose, có piv uvidità cercarle e riserrarle.

(Della fossa.)

Starà molti occupati in esercizio a leuare di quella cosa che tanto crescerà, quam to se ne leuò.

(Del peso posto sul piumaccio.)

E a molti corpi nel vedere da lor leuar la testa, si vedrà manifestamente crescere, e rendendo loro la leuità testa, immediatamente diminuiscono la greadezza.

(Del pigliare de' pidocchi.)

Saran molti cacciatori d'animali che, quanto pív nel pigliaranno maco n'avrà, e così de conuerso pív n'avrà, quátto men ne piglieranno.

(Dello tignere l'acqua colle 2 sechie a vna sola corda.)

E rimaranno occupati molti che quàto riviranno in giù la cosa, essa pív se ne fugìra in contrario modo.

(Le lingue de' porci e vitelli nelle budelle.)

O cosa spurca, che si vedrà l'uno animale aver la lingua in culo all'altro.

(De' crivelli fatti di pelle d'animali.)

Vedrassi il cibo degli animali passar dentro alle lor pelli per ogni parte salvo che per la bocca, e penetra distrutto dall'opposta parte insino alla piana terra.

1295.

(Of the Avaricious.)

There will be many who will eagerly and with great care and solicitude follow up a thing, which, if they only knew its malignity, would always terrify them.

(Of those men, who, the older they grow, the more avaricious they become, whereas, having but little time to stay, they should become more liberal.)

We see those who are regarded as being most experienced and judicious, when they least need a thing, seek and cherish it with most avidity.

(Of the Ditch.)

Many will be busied in taking away from a thing, which will grow in proportion as it is diminished.

(Of a Weight placed on a Feather-pillow.)

And it will be seen in many bodies that by raising the head they swell visibly; and by laying the raised head down again, their size will immediately be diminished.

(Of catching Lice.)

And many will be hunters of animals, which, the fewer there are the more will be taken; and conversely, the more there are, the fewer will be taken.

(Of Drawing Water in two Buckets with a single Rope.)

And many will be busily occupied, though the more of the thing they draw up, the more will escape at the other end.

(Of the Tongues of Pigs and Calves in Sausage-skins.)

Oh! how foul a thing, that we should see the tongue of one animal in the guts of another.

(Of Sieves made of the Hair of Animals.)

We shall see the food of animals pass through their skin everyway excepting through their mouths, and penetrate from the outside downwards to the ground.

1295. 2. fiennò... essollecitudine seguirono. 3. chesnepre. 6. fano astar... doberebò. 7. vedansì acquelli chesn gudicham... gudito. 9. della fossa... della informa di frenesia o farmenu. 10. dissanà di cernuolo. 11. molti "ochupati" in... allumàtr... di... chesa cresciere. 12. ta se ne leuò [acqueto pív se ne pone pív gressere diminuisc]. 13. piumaccio. 14. molti corpi... dallor... manàt [i]. 15. cresciere... imediáte. 16. diminvissee. 17. pidochi. 18. essaràn. 19. nanàno... nanàr. 21. dellottignier laca"a", 22. ochupati... pív [tirarà]. 23. trieràna in gu. 25. la salisìca che... mu nelle budelle. 26. molti si farà cesa "abiteranò nelle" delle propie. 27. lingue de' porci "e vidili" nelle. 28. spurca... bocha. 31. bocha. 33. oposità. 34. ferço... possenti... difedere. 38. volatili. 40. zocholi. 41. chelli. 45. dellì "grandì"
PROPHECIES.

35 The cruel horns of powerful bulls will screen the lights of night against the wild fury of the winds.

36 Flying creatures will give their very feathers to support men.

37 The mire will be so great that men will walk on the trees of their country.

38 And in many parts of the country men will be seen walking on the skins of large beasts.

39 There will be great winds by reason of which things of the East will become things of the West; and those of the South, being involved in the course of the winds, will follow them to distant lands.

40 Men will speak to men who hear not; having their eyes open, they will not see; they will speak to these, and they will not be answered. They will implore favours of those who have ears and hear not; they will make light for the blind.

41 There will be many men who will move one against another, holding in their hands a cutting tool. But these will not do each other any injury beyond tiring each other; for, when one pushes forward the other will draw back. But woe to him who comes between them! For he will end by being cut in pieces.

42 Dismal cries will be heard loud, shrieking with anguish, and the hoarse and smothered tones of those who will be despoiled, and at last left naked and motionless; and this by reason of the mover, which makes every thing turn round.

animali. 46. sara . . occi [i]. 48. ecquelle dinezodi. 51. pareranno . . ali . . sentiranno . . arà gli [i]. 52. nò fie lor riss. 53. aciai orecchi . . lume e [l]. 51. he orbo parerà color di ciò gra [i] [i] [i] [i] sre. 55. presossich. 56. metti per ordine e meziali cernimento chiesiansno e così fa del. 57. gorno e della norte. 59. molti [chezzanza motor di piedi] si moverà [cholle br fur] .[f[ia alie cholle testa]. 60. chostra . . itagliente. 61. infralor. 62. chachiera inati. 63. trio chiesiafra mezo . . rimara. 64. impezi. 65. dasseta. 66. doleti grida [fatti chon diuere voc] le. 67. rave e inochiato
**HUMOROUS WRITINGS.**

(Of putting Bread into the Mouth of the Oven and taking it out again.)

In every city, land, castle and house, men shall be seen, who for want of food will take it out of the mouths of others, who will not be able to resist in any way.

(Of tilled Land.)

The Earth will be seen turned up side down and facing the opposite hemispheres, uncovering the lurking holes of the fiercest animals.

(Of Sowing Seed.)

Then many of the men who will remain alive, will throw the victuals they have preserved out of their houses, a free prey to the birds and beasts of the earth, without taking any care of them at all.

(Of the Rains, which, by making the Rivers muddy, wash away the Land.)

[81] Something will fall from the sky which will transport a large part of Africa which lies under that sky towards Europe, and that of Europe towards Africa, and that of the Scythian countries will meet with tremendous revolutions [84].

(Of Wood that burns.)

The trees and shrubs in the great forests will be converted into cinder.

(Of Kilns for Bricks and Lime.)

Finally the earth will turn red from a conflagration of many days and the stones will be turned to cinders.

(Of boiled Fish.)

The natives of the waters will die in the boiling flood.

(Of the Olives which fall from the Olive trees, shedding oil which makes light.)

And things will fall with great force from above, which will give us nourishment and light.

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81—84. Compare No. 945.
Delle ciotette e gufi; ciò che succhiella alla parra.

Molti periranno di fracassamento di testa e salteranno loro li occhi in grà parr te della testa per causa d'animali pav rosi vsciti dalle tenebre.

Del lino che fa la cura de' giièti.

Sarà reveriti e onorati e có recerçita e òmore ascoltati, li sua precetti di chi prima fusse legato, stratificato o martorizzato da molte e diverse battitoe.

De' libri che insegnano precetti.

I corpi sanz'anima ci daranno con lor sententie precetti vtili al ben morire.

De' battuti e scoreggiati.

Li omini si nasconderanno sotto le scorze delle scorticite erbe, e quii grie dando si darà martiri con battitie di menbra a se medesimi.

Delle maniche de' coltegli fatte di corna di castrone.

Nelle corna dell' animali si vedranno taglietì. Ferri colli quali si torna la uita a molti della loro spetie.

Della note che nô si conosce alcun colore.

Verrà a tanto che non si conoscerà differenza infra colori, anzi si faran tutti di nera qualità.

Delle spade e lance che per se mai muocono a nessuno.

Chi per se è màsutto e sanza alcuna offensione, si farà spauenutevole e feroce mediante le triste cópa eignie, e torrà la vita crudelissimamente a molte genti; e pìv n'ucciderbbe, se corpi sì'z'anima e usciti dalle speelonche non lì difendessino, cioè le corazze di ferro.

De' lacciule e trappole.

Molti morti si moverà con furia e piglieràno e legheranno vivi, e serviranno gli a lor nemici circa la lor morte e distruzione.

Of Owls and screech owls and what will happen to certain birds.

Many will perish of dashing their heads in pieces, and the eyes of many will jump out of their heads by reason of fearful creatures come out of the darkness.

Of flax which works the cure of men.

That which was at first bound, cast out and rent by many and various beaters will be respected and honoured, and its precepts will be listened to with reverence and love.

Of Books which teach Precepts.

Bodies without souls will, by their contents give us precepts by which to die well.

Of Flagellants.

Men will hide themselves under the bark of trees, and, screaming, they will make themselves martyrs, by striking their own limbs.

Of the Handles of Knives made of the Horns of Sheep.

We shall see the horns of certain beasts fitted to iron tools, which will take the lives of many of their kind.

Of Night when no Colour can be discerned.

There will come a time when no difference can be discerned between colours, on the contrary, everything will be black alike.

Of Swords and Spears which by themselves never hurt any one.

One who by himself is mild enough and void of all offence will become terrible and fierce by being in bad company, and will most cruelly take the life of many men, and would kill many more if they were not hindered by bodies having no soul, that have come out of caverns that is, breastplates of iron.

Of Snares and Traps.

Many dead things will move furiously, and will take and bind the living, and will ensnare them for the enemies who seek their death and destruction.
HUMOROUS WRITINGS.

(De' metalli.)

132. Uscirà dalle oscure e tenebrosa spelonche, che metterà tutta l'umana potestà in grandi affanni, pericoli e morte; a molti segui' ci lor, dopo molti affanni, darà' 133. diletto; ma chi no ha suo partigiano morrà' 134. con stento e calamità; questo commetterà' infiniti tradimenti, questo avventura' e persuaderà' li omni tristi alli assassinamenti e latrocini e le per- fide; questa darà' 135. sospetto a' i suoi partigiani, questo torrà' 136. lo stato alle città libere; questo torrà' 137. la uita a molti; questo travagherà' infiniti omini infra loro con molte arti, inganni e tradimenti; o animali molti e stuprioso! Qu' omini che tutti tornassero nell'inferno! per costui 138. s'imarrà diserte le grà' sole delle lor' 139. piú; per costui infiniti animali perderanno la uita.

(Of Metals.)

That shall be brought forth out of dark and obscure caves, which will put the whole human race in great anxiety, peril and death. To many that seek them, after many sorrows they will give delight, and to those who are not in their company, death with want and misfortune. This will lead to the commission of endless crimes; this will increase and persuade bad men to assassinations, robberies and treachery, and by reason of it each will be suspicious of his partner. This will deprive free cities of their happy condition; this will take away the lives of many; this will make men torment each other with many artifices deceptions and reasons. O monstrous creature! How much better would it be for men that every thing should return to Hell! For this the vast forests will be devastated of their trees; for this endless animals will lose their lives.

(Of Fire.)

One shall be born from small beginnings which will rapidly become vast. This will respect no created thing, rather will it, by its power, transform almost every thing from its own nature into another.

(Of Ships which sink.)

Huge bodies will be seen, devoid of life, carrying, in fierce haste, a multitude of men to the destruction of their lives.

(Of Oxen, which are eaten.)

The masters of estates will eat their own labourers.

(Of beating Beds to renew them.)

Men will be seen so deeply ungrateful that they will turn upon that which has harboured them, for nothing at all; they will so load it with blows that a great part of its inside will come out of its place, and will be turned over and over in its body.

(Of Things which are eaten and which first are killed.)

Those who nourish them will be killed by them and afflicted with merciless deaths.

Dello specchiar le mura delle città nel l'acqua de' loro fossi.)

182 Vedrannosi l'alter muro delle grà città sotto sopra ne' loro fossi.

(361 del de' fiumi, e delle pole 186 e nebbia mista coll'aria, e del 187 loco misto col suo e altri cò dascìo.)

183 Vedrassi tutti li elementi insieme misti con grà re'svoluzione trascorrere ora inverso il centro del nò 190 do, ora inverso il celo, e quàdo dalle parti meri'191 dionali scorere có furà inverso il fred 192 do set-tentrione, qualche volta dall'orìce inverso l'occidente, e così di questo in quell'alto tro emisferio.

(In ogni punto si può fare divisió ne' de' 2 emisperio.)

196 Li omini tutti scàbieranno emisferio immediate.

(376 da huo e' resistente a occidente.)

199Movèrannósi tutti li animali da orìete a occidente, e così da aquilone a meriggio scavievolmète, e così de' còuercso.

(Del moto dell'acque che portano 202 i legnami che son morti.)

203 Corpi sanz'anima, per se medesimi si moveranno e porterà 201 con seco innume-rabile generazione di morti, togliendo le richèze a circustranti viuèti.

(377 che sendo màgiane nò possono fare e pulcini.)

208O quanti fiè quegli, ai quali sarà pro-bito il nascere!

(De' pesci che si màgiano non nati.)

210 Infinita generazione si perderà per la morte delle graude.

(Del piàto fatto il venerdì santo.)

210 In tutte le parti d'Europa sarà piàto da grà popoli per la morte d'ù 221 solo omo morto in orìete.

(Of the Reflection of Walls of Cities in the Water of their Ditches.)

The high walls of great cities will be seen up side down in their ditches.

(379 of Water, which flows turbid and mixed with Soil and Dust; and of Mist, which is mixed with the Air; and of Fire which is mixed with its own, and each with each.)

All the elements will be seen mixed together in a great whirling mass, now borne towards the centre of the world, now towards the sky; and now furiously rushing from the South towards the frozen North, and sometimes from the East towards the West, and then again from this hemisphere to the other.

(The World may be divided into two Hemi-spheres at any Point.)

All men will suddenly be transferred into opposite hemispheres.

(The division of the East from the West may be made at any point.)

All living creatures will be moved from the East to the West; and in the same way from North to South, and vice versa.

(Of the Motion of Water which carries wood, which is dead.)

Bodies devoid of life will move by themselves and carry with them endless generations of the dead, taking the wealth from the bystanders.

(Of Eggs which being eaten cannot form Chickens.)

Oh! how many will they be that never come to the birth!

(Of Fishes which are eaten unborn.)

Endless generations will be lost by the death of the pregnant.

(Of the Lamentation on Good Friday.)

Throughout Europe there will be a lamenta-tion of great nations over the death of one man who died in the East.

HUMOROUS WRITINGS.

[1295.

**Del sogniare.**

Andrandro li omini e nò si moveranno, 221 parleranno có chi no si trova, sentí 225 trao chi no parla.

**Dell’ombra che si move coll’uomo.**

Vedrannosi forme e figure d’uomini e d’animali, che seguiranno essi ansi 228 e omini doevunque fugrarno, 230 e tal fia il moto di lui qual è dell’altro, ma parà cosa mirabile delle 233 varie grandezze in che essi si trasmutano.

**Dell’ ombra del sole e dello spechiarsi nell’acqua in un medesimo tempo.**

Delle casse che riseranno 210 molti tesori.

Tovrassì, dentro a de’ noci e deli alberi, 214 e altre piante tesori grádissimi, i quali 213 li stanno occulti e ben guardati.

**Dello spegnere el lume a chi va al letto.**

Molti per mandare fori el fiato con troppa prestezza perderanno el uce 247 dере e in briece tutti el sentimèti.

**Delle canpanelle de’ muli che stanno presso ai loro orechi.**

Sentirasi in molte parti dell’Europa struometi di uarie magnitudini far duere 253 armonie con grandissime fatiche di chi 251 iv presso l’ode.

**Delli asini.**

Le molte fatiche saran remnerate di fume, di sete, di disagio, e de mazzate, e di pù ture, e bestemìe, e grà illanìe.

**De’ soldati a cavallo.**

Molti sarà vedutì portati da gràdì ani 261 malì con veloce corso alla ruina della sua vita e prestissima morte.

Per l’aria e per la terra saranno veduti ani 261 malì di diversi colori portarne có fu 265 rore li omini alla destruzione di lor vita.

**Delle stelle delle sporni.**

Per causa delle stelle si uedranno li 267 esser velociissimi al pari di qualle 269 animal ueloce.

**Of Dreaming.**

Men will walk and not stir, they will talk to those who are not present, and hear those who do not speak.

**Of a Man’s Shadow which moves with him.**

Shapes and figures of men and animals will be seen following these animals and men wherever they flee. And exactly as the one moves the other moves; but what seems so wonderful is the variety of height they assume.

**Of our Shadow cast by the Sun, and our Reflection in the Water at one and the same time.**

Many a time will one man be seen as three and all three move together, and often the most real one quits him.

**Of wooden Chests which contain great Treasures.**

Within walnuts and trees and other plants vast treasures will be found, which lie hidden there and well guarded.

**Of putting out the Light when going to Bed.**

Many persons puffing out a breath with too much haste, will thereby lose their sight, and soon after all consciousness.

**Of the Bells of Mules, which are close to their Ears.**

In many parts of Europe instruments of various sizes will be heard making divers harmonies, with great labour to those who hear them most closely.

**Of Asses.**

The severest labour will be repaid with hunger and thirst, and discomfort, and blows, and goadings, and curses, and great abuse.

**Of Soldiers on horseback.**

Many men will be seen carried by large animals, swift of pace, to the loss of their lives and immediate death.

In../../.../in the air and on earth animals will be seen of divers colours furiously carrying men to the destruction of their lives.

**Of the Stars of Spurs.**

By the aid of the stars men will be seen who will be as swift as any swift animal.

PROPHECIES.

[[Il bastone chi' è morto.]]

271 Il movimeto de' morti farà fugire
cò dolore e piato e cò grida molti
viui.

[[Dell' esca.]]

271 Cò pietra e con ferro si rende275
ranno visibili le cose che prima nò 275
si vedeano.

C. A. 362 d.; 1131 d.

1296.

[[Del navigare.]]

2 Vedrassì li alberi delle grà selue
di Taurus, c e di Sinai, Apennino, e Atlante
scorrere per l'aria 4da oricte a occidète, da
aquilone a meridìe, e portaranno per l'aria
grá moltitudine 6d'omini; o quàti voti! o
quàti mor'ti! o quanta speratiò d'amici e di
parètì! o quàti fiè quelli che nò rivedranno
piè le lor prov'vinicì nè le lor patrie, e che
moriranno sanza se'polture colle lor ossa
sparse in diuersi 14°patrie, o sia senza

[[Dello sgomberare l'ogni santi.]]

13 Molti abbandoneranno le propie abita-
tioni, e por'4terà cò seco tutti e sua valsenti,
andran 3no abitare in altri paesi.

[[Del di de' morti.]]

17 E quàti fiè quelli che piàgeranno i
lor 18 antichi morti portàdo lumi à quelli.

[[De' frati che spéedendo parole; 20 ricueuono
di grà ricezze e danno 21 il paradiso.]]

21 Le invisibili monete farà tròfare
molti spe'25 diorie di quelle.

[[Degli archi fatti 27 colli corni de'boi.]]

28 Molti fiè quelli che per causa delle
bouine cor'9na moriranno di dolente morte.

[[Dello scriver lettere da vn 3pàese a vn
altro.]]

32 Parleransì li uomini di remotissimi paesi
l'uno àl'altro e rispòderàsi.

[[Degli emisferi che sono infiniti 34 e da
infinité linie son diuissi, in mo'4 do che senpre
ciascuno uomo n' à 36 vna d'esse linie intra
l'ù de' piedi e l'altro.]]

37 Parleransì e coccheransì e abbraccieran
si li uomini stanti da l'uno àl'altro emisperio,
et tenderansì i loro linguaggi.

1296. 1. navigare. 3. apennino etatal scorere. 4. occidète. 5. portarono. 6. [di spolia] domini. 8. rivedersano. 9. nella... morà.
10. cholle... diuissi. 12. isgombra. 14. chôescho... andra. 17. i lor[parèj]. 20. ricueuano... riche e
dano. 22. [vedrassi gradissima turba i quali acquistarì gra]. 23. [dizime richiezze chi prezio invisibile monete]. 24. in-
visibile. 28. charua. 33. chossano. 35. ciascuno homo. 36. infralli lua piedì. 37. coccherano e abbraccieran. 38. lor-
De' preti che dicono messe.

40. Molti sien quelli che per esercitare la lor arte si uestirà richissimi e questo parrà esser fatto seco'do l'uso dei greziali.

De' frati confessori.

43. Le suettrute donne di propria volon'ità andranno a palesare agli omini tutti le loro lussurie e opere vergognose e segrette sime.

Delle chiese e abitati di frati.

51. Assai saranno che lascieranno li eserciti e le fatiche e povertà di uita e di robba, e andranno abitare nelle richesse e triofanti edifici mostrando questo esser il mezzo di farsi amico a Dio.

Del vendere il paradiso.

67. Infinita moltitudine venderanno publicamente e pacificamente cose di grandissimo prezzo sanza licenza del padrone di quelle, e che mai no furo loro nè in lor potestà, e a questo nò prove'drà la giustitia vmana.

De' morti che si uanno a sotterrare.

60. I semplici popoli porterà gran quantità di lumi per far lumi ne' viaggi a tutti quelli che integralmente anno perso la uirtù visiua.

Delle doti delle fanciulle.

77. E dove prima la gioventù feminina no si potea difendere dall'la lussuria e rapina de' maschi, nè per guardie di parenti nè fortezze di mura, verrà tempo che biongierà che padri e parenti d'esse fanciulle le paghino di grà prezzi chi voglia dormire con loro, ancoraché es' se sien ricche, nobili, e bellissime; cierto è, par qui che la natura voglia spegnire la umana spettie come cosa invile al mondo, e guaatrarice di tutte le cose create.

Della crudelità dell'omo.

79. Vedranossi animali sopra della terra, i quali sempre con batteranno infra loro e

Of Priests who say Mass.

There will be many men who, when they go to their labour will put on the richest clothes, and these will be made after the fashion of aprons [petticoats].

Of Friars who are Confessors.

And unhappy women will, of their own free will, reveal to men all their sins and shameful and most secret deeds.

Of Churches and the Habitations of Friars.

Many will there be who will give up work and labour and poverty of life and goods, and will go to live among wealth in splendid buildings, declaring that this is the way to make themselves acceptable to God.

Of Selling Paradise.

An infinite number of men will sell publicly and unhindered things of the very highest price, without leave from the Master of it; while it never was theirs nor in their power; and human justice will not prevent it.

Of the Dead which are carried to be buried.

The simple folks will carry vast quantities of lights to light up the road for those who have entirely lost the power of sight.

Of Dowries for Maidens.

And whereas, at first, maidens could not be protected against the violence of Men, neither by the watchfulness of parents nor by strong walls, the time will come when the fathers and parents of those girls will pay a large price to a man who wants to marry them, even if they are rich, noble and most handsome. Certainly this seems as though nature wished to eradicate the human race as being useless to the world, and as spoiling all created things.

Of the Cruelty of Man.

Animals will be seen on the earth who will always be fighting against each other.
PROPHECIES.

There will be many which will increase in their destruction.

There will be many who, forgetting their existence and their name, will lie as dead on the spoils of other dead creatures.

The East will be seen to rush to the West and the South to the North in confusion round and about the universe, with great noise and trembling or fury.

The solar rays will kindle fire on the earth, by which a thing that is under the sky will be set on fire, and, being reflected by some obstacle, it will bend downwards.

... essenso ... ciascuna, 81. parte ... ars, 82. attiera, 83. poichessari passenti ... dellor, 81. affanno "e fatiche e guerre e furii" acquequelle cosa animata "e per la loro assimutata superba" questi, 85. mala ... geavanza "delle lor menvra" gli tera, 86. restera ... ossotto ellaacqua, 87. quasta escevalla, 88. ettratino ... iga da, 89. chome me nò tapri e precipita nellalre fissura, 90. palatiri e spindle acce ... dissipa.

Gran parte del mare si fuggirà inverso il cielo e per molto tempo non rà ritorno; (Cioè pe' nuvoli.)

Restaci il moto che separa il motore dal mobile.

Sarà annegato chi fa il lume al culto diuino. (Le ape che fa' nano la cera delle candele.)

I morti usciranno di sotto terra e coi loro fieri mouimenti caccieranno dal mondo innumerevoli creature umane.

Il ferro uscito di sotto terra è morto, e se ne fa l'arme che ammorti tanti uomini.

Le grandissime montagne coracherà sieno remote da marini liti, scaccierà il mare dal suo sito.

Questo sono li fiumi che portano le terre, da loro leuate dalle montagne, e le scaricare mo ai marini, e do' entro la terra si fuggirà il mare.

L'acqua caduta dai nuvoli ancora in moto sopra le spiagge de' monti si fermerà per lugo spazio di tempo senza fare alcun moto, e questo accade in molte e diuerse province.

La neve che fiocca è acqua.

I gran sassi de' monti gitterà fuoco tale che bruceranno il le legname di molte e grandi selve e molte fere salutatiche e dimestiche.

La pietra del fuoco, che fa foco che consuma' ma tutte le seme del le legnie con che si disfa le selve; E cuocierassi con esse la carne delle bestie.

O quanti grandi edifizj fieno ruinati per causa del fuoco!

Del fuoco delle bonbarde.

I buoi fieno in gran parte causa delle ruine delle città, e similmente cavalli e bufali

(Del fire delle bonbarde.)

A great part of the sea will fly towards heaven and for a long time will not return. (That is, in Clouds.)

There remains the motion which divides the mover from the thing moved.

Those who give light for divine service will be destroyed. (The Bees which make the Wax for Candles.)

Dead things will come from underground and by their fierce movements will send numberless human beings out of the world. (Iron, which comes from under ground is dead but the Weapons are made of it which kill so many Men.)

The greatest mountains, even those which are remote from the sea shore, will drive the sea from its place.

This is by Rivers which carry the Earth they wash away from the Mountains and bear it to the Sea-shore; and where the Earth comes the sea must retire.

The water dropped from the clouds still in motion on the flanks of mountains will lie still for a long period of time without any motion whatever; and this will happen in many and divers lands.

Snow, which falls in flakes and is Water.

The great rocks of the mountains will throw out fire; so that they will burn the timber of many vast forests, and many beasts both wild and tame.

The Flint in the Tinder-box which makes a Fire that consumes all the loads of Wood of which the Forests are despoiled and with this the flesh of Beasts is cooked.

Oh! how many great buildings will be ruined by reason of Fire.

The Fire of great Guns.

Oxen will be to a great extent the cause of the destruction of cities, and in the same way horses and buffaloes

(by drawing Guns.)
1298.

The Lion tribe will be seen tearing open the earth with their clawed paws and in the caves thus made, burying themselves together with the other animals that are beneath them.

Animals will come forth from the earth in gloomy vesture, which will attack the human species with astonishing assaults, and which by their ferocious bites will make confusion of blood among those they devour.

Again the air will be filled with a mischievous winged race which will assail men and beasts and feed upon them with much noise—filing themselves with scarlet blood.

1299.

Blood will be seen issuing from the torn flesh of men, and trickling down the surface.

Men will have such cruel maladies that they will tear their flesh with their own nails. (The Itch.)

Plants will be seen left without leaves, and the rivers standing still in their channels.

The waters of the sea will rise above the high peaks of the mountains towards heaven and fall again on to the dwellings of men. (That is in, Clouds.)

The largest trees of the forest will be seen carried by the fury of the winds from East to West. (That is across the Sea.)

Men will cast away their own victuals. (That is, in Sowing.)

1300.

Human beings will be seen who will not understand each other's speech; that is, a German with a Turk.

Fathers will be seen giving their daughters into the power of man and giving up all their former care in guarding them. (When Girls are married.)

Men will come out their graves turned into flying creatures; and they will attack other men, taking their food from their very hand or table. (As Flies.)
1301. Molti fien quegli che scorticàdo la madre li arrovescieranno la sua pelle adosso; [i lavoratori della terra.] 1302. Felici siè quelli che presteràno ore-2 chi alle parole de' morti; [Leggere le bone opere e osservarle.] 1303. Many will there be who, slaying their mother, will tear the skin from her back. [Husbandmen till the Earth.] 1304. Happy will they be who lend ear to the words of the Dead. [Who read good works and obey them.] 1305. Feathers will raise men, as they do birds, towards heaven [that is, by the letters which are written with quills.] 1306. The works of men's hands will occasion their death. [Swords and Spears.] 1307. Men out of fear will cling to the thing they most fear. [That is they will be miserable lest they should fall into misery.] 1308. Things that are separate shall be united and acquire such virtue that they will restore to man his lost memory; that is papyrus [sheets] which are made of separate strips and have preserved the memory of the things and acts of men. 1309. The bones of the Dead will be seen to govern the fortunes of him who moves them. [By Dice.] 1310. Cattle with their horns protect the Flamme from its death. [In a Lantern.] 1311. The Forests will bring forth young which will be the cause of their death. [The handle of the hatchet.]

1301. Le penne leueràno li omini siccome gli ucielli inverso il cielo; [cioè per le lettere fatte da esse pène.] 1302. L'umane opere fieno cagione di lor morte; [le spade e laèce.] 1303. Li omini perseguiranno quella cosa della qual pív temono; [sarà miseri per nò venire i miseria.] 1304. Le cose disunite s'uniranno e ricieveràno in se tal uirtù, che rëràno la persa memoria alli omìni, cioè i papiri che sò fatti di peli disuniti tégono memòria delle cose e fatti dell'omini. 1305. Vedranosi l'ossa de' morti cò veloce moto tratta're la fortuna del suo motore; [i dadi.] 1306. I buoi colle lor corna difenderàno il foco dalla sua morte; [la läterna.] 1307. Le selue partoriranno figlioli che fiano causa della loro morte; [il manico della scura.] 1308. Li omini batteràno aspraméte; chia-19 se causa di lor uita; [batteràno il grano.] 1309. Le pelli delli animali removeràno li omini con gran igrideri e bestemie dal lor silentio; [le balle da giocare.] 1310. Molte volte la cosa disunita fia causa di gràde unitione; [cioè il pettine fatto dalla disunità canna unisce le ?fila nella seta.] 1311. Il vèto passato per le pelli delli animali farà saltare gli omini; [cioè la piva che fa lo saltare.] 1312. Many will deal bitter to blows to that which is the cause of their life. [In thrashing Grain.] 1313. The skins of animals will rouse men from their silence with great outcries and curses. [Balls for playing Games.] 1314. Very often a thing that is itself broken is the occasion of much union. [That is the Comb made of split Cane which unites the threads of Silk.] 1315. The wind passing through the skins of animals will make men dance. [That is the Bag-pipe, which makes people dance.]
1303.  
(De noci battuti.)  
Quelli che avranno fatto meglio, saranno piv battuti e i suoi figlioli toli e scorticati overo spogliati e rotte e frascassate le sue ossa.  
(Of Walnut trees, that are beaten.)  
Those which have done best will be most beaten, and their offspring taken and flayed or peeled, and their bones broken or crushed.

1304.  
(E delle scolture.)  
Oimè, che vedo il salvatore di novo crocifisso.  
(Of Sculpture.)  
Alas! what do I see? The Saviour crucified anew.

1305.  
(De' preti chenengono l'ostia in corpo.)  
Quelli che inboccheranno, per l'altrui mani faro tolto il cibo di bocca;  
(Of Priests who bear the Host in their body.)  
Then almost all the tabernacles in which dwells the Corpus Domini, will be plainly seen walking about of themselves on the various roads of the world.

1306.  
(De' crocifissi vèduuti.)  
Io vedo di novo veduto e crocifisso Cristo se marterizzare i suoi sâti.  
(Of Crucifixes which are sold.)  
I see Christ sold and crucified afresh, and his Saints suffering Martyrdom.

I.2 176]  
(De' noci battuti.)  
Quelli che avranno fatto meglio, saranno piv battuti e i suoi figlioli toli e scorticati overo spogliati e rotte e frascassate le sue ossa.  
(Of Walnut trees, that are beaten.)  
Those which have done best will be most beaten, and their offspring taken and flayed or peeled, and their bones broken or crushed.

I.2 188]  
E quelli che pascono l'erbe farà della notte 3 giorno; [Sevo.]  
And those who feed on grass will turn night into day (Tallow.)

I.2 188]  
E molti terrestri e acquatici animali morteranno fralle stelle; [Cioè pianeti.]  
And many creatures of land and water will go up among the stars (that is Planets.)

I.2 188]  
Vedrassi i morti portare i vivi;  
The dead will be seen carrying the living (In Carts and Ships in various places.)

I.2 188]  
A molti farà il cibo di bocca;  
Food shall be taken out of the mouth of many (the oven's mouth.)

I.2 188]  
Quelli che si inboccheranno, per l'altrui mani faro tolto il cibo di bocca; (Il forno.)  
And those which will have their food in their mouth will be deprived of it by the hands of others (the oven.)

I.2 188]  
E quelli che pascono l'erbe 2 farà della notte 3 giorno; [Sevo.]  
And those who feed on grass will turn night into day (Tallow.)

I.2 188]  
E molti terrestri e acquatici animali morteranno fralle stelle; [Cioè pianeti.]  
And many creatures of land and water will go up among the stars (that is Planets.)

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Vedrassi i morti portare i vivi;  
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And those which will have their food in their mouth will be deprived of it by the hands of others (the oven.)
1306. (Of Children who are suckled.)

Many Franciscans, Dominicans and Benedictines will eat that which at other times was eaten by others, who for some months to come will not be able to speak.

(Of Cockles and Sea Snails which are thrown up by the sea and which rot inside their shells.)

How many will there be who, after they are dead, will putrefy inside their own houses, filling all the surrounding air with a fetid smell.

1307. (Of Mules which have on them rich burdens of silver and gold.)

Much treasure and great riches will be laid upon four-footed beasts, which will convey them to divers places.

1308. (Of the Shadow cast by a man at night with a light.)

Huge figures will appear in human shape, and the nearer you get to them, the more will their immense size diminish.

1306. It seems to me probable that this note, which occurs in the note book used in 1502, when Leonardo, in the service of Cesare Borgia, visited Urbino, was suggested by the famous pillage of the riches of the palace of Guidobaldo, whose treasures Cesare Borgia at once had carried to Cesena (see Gregorovius, Geschichte der Stadt Rom im Mittelalter, XIII, 5, 4).
1309.

Delle biscie portate dalle ciconie. 
Vedrannosi in grandissima altezza dell’aria lughiissimi serpenti à contattere colli uccelli.
Delle bóbarde ch’escono dalla fossa e dalla forma.
Uscirà di sotto terra chi con spauete-voli grida stordirà i circonstanti vicini e col suo fiato farà morire li ominï e ruinare le città e castella.

1310.

Del grão e altre semêze.
Gitteranno li ominï fori delle lor propie case quelle utsestalligie, le quali erà dedicate a sostentare la lor uita.
Delli alberi che nutriscono i nesti.
Vedrannosi i padri e le madri fare molto pîv giovamento ai figliastri che ai lor ueri figlioli.
Del turibolo dell’incèso.
Quelli che cò uestimèti bianchi andranno con arrogante movimèto minacciando con metallo e fuoco, che nò facieva lor detrimento alcuno.

1311.

Del segare dell’erbe.
Spégneransi innumerabili viti e farassi sopra la terra innumerabili buchi.
Della vita dell’omini che ogni año si mvtano di carne.
Li ominï passerà morti per le sue propie budele.

Of Snakes, carried by Storks.
Serpents of great length will be seen at a great height in the air, fighting with birds.
Of great guns, which come out of a pit and a mould.
Creatures will come from underground which with their terrific noise will stun all who are near; and with their breath will kill men and destroy cities and castles.

Of Grain and other Seeds.
Men will fling out of their houses those victuals which were intended to sustain their life.
Of Trees, which nourish grafted shoots.
Fathers and mothers will be seen to take much more delight in their step-children then in their own children.
Of the Censer.
Some will go about in white garments with arrogant gestures threatening others with metal and fire which will do no harm at all to them.

Of drying Fodder.
Innumerabili lives will be destroyed and innumerabili vacant spaces will be made on the earth.
Of the Life of Men, who every year change their bodily substance.
Men, when dead, will pass through their own budeles.
S. K. M. II. 2: 30]

**1312.**

**[I calzolari.]**

2 Li omni vedranno cò piacere 3 disfare e röpere l'opere loro.

**1313.**

**[Shoemakers.]**

Men will take pleasure in seeing their own work destroyed and injured.

S. K. M. II. 2: 69a]

**1312.**

**[De capretti.]**

2 Ritornerà il tépo d'Erode, perchè l'innocèti figliuoli sarà tolti alle loro balie, e da crudeli omini di gran ferite moriranno.

2 The time of Herod will come again, for the little innocent children will be taken from their nurses, and will die of terrible wounds inflicted by cruel men.

1312. 1—3 R. 2. vederà chò. 3. disfare.
1313. 2. [saranno] tolti) ritornera. 3. perche li nip i. 4. li nocèi bguoli. 7. gra.
V.

DRAUGHTS AND SCHEMES FOR THE HUMOROUS WRITINGS.

1314.

A FABLE.

The crab standing under the rock to catch the fish which crept under it, it came to pass that the rock fell with a ruinous downfall of stones, and by their fall the crab was crushed.

THE SAME.

The spider, being among the grapes, caught the flies which were feeding on those grapes. Then came the vintage, and the spider was cut down with the grapes.

The vine that has grown old on an old tree falls with the ruin of that tree, and through that bad companionship must perish with it.

The torrent carried so much earth and stones into its bed, that it was then constrained to change its course.

The net that was wont to take the fish was seized and carried away by the rush of fish.

The ball of snow when, as it rolls, it descends from the snowy mountains, increases in size as it falls.

The willow, which by its long shoots hopes as it grows, to outstrip every other plant, from having associated itself with the vine which is pruned every year was always crippled.
Fauola della lingua morsa dai dětî.

Il ciedro insuperbito dalla sua bellezza dubita delle piante che li sò dîtoro, e fatto tole si torre dinanzi; il ucto poi non essendo interrotto, lo gittò per terra diradicate. La uitalba-non stàdo cotèta nella sua siepe, commìcìò a passare coi sua rami la convnve strada e appicarsi all'opposta siepe, onde da uìadanti poi fu rota.

Il calderugio dà la vittouaglia ai figliuoli ingabbiatî; — prîma morte che perdere libertà.

Le capre còdur^ràho il uino alle città.

Tutte le cose che nel uemno fiè nascoste sotto la neve rimarranno scoperte e palesi nell'estate; detta per la bugia che nò può stare occultâ.

Il giglio si pose sopra la ripa di Tessino e la corrète tirò la ripa istēme col lilio.

Il giglio si pose sopra la ripa di Tessino, e la corrète tirò la ripa ìsieme col lilio.

Facetia.

Perchê li Ungheri tègono la croce doppia. Why Hungarian ducats have a double cross on them.

Fable of the tongue bitten by the teeth. The cedar puffed up with pride of its beauty, separated itself from the trees around it and in so doing it turned away towards the wind, which not being broken in its fury, flung it uprooted on the earth.

The travell'r's joy, not content in its hedge, began to fling its branches out over the high road, and cling to the opposite hedge, and for this it was broken away by the passers by.

The goldfinch gives victuals to its caged young. Death rather than loss of liberty.

Goats will convey the wine to the city.

All those things which in winter are hidden under the snow, will be uncovered and laid bare in summer. (for Falsehood, which cannot remain hidden).

The lily set itself down by the shores of the Ticino, and the current carried away bank and the lily with it.

A jest.
DRAUGHTS AND SCHEMES.

A simile.

A vase of unbaked clay, when broken, may be remoulded, but not a baked one.

Seeing the paper all stained with the deep blackness of ink, it he deeply regrets it; and this proves to the paper that the words, composed upon it were the cause of its being preserved.

The pen must necessarily have the pen-knife for a companion, and it is a useful companionship, for one is not good for much without the other.

The knife, which is an artificial weapon, deprives man of his nails, his natural weapons.

The mirror conducts itself haughtily holding mirrored in itself the Queen. When she departs the mirror remains there...

Flax is dedicated to death, and to the corruption of mortals. To death, by being used for snare sheets and birds, animals and fish, to corruption, by the flaxen sheets in which the dead are wrapped when they are buried, and who become corrupt in these windings.—And again, this flax does not separate its fibre till it has begun to steep and putrefy, and this is the flower with which garlands and decorations for funerals should be made.

Shadows will come from the East which will blacken with great colour darkness the sky that covers Italy.

All men will take refuge in Africa.

1321. 

1322. 

1323. 

1324. 

1325. 

1326. 

1321. 

A simile.

I. 2. roto crudorotossi po.
1322. 1. charta . . machiata. 2. oscura negrezza. 3. dole el . . mostra a ess. 4. parole chesso sopra lei chòpone.
1323. 1. ha las. 2. esimilemète.
1324. 1. coltello . . . . accidétale armatura’ cada. 2. unghi. 3. losspechio. 4. asse. 5. losse. 6. rimàlinle.
1325. 1. morte e su. 2. pella. 3. veclli. 4. pessi. 5. curritione pe le. 6. volgano . . . chessi. 7. corròpone. 8. spicha.
1326. 1-6 R. 1. camica chellavorano. 2. vera unbre. 3. codioscurita . . tignierano.
Per il pannolino che si tiè colla mano nel coltello dell’acqua corrente, nella quale acqua il panno lascia tutte le sue brutture, significa questo ecc.

6 Per lo spino inscirto sopra boni frutti significa que’ loro che per se non e’ disposto a virtù, ma medesimamente l’aiuto dei preceptori da di se vn fassi nome virtù.

C. A. 362; 1165

Comune.

Vn meschino sarà soiato e essi soiatori sempre sien sua ingannatori e rubatori e’ assassini d’esso meschino.

La percussione della spera del sole apparirà cosa che, chi la crederà coprire, sarà coperto da lei.

[De’danari e oro.]

Uscirà dalle cavernose spelonche, chi farà con sudore affaticare tutti i popoli del mondo, có gradi affanni, ansiesta, sudori per essere avvittato da lui.

[Della paura della pouertà.]

La cosa maluagia e spaventuole darà di se tato timore appresso a dehì omni che come maddi, credendo fugirla, concorreranno có veleto moto alle sue smisurate forze.

[Del consiglio.]

E colui che sarà più necessario a chi avrà bisogno di lui sarà sconosciuto, cioè piov sprezzato.

W. XXX.

[Delles ape.]

Vivono a popoli insieme, sono annegate per torli il mele; molti e grandissimi popoli saranno annegati nelle lor propie case.

1327.

The cloth which is held in the hand in the current of a running stream, in the waters of which the cloth leaves all its foulness and dirt, is meant to signify this &c.

By the thorn with inoculated good fruit is signified those natures which of themselves were not disposed towards virtue, but by the aid of their preceptors they have the repudiation of it.

A COMMON THING.

A wretched person will be flattered, and these flatterers are always the deceivers, robbers and murderers of the wretched person.

The image of the sun where it falls appears as a thing which covers the person who attempts to cover it.

[Money and Gold.]

Out of cavernous pits a thing shall come forth which will make all the nations of the world toil and sweat with the greatest torments, anxiety and labour, that they may gain its aid.

[Of the Dread of Poverty.]

The malicious and terrible [monster] will cause so much terror of itself in men that they will rush together, with a rapid motion, like madmen, thinking they are escaping her boundless force.

[Of Advice.]

The man who may be most necessary to him who needs him, will be repaid with ingratitude, that is greatly contemned.

1329.

They live together in communities, they are destroyed that we may take the honey from them. Many and very great nations will be destroyed in their own dwellings.
PERCHÈ I CANI ODORÀ VOLENTIERI IL CULO L'UNO ALTRO.

Questo animali à in odio i po'veri, perché e' magliano tristi cibi, e ama li richi, perché essi an' bone vivide e massime di carinè; E lo sterco delli animali sempre ri-
tiene della virtù della sua origine, come mostrano le feccie......

Ora i cani àno si sottisissimo odo' rato che col naso sentono la uirù rima'sta in tali feccie; e che siè uero, se le trova per le strade odorano, e se vi sentono dentro vi' rìti di carne o d'altro, essi le pigliano, e se' nó, le lasciano; e per tornare al quesito di'eco, che se conoscono il cane mediante tali odori essere ben pas-
ciuto, essi lo riguar'dano, perché stimano quello avere potète e ricco pat' drone, e se nó sentono tale odore co' uirù, essi sti'mano tal cane essere da poco, e avere povero e' tristo padrone, e però mordono tali cani come fare'bbbero il suo padrone.

WHY DOGS TAKE PLEASURE IN SMELLING AT EACH OTHER.

This animal has a horror of the poor, because they eat poor food, and it loves the rich, because they have good living and especially meat. And the excrement of ani-

mals always retains some virtue of its origin as is shown by the faeces......

Now dogs have so keen a smell, that they can discern by their nose the virtue remaining in these faeces, and if they find them in the streets, smell them and if they smell in them the virtue of meet or of other things, they take them, and if not, they leave them: And to return to the ques-
tion, I say that if by means of this smell they know that dog to be well fed, they respect him, because they judge that he has a powerful and rich master; and if they discover no such smell with the virtue of meet, they judge that dog to be of small account and to have a poor and humble master, and therefore they bite that dog as they would his master.

The circular plans of carrying earth are very useful, inasmuch as men never stop in their work; and it is done in many ways. By one of these ways men carry the earth on their shoulders, by another in chests and others on wheelbarrows. The man who carries it on his shoulders first fills the tub on the ground, and he loses time in hoisting it on to his shoulders. He with the chests loses no time.

Se'l Petrarcha amò si forte il lauro, perché 'gli è buon frulla salsiccia e tonno; nò posso di lor ciancie far tesauro.

Se Petrarch was so fond of bay, it was be-irony, because it is of a good taste in sausages and with tunny; I cannot put any value on their foobery.


1331. 1. còcosì. 4. effa. 6. po'o're. 7. insosp. 8. colleban. 9. le e . . carre. 10. chella. 11. inspall. 14. inspall . . della 15. la non.


1330—1332.] HUMOROUS WRITINGS. 377

F. 47 n]

1330.

C. A. 685; 203 d]

Tr. 24]

1332.

Si patria Senatore (sic)'

1330, 1. petrarcha . . laur [||]. 2. percheglie e bò . . e ton [||]. 3. i nó . . giuse.

1331. The subject of this text has apparently no connection with the other texts of this section.

1332. Conte Porro has published these lines in the Archivio Stor. Lombardo VIII, IV; he reads the Vol. ii.
We are two brothers, each of us has a brother. Here the way of saying it makes it appear that the two brothers have become four.

Take in each hand an equal number; put 4 from the right hand into the left; cast away the remainder; cast away an equal number from the left hand; add 5, and now you will find 13 in this [left] hand; that is—I made you put 4 from the right hand into the left, and cast away the remainder; now your right hand has 4 more; then I make you throw away as many from the right as you threw away from the left; so, throwing from each hand a quantity of which the remainder may be equal, you now have 4 and 4, which make 8, and that the trick may not be detected I made you put 5 more, which made 13.
mio 12 vn·4; onde quel 4 trasmutato da me a te fa che'l mio 12 resta 8, e'l tuo 8 si fa 12; adunque il mio 8 è equale al tuo 8 innanzi, che lo facesse 12.

4 transferred from me to you reduced my 12 to a remainder of 8, and your 8 became 12; so that my 8 is equal to your 8, before it was made 12.

Se tu vuoi insegnare a vno·vna cosa che tu·nò sappia, falli misurare la lunghezza d'una cosa a te incognita, e lui saprà la misura che tu prima nò sà·peuri; — maestro Giovannì da Lodi.

If you want to teach someone a subject you do not know yourself, let him measure the length of an object unknown to you, and he will learn the measure you did not know before;—Master Giovanni da Lodi.
XXI.


When we consider how superficial and imperfect are the accounts of Leonardo's life written some time after his death by Vasari and others, any notes or letters which can throw more light on his personal circumstances cannot fail to be in the highest degree interesting. The texts here given as Nos. 1351—1353, set his residence in Rome in quite a new aspect; nay, the picture which irresistibly dwells in our minds after reading these details of his life in the Vatican, forms a striking contrast to the contemporary life of Raphael at Rome.

I have placed foremost of these documents the very remarkable letters to the Defterzar of Syria. In these Leonardo speaks of himself as having staid among the mountains of Armenia, and as the biographies of the master tell nothing of any such distant journeys, it would seem most obvious to treat this passage as fiction, and so spare ourselves the onus of proof and discussion. But on close examination no one can doubt that these documents, with the accompanying sketches, are the work of Leonardo's own hand. Not merely is the character of the handwriting his, but the spelling and the language are his also. In one respect only does the writing betray any marked deviation from the rest of the notes, especially those treating on scientific questions; namely, in these observations he seems to have taken particular pains to give the most distinct and best form of expression to all he had to say; we find erasures and emendations in almost every line. He proceeded, as we shall see, in the same way in the sketches for letters to Giuliano de' Medici, and what can be more natural, I may ask, than to find the draft of a letter thus altered and improved when it is to contain an account of a definite subject, and when personal interests are in the scale? The finished copies as sent off are not known to exist; if we had these instead of the rough drafts, we might unhesi-
tatingly have declared that some unknown Italian engineer must have been, at that
time, engaged in Armenia in the service of the Egyptian Sultan, and that Leonardo had
copied his documents. Under this hypothesis however we should have to state that this
unknown writer must have been so far one in mind with Leonardo as to use the same
style of language and even the same lines of thought. This explanation might—as I
say—have been possible, if only we had the finished letters. But why should these rough
drafts of letters be regarded as anything else than what they actually and obviously are? If Leonardo had been a man of our own time, we might perhaps have attempted to
account for the facts by saying that Leonardo, without having been in the East himself,
might have undertaken to write a Romance of which the scene was laid in Armenia,
and at the desire of his publisher had made sketches of landscape to illustrate the text.

I feel bound to mention this singular hypothesis as it has actually been put forward (see No. 1336 note 5); and it would certainly seem as though there were no other
possible way of evading the conclusion to which these letters point, and their bearing
on the life of the master,—absurd as the alternative is. But, if, on a question of such
importance, we are justified in suggesting theories that have no foundation in probability,
I could suggest another which, as compared with that of a Fiction by Leonardo, would
be neither more nor less plausible; it is, moreover the only other hypothesis, perhaps,
which can be devised to account for these passages, if it were possible to prove that the
interpretation that the documents themselves suggest, must be rejected a priori; viz
may not Leonardo have written them with the intention of mystifying those who, after
his death, should try to decipher these manuscripts with a view to publishing them?
But if, in fact, no objection that will stand the test of criticism can be brought against
the simple and direct interpretation of the words as they stand, we are bound to regard
Leonardo's travels in the East as an established fact. There is, I believe nothing in
what we know of his biography to negative such a fact, especially as the details of his
life for some few years are wholly unknown; nor need we be at a loss for evidence which
may serve to explain—at any rate to some extent—the strangeness of his undertaking
such a journey. We have no information as to Leonardo's history between 1482 and
1486; it cannot be proved that he was either in Milan or in Florence. On the other
hand the tenor of this letter does not require us to assume a longer absence than a year
or two. For, even if his appointment (officio) as Engineer in Syria had been a perma-
nent one, it might have become untenable—by the death perhaps of the Deffedar, his
patron, or by his removal from office—, and Leonardo on his return home may have
kept silence on the subject of an episode which probably had ended in failure and
disappointment.

From the text of No. 1379 we can hardly doubt that Leonardo intended
to make an excursion secretly from Rome to Naples, although so far as has hitherto
been known, his biographers never allude to it. In another place (No. 1077) he says that
he had worked as an Engineer in Friuli. Are we to doubt this statement too, merely
because no biographer has hitherto given us any information on the matter? In the
geographical notes Leonardo frequently speaks of the East, and though such passages
afford no direct proof of his having been there, they show beyond a doubt that, next to the Nile, the Euphrates, the Tigris and the Taurus mountains had a special interest in his eyes. As a still further proof of the futility of the argument that there is nothing in his drawings to show that he had travelled in the East, we find on Pl. CXX a study of oriental heads of Armenian type,—though of course this may have been made in Italy.

If the style of these letters were less sober, and the expressions less strictly to the point throughout, it might be possible to regard them as a romantic fiction instead of a narrative of fact. Nay, we have only to compare them with such obviously fanciful passages as No. 1354, Nos. 670—673, and the Fables and Prophecies. It is unnecessary to discuss the subject any further here; such explanations as the letter needs are given in the foot notes.

The drafts of letters to Lodovico il Moro are very remarkable. Leonardo and this prince were certainly far less closely connected, than has hitherto been supposed. It is impossible that Leonardo can have remained so long in the service of this prince, because the salary was good, as is commonly stated. On the contrary, it would seem, that what kept him there, in spite of his sore need of the money owed him by the prince, was the hope of some day being able to carry out the project of casting the 'gran cavallo'.
AL DIODARIO DI SIRIA LOCOTENÈTE DEL SACRO SULTANO DI BABILONIA.

Il n'avo accidète accaduto in queste nostre parti settantroniali, il quale sò cerno che nò solamète a te ma a tutto l'universo.

1336.

TO THE DEVATDAR OF SYRIA, LIEUTENANT OF THE SACRED SULTAN OF BABYLON.

The recent disaster in our Northern parts which I am certain will terrify not you alone but the whole world, which

1336. Lines 1—52 are reproduced in facsimile on Pl. CXVI.

Diario. This word is not to be found in any Italian dictionary, and for a long time I vainly sought an explanation of it. The youthful reminiscences of my wife afforded the desired clue. The chief town of each Turkish Villayet, or province—such as Broussa, for instance, in Asia Minor, is the residence of a Defterdar, who presides over the financial affairs of the province. Defterdar was, in former times, the name given to the Ministry of Finance at Constantinople; the Minister of Finance to the Porte is now known as the Maliô-Nasri and the Defterdars are his subordinates. A Defterdar, at the present day is merely the head of the finance department in each Provincial district. With regard to my suggestion that Leonardo's Diodario might be identical with the Defterdar of former times, the late M. C. Defrémery, Arabic Professor, and Membre of l'Institut de France wrote to me as follows: "Votre conjecture est parfaitement fondée; diario è l'equivalent de divadar ou plus exactement ofizdaar, titre d'une importante dignité en Egypte, sous les Mamelouks.

The word however is not of Turkish, but of Perso-Arabic derivation. Diftar (Arabic) meaning folio; for dar (Persian) Bookkeeper or holder is the English equivalent; and the idea is that of a deputy in command. During the Mamelook supremacy over Syria, which corresponded in date with Leonardo's time, the office of Defterdar was the third in importance in the State.

Sultano di Babilonia. The name of Babylon was commonly applied to Cairo in the middle ages. For instance Breidenbach, Bavariorum Hierusalymana p. 218 says: "At last we reached Babylon. But this is not that Babylon which stood on the further shore of the river Chober, but that which is called the Egyptian Babylon. It is close by Cairo and the two are but one and not two towns; one half is called Cairo and the other Babylon, whence they are called together Cairo-Babylon; originally the town is said to have been named Memphis and then Babylon, but now it is called Cairo." Compare No. 1085, 6.

Cairo was governed from 1582 till 1517 by the Borgite or Tcherkessian dynasty of the Mamelook Sultans. One of the most famous of these, Sultan Kai Bey, ruled from 1468—1496 during whose reign the Gama (or Mosque) of Kai Bey and tomb of Kai Bey near the Okella Kai Bey were erected in Cairo, which preserve his name to this day. Under the rule of this great and wise prince many foreigners, particularly Italians, found occupation in Egypt, as may be seen in the 'Viaggio di Josaphat Barbaro', among other travellers. "Next to Leonardo (so I learn from Prof. Jac. Burekhard of Bîle) Kai Bey's most helpful engineer was a German

CCC
farà 4terrore; il quale successivamente ti sarà detto per ordine mostrando primo l'effetto e poi la causa...

5Ritrovandomi io in queste parti d'Erminia  a dare con amore e sollecitudine opera a quello vîtio, pel quale tu mi mādăstă, et nel 6dare principio in quelle parti che a me pareano esser - piv al proposito shall be related to you in due order, showing first the effect and then the cause[4].

Finding myself in this part of Armenia[5] to carry into effect with due love and care the task for which you sent me[6]; and to make a beginning in a place which seemed to me to be most to our purpose, I entered into

who in about 1487 superintended the construction of the Mole at Alexandria. Felix Fabri knew him and mentions him in his Historia Sacrorum, written in 1488."

3. *Il nuovo accidente accaduto,* or as Leonardo first wrote and then erased, è accaduto un nuovo accidente. From the sequel this must refer to an earthquake, and indeed these were frequent at that period, particularly in Asia Minor, where they caused immense mischief. See No. 1101 note.

4. The text here breaks off. The following lines are a fresh beginning of a letter, evidently addressed to the same person, but, as it would seem, written at a later date than the previous text. The numerous corrections and amendments amply prove that it is not a copy from any account of a journey by some unknown person; but, on the contrary, that Leonardo was particularly anxious to choose such words and phrases as might best express his own ideas.

5. *Farti d'Erminia.* See No. 945. The extent of Armenia in Leonardo's time is only approximately known. In the XVth century the Persians governed the Eastern, and the Arabs the Southern portions. Arabic authors—'as, for instance Albulfedah—include Cilicia and a part of Cappadocia in Armenia, and Greater Armenia was the tract of that country known later as Turcomania, while Armenia Minor was the territory between Cappadocia and the Euphrates. It was not till 1522, or even 1574, that the whole country came under the dominion of the Ottoman Turks, in the reign of Selim I.

The Mameluk Sultans of Egypt seem to have taken a particular interest in this, the most Northern province of their empire, which was even then in danger of being conquered by the Turks. In the autumn of 1477 Sultan Kaţb Bey made a journey of inspection, visiting Antioch and the valleys of the Tigris and Euphrates with a numerous and brilliant escort. This tour is briefly alluded to by Moodchreddin p. 561; and by Weil, Geschichte der Abbasiden V, p. 358. An anonymous member of the suite wrote a diary of the expedition in Arabic, which has been published by R. V. Lonzone (*Vaggio in Palatina e Soria di Kaţb Pa XVIII sultana della II dinastia* mamelucca, fatto nel 1477. Testo arabo, Torino 1878', without notes or commentary). Compare the critique on this edition, by J. Gildeheimer in Zeitschrift des Deutschen Palastina Vereins (Vol. III p. 246—249). Lanzone's edition seems to be no more than an abridged copy of the original. I owe to Professor Schéfer, Membre de l'Institut, the information that he is in possession of a manuscript in which the text is fuller, and more correctly given. The Mameluk dynasty was, as is well known, of Circassian origin, and a large proportion of the Egyptian Army was recruited in Circassia even so late as in the XVth century. That was a period of political storms in Syria and Asia Minor and it is easy to suppose that the Sultan's minister, to whom Leonardo addresses his report as his superior, had a special interest in the welfare of those frontier provinces. Only to mention a few historical events of Sultan Kaţb Bey's reign, we find that in 1488 he assisted the Circassians to resist the encroachments of Akeddioulet, an Asiatic prince who had allied himself with the Osmani to threaten the province; the consequence was a war in Cilicia by sea and land, which broke out in the following year between the contending powers. Only a few years earlier the same province had been the scene of the so-called Caramanch in war in which the united Venetian, Neapolitan and Scaronic fleets had been engaged. (See Corinaldo Cippico, *Della guerra dei Veneziani nell'Asia dal 1469—1474. Venezia 1796, p. 54) and we learn incidentally that a certain Leonardo Boldo, Governor of Scutari under Sultan Mahmoud,—as his name would indicate, one of the numerous renegades of Italian birth—played an important part in the negotiations for peace.

Tu mi mandasti. The address tu to a personage so high in office is singular and suggests personal intimacy; Leonardo seems to have been a favourite with the Diodario. Compare lines 54 and 55.

I have endeavoured to show, and I believe that I am also in a position to prove with regard to these texts, that they are draughts of letters actually written by Leonardo; at the same time I must not omit to mention that shortly after I had discovered
nosta', entrai nella città di Calindra, vicina ai nostri confini; questa città è posta nelle spazzie di quell'altra parte del mole Tavro, che è divisa dall'Eufraates e riguarda i corni del grà Mote Tavlo per ponete; Questi corni son di tanta altura che par che tocchi il cielo, chè nell' universo non è parte terre più alta della sua cima; e sempre 4 ore mananza di è per

the city of Calindra, near to our frontiers. This city is situated at the base of that part of the Taurus mountains which is divided from the Euphrates and looks towards the peaks of the great Mount Taurus to the West. These peaks are of such a height that they seem to touch the sky, and in all the world there is no part of the earth, higher than its summit, and the rays of

di calindra... confini [e] questa ... ispieghe [del] mi di quel. 8. divisa [dal lago] dallenfrates [essa per le] e riguarda i [grà] corni del "grà". 9. altura [che loro per me non credo] "che par che toccchino il cielo" che nell'universo [68] "none" parte, 10. sti piu al della... essenzan... [di] [altro] e perchoss... [che] alleci si mostra. 11. isere... pietra biachiastia

these texts in the Codex Atlanticus and published a paper on the subject in the Zeit- schrift für bildende Kunst (Vol. XVII), Prof. Govi put forward this hypothesis to account for their origin:

"Quanto alle notizie sul monte Tavro, sull'Armenia e sull'Asia minore che si contengono negli altri frammenti, esse vennero prese da qualche geografo o viaggiatore contemporaneo. Dall'indice imperfetto che accompagna quei frammenti, si potrebbe dedurre che Leonardo volesse farne un libro, che poi non venne compiuto. A ogni modo, non è possibile di trovare in questi brani nessun indizio di un viaggio di Leonardo in oriente, né della sua conversazione alla religione di Maometto, come qualcuno pretendevolmente. Leonardo amava con passione gli studi geografici, e né suoi scritti si incontrano spesso itinerari, indicazioni, o descrizioni di luoghi, schizzi di carte e abbassi topografici di varie regioni, non è quindi strano che egli, abile narratore come era, si fosse proposto di scrivere una specie di Romance in forma epistolare svolgendone l'intreccio nell'Asia Minore, intorno alla quale i libri dell'altro, e forse qualche viaggiatore amico suoi, gli avevano somministrato alcuni elementi più o meno fantastici. (See Trasunti della Reale Accademiz dei Lincei Vol. V Ser. 3).

It is hardly necessary to point out that Prof. Govi omits to name the sources from which Leonardo could be supposed to have drawn his information, and I may leave it to the reader to pronounce judgment on the anomaly which is involved in the hypothesis that we have here a fragment of a Romance, cast in the form of a correspondence. At the same time, I cannot but admit that the solution of the difficulties proposed by Prof. Govi is, under the circumstances, certainly the easiest way of dealing with the question. But we should then be equally justified in supposing some more of Leonardo's letters to be fragments of such romances； particularly those of which the addresses can no longer be named. Still, as regards these drafts of letters to the Daddario, if we accept the Romance theory, as proposed by Prof. Govi, we are also compelled to assume that Leonardo purposed from the first to illustrate his tale; for it needs only a glance at the sketches on Pl. CXVI to CXIX to perceive that they are connected with the texts; and of course the rest of Leonardo's numerous notes on matters pertaining to the East, the greater part of which are here published for the first time, may also be somehow connected with this strange romance.

7. Città de Calindra (Calindra). The position of this city is so exactly determined, between the valley of the Euphrates and the Taurus range that it ought to be possible to identify it. But it can hardly be the same as the sea port of Cilicia with a somewhat similar name Celenderis, Kelandria, Celindria, Kilindria, now the Turkish Gulnar. In two Catalonian Portulans in the Bibliothèque Nationale in Paris—one dating from the XVth century, by Wilhelm von Soler, the other by Olivez de Majorca, in 1584—I find this place called Calandra. But Leonardo's Calindra must certainly have lain more to the North West, probably somewhere in Kurdistan. The fact that the geographical position is so carefully determined by Leonardo seems to prove that it was a place of no great importance and little known. It is singular that the words first written in I. 8 were divisa dal lago (Lake Van?), altered afterwards to dall'Eufraates.

Nostri confini, and in I. 6 proposito nostro. These refer to the frontier and to the affairs of the Mamelook Sultan. Lines 65 and 66 throw some light on the purpose of Leonardo's mission.

8. I corni del grà mòte Tavro. Compare the sketches Pl. CXVI—CXVIII. So long as it is impossible to identify the situation of Calindra it is most difficult to decide with any certainty which peak of the Taurus is here meant; and I greatly regret that I had no foreknowledge of this puzzling topographical question when, in 1876, I was pursuing archaeological enquiries in the Provinces of Aleppo and Cilicia, and had to travel for some time in view of the imposing snow-peaks of Bulghar Dagh and Ala Tepessi.

9—10. The opinion here expressed as to the height of the mountain would be unmeaning, unless it had been written before Leonardo moved to Milan, where Monte Rosta is so conspicuous an
cossa dai razi del sole in oriète; e per essere leci di pitra biarchissima, essa forte risplende, e fa l’uficio a questi Ermini come farebbe vn bel lume di luna nel mezzo delle tenebre; e per la sua grande altura essa passa la somma altèza de’ nuvoli per spatio di 4 miglia; e per linia retta questa cima è ueduta di grà parte dell’occidente illuminata dal sole dopo il suo tramontare insino alla 3a parte della notte; ed è quella che appresso di voi ne tempi sereni abbiamo già giudicato essere vna cometa, e pare a noi 15 tenebre della notte mutarsi in varie figure, e quado diuidersi in due o in 3 parti, e quado luga e quado corta; e questo nasce per li 10 nuvoli che nel orizzonte del cielo s’interpongono infra parte d’esso monte e il sole, e per tagliare l’uno essi razzi solari, il lume del monte è interrotto con vari spati di nuvoli, e però è di figvra uaria bile nel suo splendore.

DIVISIONE DEL LIBRO.

20 La predica e persuasione di fede;
21 La subita inodatione insin al fine suo;
22 La ruina della città;
23 La morte del popolo e disperazione;
24 La cerca del predica tore e la sua liberazione e benvo lentia;
25 Descrizione della causa di tal ruina del mòte;
26 Il danno ch’ella fece;

[The purpose of the above is to explain the phenomena observed during a comet, and to describe the predications made by different groups of people.]

The divisions of the book. The praise and confession of the faith. The sudden inundation, to its end. The destruction of the city. The death of the people and their despair. The preacher’s search, his release and benevolence.

Description of the cause of this fall of the mountain. The mischief it did.

The mischief which he had at hand; more probably, indeed, of one he purposed writing.

Persuazione di fede; of the Christian or the Mohammedan faith? We must suppose the latter, at the beginning of a document addressed to so high a Mohammedan official. Predica probably stands as an abbreviation for predicazione (lat. predicatio) in the sense of praise or glorification; very probably it may mean some such initial doxology as we find in Mohammedan works. (Comp. l. 40.)

The phraseology of this is too general for any conjecture as to its meaning to be worth hazarding.

Ruina del monte. Of course by an earthquake. In a catalogue of earthquakes, entitled kchf aussal-sařeb an avarv evl-zidb, and written by Djefal eddin...
[32] Fall of snow.

The finding of the prophet [33].

His prophesy.

[35] The inundation of the lower portion of Eastern Armenia, the draining of which was effected by the cutting through the Taurus Mountains.

How the new prophet showed [40] that this destruction would happen as he had foretold.

Description of the Taurus Mountains [43] and the river Euphrates.

Why the mountain shines at the top, from half to a third of the night, and looks like a comet to the inhabitants of the West after the sunset, and before day to those of the East.

Why this comet appears of variable forms, so that it is now round and now long, and now again divided into two or three parts, and now in one piece, and when it is to be seen again.

**OF THE SHAPE OF THE TAURUS MOUNTAINS [53].**

I am not to be accused, Oh Devatdar, of idleness, as your chillings seem to hint; but your excessive love for me, which gave rise to the benefits you have conferred on me [55] is that which has also compelled me to the utmost painstaking in seeking out and diligently investigating the cause of so great and stupendous an effect. And this could not be done without time; now, in order to satisfy you fully as to the cause of so great an effect, it is requisite that I should explain to you the form of the place, and then I will proceed to the effect, by which I believe you will be amply satisfied.

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Syouthy, the following statement occurs: "In the year 889 A.D., there were six shocks of earthquake at Aleppo. They were excessively violent and threw the inhabitants into consternation." I owe this communication to the kindness of Prof. Ch. Schüfer, Membre de l'Institut, to whom this unpublished Arabic MS. belongs. The foregoing entries refer to two earthquakes in Cairo, in 1476 and 1481: the following ones indicate a time at which Leonardo was, certainly, living in Milan.

[36] Tagliata di Monte Tavro. The Euphrates flows through the Taurus range near the influx of the Kura Shai; it rushes through a rift in the wildest cliffs from 2000 to 3000 feet high and runs on for 90 miles in 300 falls or rapids till it reaches Telek, near which at a spot called Gleikash, or the Hart's leap, it measures only 35 paces across. Compare the map on Pl. CXIX and the explanation fo it on p. 391.
59 No ti dolore, o Diodario, del mio tardare, a dar risposta alla tua desiderosa richiesta, perché queste cose, di che tu mi richiedi, sono di natura che non si può fare senza processo di tempo; nè il mio essere la causa di tali grandissimi effetti, bisogna descrivere. C'è bene non descrivere le cose così come sono, e ma, perch'egli o voler mostrare la causa di tali effetti, bisogna descrivere, e mollo che tu potrai poi cedere la facilità di quella descrittica; ma lasciando indietro la descrizione della forma dell'Asia Minore, e che mari o terre sieno quelle che terminono la figura della sua qualità, perché della la qualità, e sollecitudine de' tuoi studi non t'anno dell'altro, e nella figura la vera figura di Tavros Mote, il quale è quello che è cavatore di quella superficie e danosa maraviglia, la quale, serue alla spedizione del nostro proposito; Questo monte Tavro è quello che appresso di molti è detto essere il giogo del Monte Cauccaso, ma avendo voluto, ben chiarirmi, o voluto parlare con alcuni di quelli che abitano sopra del Mar Caspio, i quali mostrano che quel si il vero Mote Cauccaso, che, benché i molti abitanti abbiano il medesimo nome, questi son di maggiore altezza, e però desidero, perché Cauccaso in lingua Scitica vuol dire somma alzata, e in vero non ci c'è notizia che l'ortoche l'occidente abbia monte di si grande altezza. E la prua, che così sia, è che li abitatori de' paesi, che gli stanno per ponente, vedono i razi del sole che alluminia insino alla parte delle maggior notti grà parte della sua cima, ed è simile fa a quelli paesi che gli stanno per ponente.

Qualità e qualità del mòte Tavro.

73 L'ombra di questo monte di Tavro è di tanta altezza che, quando di mezzo giorno il sole è a mezzo giorno, la sua obra s'a

59 Do not be aggrieved, O Devata, by my delay in responding to your pressing request, for those things which you require of me are of such a nature that they cannot be well expressed without some lapse of time; particularly because, in order to explain the cause of such a great effect, it is necessary to describe with accuracy the nature of the place; and by this means I can afterwards easily satisfy your above-mentioned request.

I will pass over any description of the form of Asia Minor, or as to what seas or lands form the limits of its outline and extent, because I know that by your own diligence and carefulness in your studies you have not remained in ignorance of these matters; and I will go on to describe the true form of the Taurus Mountain which is the cause of this stupendous and harmful marvel, and which will serve to advance us in our purpose. This Taurus is that mountain which, with many others is said to be the ridge of Mount Caucasus; but wishing to be very clear about it, I desired to speak to some of the inhabitants of the shores of the Caspian sea, who give evidence that this must be the true Caucasus, and that though their mountains bear the same name, yet these are higher; and to confirm this in the Scythian tongue Caucasus means a very high peak, and in fact we have no information of there being, in the East or in the West, any mountain so high. And the proof of this is that the inhabitants of the countries to the West see the rays of the sun illuminating a greater part of its summit for as much as a quarter of the longest night. And in the same way, in those countries which lie to the East.

Of the structure and size of Mount Taurus.

73 The shadow of this ridge of the Taurus is of such a height that when, in the middle of June, the Sun is at its meridian, its
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74 stende insino al principio della Sarmatia, che sono giornate 12, e a mezzo dicembre s'estende insino ai monti Iperboroi, che è viaggio d'un mese inverso tramontana; E senpre la sua parte opposta al luogo che soffia è priva di nuvole e nebbie, perchè il vento, che s'apre nella percussione del sasso, dopo esso sasso si uiene a richiudere, e in tal moto porta con seco i nuvoli da ogni parte, e lascia in loro percussione; e senpre è piena di percussione di sette per la grà moltitudine di nuvole che lì si ricettati, onde il sasso è tutto fracassato e pien di grà ruine; Questo nelle 78 sua radici è abitato da richissimi popoli, ed è pieno di bellissimi fonti e fiumi; è feritile e abondante d'ogni bene e massime nelle parti che riguardano a mezzo giorno; — 80 ma quando se n'è montato circa 3 miglia, si comincia a trovare le selue de' grà di abeti, faggi e faggi e altri simili alberi; dopo questi per spatio di 3 al 8° tre miglia si trovano praterie e gràdissime pasture, e tutto il resto, insino all'abito del Monte Tavro, sono nevi chelli.

75. gogho... mezo gugnio... he a mezo gorno. 74. insino [alla sarmatia] al... chessò gornate... mezo di... cembre sasse. 75. viaggio... oposita. 76. chesoffita... nuvoli emmeab... chessa... Percussion. 77. vedere... perche... in... nuvoli... parte [e ne] ella... Percussion... The text between the words Percussion and Questa has subsequently been added and is written on the margin in 15 short lines. Nogli chelli... ettuno frachiscato. 78. abita... piena... effiumi. 79. mezo gorno. 80. montita circa... comica... Atrovare. 81. effaggi... alberi [infral]... dopo... questo... In pace. 82. trova... pastura... ettuno il... 83. nassimeto... neve eterna. 84. tino chessa...
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ich mai per alcù tempo si paràtono, che s’astendono all’altezza di circa 14 miglia in tutto; da questo nasce il Tavro insino all’altezza d’un miglio non passano mai i nuvoli; 87 e qui abbiamo 15 miglia, che sono circa a 5 mila di d’altezza per linea retta, 87 e altrettanto o circa troviamo essere la caima delli corni del Tavro, 85 nei quali dal mezzo in su si comincia a trovare aria che riscaldà e no 85 vi si sente soffiatemi de’ uci, ma nessuna cosa di può troppo vivere; 88 qui è no nasci cosa alcuna, salvo alcuni vecelli rapaci che 97 covano nel l’alte fessure del Tavro, e discièdono poi sotto i nuvoli 97 a fare le loro prede sopra i monti erbosi; Questo è tutto sasso semplice, 95 cioè da’ nuvoli insù, ed è sasso candissimono e in sulla alta cima no 94 si può andare per l’aspra e pericolosa sua salita.

C. A. 2118; 6212r

1337.

1337. On comparing this commencement of a letter of the 1537 1—2 with that in l. 3 and 4 of No. 1336 it is quite evident that both refer to the same event. (Compare also No. 1337 l. 10—12 and 17 with No. 1336 l. 23, 24 and 32.) But the text No. 1336, including the fragment l. 3—4, was obviously written later than the draft here reproduced. The Didotario is not directly addressed—the person addressed indeed is not known—and it seems to me highly probable that it was written to some other patron and friend whose name and position are not mentioned.
a fare tanto nocimeto alli omini quato al presente da noi sè veduto e provato, in modo ch’io no posso imaginare che cosa si possin piov accrescere a tanto male, il quale noi provammo in spatio di dieci ore; In prima fummo assaliti e combattuti dall’impeca e furor de’ vetti e a questo s’avviusero le ruine delle grà morti di neve, i quali anno ripieni tutte queste valli e còquassato grà parte della nostra città; E no sì còtentado di questo, la fortuna 12 cò subiti diluvi d’acque ebbe a sommergere tutta la parte bassa di questa città; oltre di questo s’aggiunse una subita pioglia, anzi ruinosa tepesta piena d’acqua, sabbia e fango, insieme avviluppati con radici sterci e ciocchi di varie piante; e ogni cosa scorrendo per l’aria discendeva sopra di noi; e in ultimo uno incendio di fuoco parea còdotto no che da vetù ma da 10 milia diailiki, che’l portassimo, il quale abbruciato e distinto tutto questo 15 paese, e ancora non vi è cessato; E que’ pochi, che siano restati, siamo rimasti cò tanto sbigottimento che tata pava che appena come balordi abbiamno adire di parlare l’uno coll’altro; avendo abbandonato ogni nostra cura, ci stiamo insieme nititi 17 in cierte ruine di chiese insieme misti maschi e femine, piccoli e grandi, a modo di 18 torne di capre; e i vicini per pietà ci anno soccorso di uettovaglie, i quali era prima nostri us here, what we have seen and gone through is such that I could not imagine that things could ever rise to such an amount of mischief, as we experienced in the space of ten hours. In the first place we were assailed and attacked by the violence and fury of the winds[10]; to this was added the falling up of great mountains of snow which filled up all this valley, thus destroying a great part of our city[11]. And not content with this the tempest sent a sudden flood of water to submerge all the low part of this city[12]; added to which there came a sudden rain, or rather a ruined torrent and flood of water, sand, mud, and stones, entangled with roots, and stems and fragments of various trees; and every kind of thing flying through the air fell upon us; finally a great fire broke out, not brought by the wind, but carried as it would seem, by ten thousand devils, which completely burnt up all this neighbourhood and it has not yet ceased. And those few who remain unhurt are in such dejection and such terror that they hardly have courage to speak to each other, as if they were stunned. Having abandoned all our business, we stay here together in the ruins of some churches, men and women mingled together, small and great[17], just like herds of goats. The neighbours out of pity succoured us with victuals, and they had previously been our enemies. And if


The text between the words capre and Ona is written on the margin. The words: I vicini . nostri nimici are written in six short lines on the right side and the following words esse nò . di fame sono written in eleven lines on the opposite side: i vicini

11. Della nostra città (Leonardo first wrote of questa città). From this we may infer that he had at some time lived in the place in question wherever it might be.

17. Certe ruine di chiesa. Either of Armenian churches or of Mosques, which it was not unusual to speak of as churches.

Maschi e femmine insieme unite, implies an infringement of the usually strict rule of the separation of the sexes.

18. I vicini, nostri nimici. The town must then have stood quite close to the frontier of the country.

Compare 1336. L. 7, vicini ai nostriconfini. Dr. M. Jordan has already published lines 4-13 (see Das Malerbuch, Leipzig, 1873, p. 90:—his reading differs from mine) under the title of “Description of a landscape near Lake Como”. We do in fact find, among other loose sheets in the Codex Atlanticus, certain texts referring to valleys of the Alps (see Nos. 1039, 1031 and note p. 237) and in the arrangement of the loose sheets, of which the Codex Atlanticus has been formed, these happen to be placed close to this text. The compiler stuck both on the same folio sheet; and if this is not the reason for Dr. Jordan’s choosing such a title (Description &c.) I cannot imagine what it can have been. It is, at any rate, a merely hypothetical statement. The designation of the population of the country round a city as the “enemy” (nimici) is hardly appropriate to Italy in the time of Leonardo.

DDD
it had not been for certain people who succoured us with victuals, all would have died of hunger. Now you see the state we are in. And all these evils are as nothing compared with those which are promised to us shortly.

I know that as a friend you will grieve for my misfortunes, as I, in former letters have shown my joy at your prosperity . . .

**Book 43. Of the movement of air enclosed in water.**

I have seen motions of the air so furious that they have carried, mixed up in their course, the largest trees of the forest and whole roofs of great palaces, and I have seen the same fury bore a hole with a whirling movement digging out a gravel pit, and carrying gravel, sand and water more than half a mile through the air.

Like a whirling wind which rushes down a sandy and hollow valley, and which, in its hasty course, drives to its centre every thing that opposes its furious course . . .

No otherwise does the Northern blast whirl round in its tempestuous progress . . .

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**1338.** The first sixteen lines of this passage which treat of the subject as indicated on the title-line have no place in this connexion and have been omitted.

2. *Ho veduto movimenti &c.* Nothing of the kind happened in Italy during Leonardo’s lifetime, and it is therefore extremely probable that this refers to the natural phenomena which are so fully described in the foregoing passage. (Compare too, No. 1021.) There can be no doubt that the descriptions of the Deluge in the *Libro di l’Itura* (Vol. I, No. 607–611), and that of the fall of a mountain No. 610, l. 17–30 were written from the vivid impressions derived from personal experience. Compare also Pl. XXXIV—XL.
17 No fa si grà muggchio il tèpestoso mare, 8 quando il settìètrionale aquilone 9 lo ripercuote colle scismose onde fra Scilla e Cariddì, nè Stronboli o Mongibello, quando le solfuree fiamme, essendo richiuse, 11 per forza ronpèdo e apredo il grà mòte, fulmineado 12 per l'aria pietra terre ìsieme coll'usèta e vomitata fàma . . .

15 Nè quado le infocate caverne di Mongibello rivìmitado il male tenuto elemèto, spigüendo 14 alla sua regione, cò fùria cacìàdi inàzi qualche ostacolo 15 s'interpone alla sua ipetùosa fùria.....

13 È tirato dalla mia branosa voglia, vago di udere la gran cò . . . 17 delle varie e strane forme fatte dalla artifiziosa natura, ragirotomì 18 alquàto jìra gli obòro scegli per venni all'ètrata d'una 19 grà caverne dinanzi alla quale restato alquàto 20 stupèfatto,— e igniorante di tal cosa pìegàto le mie rene 21 in arco e ferma la stàca mano sopra il ginocchio e colla destra mi fecì tenebà 22 alle abbasate e chivèe cígiglia; e spesso pìegàdomi in qua e in là per ve 23 dere dètro vi discernessì una cosa, e questo vètatai per 24 la grandè oscurità, che là entro era, e stato alquàto, subìto si destrono 25 in me 2 cose, pavà e desiderio; paura per la minaccìa 26 sa oscura spilònca, desidero per vedere se là ètro fusse alcùna 27 miracòloosa cosa . . .

C. A. 382 a 1 118 a]

Aucèo, signore mio illustissimo, uisto e considerato oramai a suffìciètia le proue di tutti quegli che sii reputano maestri e

Not does the tempestuous sea bellow so loud, when the Northern blast dashes it, with its foaming waves between Scylla and Charybdis; nor Stromboli, nor Mount Etna, when their sulphurous flames, having been forcibly confined, rend, and burst open the mountain, fulminating stones and earth through the air together with the flames they vomit.

Nor when the infamed caverns of Mount Etna, rejecting the ill-restained element vomit it forth, back to its own region, driving furiously before it every obstacle that comes in the way of its impetuous rage . . . .

Unable to resist my eager desire and wanting to see the great . . . . of the various and strange shapes made by formative nature, and having wandered some distance among gloomy rocks, I came to the entrance of a great cavern, in front of which I stood some time, astonished and unaware of such a thing. Bending my back into an arch I rested my left hand on my knee and held my right hand over my own count and contracted eye brows: often bending first one way and then the other, to see whether I could discover anything inside, and this being forbidden by the deep darkness within, and after having remained there some time, two contrary emotions arose in me, fear and desire—fear of the threatening dark cavern, desire to see whether there were any marvellous thing within it . . . .

1340.

Most illustrious Lord, Having now sufficiently considered the specimens of all those who proclaim themselves skilled contrivers, I have written a letter to your Excellency in which I give you an account of the phenomena of the great eruption of Mount Etna on the 22nd April 1794, being the 36th year of my age,

13. Mongolia is a name commonly given in Sicily to Mount Etna (from Djebel, Arab.=mountain). Fr. FERRARA, Descrizione dell'Etna con la storia delle eruzioni (Palermo, 1818, p. 88) tells us, on the authority of the Cronica del Monastero Benedictino di Lercara, of an eruption of the Vesuvius with a great flow of lava on Sept. 21, 1477. The next records of the mountain are from the years 1533 and 1538. A. Percy neither does mention any eruptions of Etna during the years to which this note may probably refer (Memoire des tremblements de terre de la péninsule italique, Vol. XXII des Memoires couronnés et Memoires des savants étrangers. Académie Royale de Belgique).

A literal interpretation of the passage would not, however, indicate a confusion to any great eruption; particularly in the connection with Stromboli, where the periodical outbreaks in very short intervals are very striking to any observer, especially at night time, when passing the island on the way from Naples to Messina.

1340. The numerous corrections, the alterations in the figures (l. 18) and the absence of any signature prove that this is merely the rough draft of a
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compositori di instrumen\i bellici, et che la inu\zione di operatione di detti instrumen\i n\o sono niente alie\i dal commune vso: Mi forsero, n\o derogando a nessuno altro, farmi itendere da Vostra Eccellentia, apr\i of instruments of war, and that the invention and operation of the said instruments are nothing different to those in common use.

I shall endeavour, without prejudice to any one else, to explain myself to your Excellency showing your Lordship my secrets, and then offering them to your best pleasure and approbation to work with effect at opportune moments as well as all those things which, in part, shall be briefly noted below.

forro\o . . . alt. 4. itende\e" da v. ex\"" . . . q\a . . . app\e\o . . . ad \a . . . piacimento. 5. opportuni . . . ci\ . . . \\a\ a . . . bre\uita "f p\\a\" saranno. 6. notate [e anch\a i molte pi\\a\o le occurrenci\e di du\\a\i casi] 7. acti . . . q\a\i. 8. volta

letter to Lodovico il Moro. It is one of the very few manuscripts which are written from left to right—see the facsimile of the beginning as here reproduced. This is probably the final sketch of a document the clean of which copy was written in the usual manner. Leonardo no doubt very rarely wrote so, and this is probably the reason of the conspicuous dissimilarity in the handwriting, when he did. (Compare Pl. XXXVIII.) It is noteworthy too that here the orthography and abbreviations are also exceptional. But such superficial peculiarities are not enough to stamp the document as altogether spurious. It is neither a forgery nor the production of any artist but Leonardo himself. As to this point the contents leave us no doubt as to its authenticity, particularly l. 32 (see No. 719, where this passage is repeated). But whether the fragment, as we here see it, was written from Leonardo's dictation—a theory favoured by the orthography, the casres and corrections—or whether it may be a copy made for or by Melzi or Mazenta is comparatively unimportant. There are in the Codex Atlanticus a few other documents not written by Leonardo himself, but the notes in his own hand found on the reverse pages of these leaves amply prove that they were certainly in Leonardo's possession. This mark of ownership is wanting to the text in question, but the compilers of the Codex Atlanticus, at any rate, accepted it as a genuine document.

With regard to the probable date of this projected letter see Vol. II, p. 3.
1. 1° Ho modi di ponti leggerissimi e forti, e atti ad portare facilissimamente, et co' quelli seguire e alcuna volta fuggire li inimici, e altri securi e ineffisibile da foco e battaglia, facili e comodi 'da levar e ponere'; Et modi di ardere e disfare quelli del' inimico.

2. So la ossidione di una terra toglie via l'acqua de' fossi; e fare infiniti poti; gatti e scale et' altri instrumenti pertinenti a detta spedizione.

3. Itè se per altezza di argine o per forterezza di loco e di sito nò si potesse la ossidione di vna terra usare l'officio delle bombarde: ho modi di ruinare omni rocca o altra forterezza, se già nò fusse fondata sù el sasso ecc.

4. Ho ancora modi di bombarde còmodissime e facili a portare: Ett con quelle buttare minuti sissima similitudine quasi di tempesta; E con il fumo di quella dand grade spaueto al'inimico e con graue suo danno e confusione ecc.

5. Et quando accadesse essere i mare, ho modi di molti instrumenti attissimi da offendere e difendere; et nauili che faranno resistenza al trarre di omni grossissima bobbarda; e polvere e fumi.

6. Itè ho modi: per caue e uie secrete distorte fatte senza alcuno strepito per uenire disegnato ancora che bisogniassa passare sotto fossi o alcuno fume.

7. Item farò cari coperti e sicuri ioffensibili, i cui ètrado ità li inimici con sue artiglierie; nò è si grade multi studine di gente d'arme che nò rompessino: E dietro a questi potranno seguire fàterie assai illesi e sèza alcuno ìpedìmêto.

8. Item occorrendo di bisogno, farò bòbarde, mortari et passauolanti di bellissimi e utili forni del comune uso.

9. Itè ho modi di bisogno, solo a farò bòbarde, mortari et passauolanti di bellissimi e utili forni del comune uso.

10. Item. I have a sort of extremely light and strong bridges, adapted to be most easily carried, and with them you may pursue, and at any time flee from the enemy; and others, secure and indestructible by fire and battle, easy and convenient to lift and place. Also methods of burning and destroying those of the enemy.

11. I know how, when a place is besieged, to take the water out of the trenches, and make endless variety of bridges, and covered ways and ladders, and other machines pertaining to such expeditions.

12. Item. If, by reason of the height of the banks, or the strength of the place and its position, it is impossible, when besieging a place, to avoid oneself of the plan of bombardment, I have methods for destroying every rock or other fortress, even if it were founded on a rock, &c.

13. Again I have kinds of mortars; most convenient and easy to carry; and with these can fling small stones almost resembling a storm; and with the smoke of these causing great terror to the enemy, to his great detriment and confusion.

14. [8] And when the fight should be at sea I have kinds of many machines most efficient for offence and defence; and vessels which will resist the attack of the largest guns and powder and fumes.

15. Item I have means by secret and tortuous mines and ways, made without noise to reach a designated [spot], even if it were needed to pass under a trench or a river.

16. Item. I will make covered chariots, safe and unattackable which, entering among the enemy with their artillery, there is no body of men so great but they would break them. And behind these, infantry will follow quite unhurt and without any hindrance.

17. Item. In case of need I will make big guns, mortars and light ordnance of fine and useful forms, out of the common type.

18. Where the operation of bombardment should fail, I would contrive catapults, mangonels, trabocchi and other machines of marvellous efficacy and not in common use. And in short, according to the variety of cases, I can contrive various and endless means of offence and defence.

[secondo le occurrenti] fuggire. 9. de àlē .. òlì. 10. obstione de..tugileto' via laqua, et. ghasti. 11. ad dicta expeditione. 12. de sìgnine .. de loco .. potesse .. obstione de. 13. dele .. omni [forte] o 'rocca' (?) altra. 14. sano. 15. anchora .. de bombàde .. facile ad .. Et cû òlì .. minuti [saxil]. 16. a [similitudine quasi] di .. ciel .. òlì. 17. cû. 18. accadeasi de .. struñi actissimi .. offendé e defendé. 19. de .. g'to'sissima .. polue. 20. fecte .. venire [ad uno cor'to] e diseg'ssa'to. 21. ... anchora .. coperti 'e sicuri' e .. cû'a'li Istrüdo Istr ın [né] li inimica cû .. si [grosss] grande. 23. darne .. Et .. poteranno insilesi. 24. alcuno. 25. occurrendo di bi soğ .. mortari .. unte forma fora del cêde. 26. màcìasi .. de le componero .. màglìani. 27. fora .. sèdo .. còpoñò .. ed [[[[[. 28. credo satisfare .. ò .. edîtì e p. 29. et pravi ..
2810. In teto di pace credo di soddisfare benissimo al paragone di ogni altro in architettura, l’impostazione di ediltii e pubblici e privati: e i codurre acqua da uno loco ad uno altro.  
39]Tè codurrió i scultura, di marmore, di bronzo e di terra: simile i pittura ciò che si possa fare a paragone di ogni altro e sia chi vuole.  
35Ancora si potrà dare opera al cauollo di bronzo, che sarà astria immortal e eterno onore della felice memoria del signore vostro padre e della icyta casa Sforzesca;  
35 E se alcuna delle sopradette cose a alcuno paressi impossibile e ifattibili, mi offer para lessimo a farne esperimento i parco uostro, o i qual loco piacerà a vostra Eccellenza, allora quale umilmente quanto più posso, mi raccomando ecc.

S. K. M. Ill. 38.6]

S. K. M. Ill. 23.6]

1341.

Al mio Illustissimo Signore Lodouico, Duca di Bari. 
Leonardo da Vinci; 
Fiorentino. 
Leonardo.


1342.

Vi piace vedere uno · modello · del quale risultà vtile a uoi e a me, e vtilità · a quelli che fiendo cagione · di nostro vtilità.

You would like to see a model which will prove useful to you and to me, also it will be of use to those who will be the cause of our usefulness.

coduceaqua...alettoadoffendi e difendii. 30. còducero. 31. ad... dešni... uole. 32. Anchò si potera... honore dela. 33. “st’vostro” patre e dela. 34. Et se alcuno dele sop”t” dicte... alcuno... impossibile e infattibile me offer. 
35. ad fare esperimento... q”al... vost ex Tina” ad. 36. humilite... me reconado de.

1341. Written from left to right. 1. Ill”mo" Sig”re". 2. bari. 
1342. 1. vedere i modello. 2. ahe. 3. acuelli cheffieno chagione.

1341. Evidently a note of the superscription cf a letter to the Duke, and written, like the foregoing from left to right. The manuscript containing it is of the year 1493. Lodovico was not proclaimed and styled Duke of Milan till September 1494. The Dukedom of Bari belonged to the Sforza family till 1499.

1342. 1343. These two notes occur in the same not very voluminous MS. as the former one and it is possible that they are fragments of the same letter. By the Modello, the equestrian statue is probably meant, particularly as the model of this statue was publicly exhibited in this very year, 1493, on the occasion of the marriage of the Emperor Maximilian with Bianca Maria Sforza.
Ecco signor molti giütil omini che faranno infra loro questa spesa, lasciando loro godere l’entrata delle acque, e passaggio di navili, e quando sarà veduto loro il prezzo loro rederanno il navilio di Martigiana . . .

There are here, my Lord, many gentlemen who will undertake this expense among them, if they are allowed to enjoy the use of admission to the waters, the mills, and the passage of vessels and when it is sold to them the price will be repaid to them by the canal of Martesana.

Assai mi rincresce d’essere i neciessità, ma pív mi dole che quella sia causa dello interroppere il desiderio mio, il quale è sempre disposto a vbidir oustra Eccellentia; forse che oustra Eccellentia nò commise altro a messer Guàltieri, credèdo che io avessi dina'ri . . . .

E mi rincresce assai che tu m’abbi ritrovato in neciessità, e che l’auere io a guadagniare il uitto, m’abbi’ interropere . . . .

Assai mi rincresce che l’auere a guadagna’ che l’uitto m’abba forzato interroppere l’opera e di soddis fare ad alcuni piccoli, del seguitare l’opera che già vostra Signoria mi commisse; Ma spero in bre’ue avere guadagnato tanto che potrò soddisfare ad animo riposato a vostra Eccellenza, alla quale mi raccomando, e se vostra Signoria credesse ch’io avessi dini, quella s’ingannerrebbe; ō tentvo 6 boche 56 mesi, e ò avuto 56 ducati.

I am greatly vexed to be in necessity, but I still more regret that this should be the cause of the hindrance of my wish which is always disposed to obey your Excellency.

Perhaps your Excellency did not give further orders to Messer Guàltieri, believing that I had money enough.

I am greatly annoyed that you should have found me in necessity, and that my having to earn my living should have hindered me . . . .

If vexes me greatly that having to earn my living has forced me to interrupt the work and to attend to small matters, instead of following up the work which your Lordship entrusted to me. But I hope in a short time to have earned so much that I may carry it out quietly to the satisfaction of your Excellency, to whom I commend myself; and if your Lordship thought that I had money, your Lordship was deceived. I had to feed 6 men for 56 months, and have had 56 ducats.

E se mi dato pív alcuna commisone d’alunga . . .

do premio del mio scrutiu , perché nò so da essere da . . .

cose assegnazioni, perché loro anno in tante di pe . . .

tie che bene possono asssetare pív di me . . .
nò la mia arte, la quale voglio mantere ed . . .
dato qualche vesti méto s’oso vna somma . . .

And if any other commission is given me by any . . . of the reward of my service. Because I am not [able] to be . . . things assigned because meanwhile they have . . . to them . . . which they well may settle rather than I . . . not my art which I wish to change and . . . given some clothing if I dare a sum . . .

1343. 1. Ecc. 2. in fano infralloro. 3. lasciádo. 4. passagio. 5. prezo lor rôdevă.


1345. 1. esse . . . comission. 3. taute di pe . . possano. 6. sloso vna soma. 7. uostra . . ochnopa. 8. vostra . . ni [“pichol

The paper on which this is written is torn down the middle; about half of each line remains.
My Lord, I knowing your Excellency's mind to be occupied... to remind your Lordship of my small matters and the arts put to silence that my silence might be the cause of making your Lordship scorn my life in your service. I hold myself ever in readiness to obey...

[11] Of the horse I will say nothing because I know the times [are bad] to your Lordship how I had still to receive two years' salary of the... with the two skilled workmen who are constantly in my pay and at my cost that at last I found myself advanced the said sum about 15 lire... works of fame by which I could show to those who shall see it that I have been everywhere, but I do not know where I could bestow my work [more]...

[17] I, having been working to gain my living...

I not having been informed what it is, I find myself...

[19] Remember the commission to paint the rooms...

I conveyed to your Lordship only requesting you...

Magnificent Commissioners of Buildings...

I, understanding that your Magnificences have made up your minds to choose certain great works in bronze, will remind you of certain things: first that you should not be so hasty or so quick to give the commission, lest by this haste it should become impossible to select a good model and a good master; and some man of small merit may be chosen, who by his insufficiency may cause you to...

Ellarcimesse. 9. fussi cossa. 10. mi tè. 11. [a dinaro. 12. chomio... ave're' el. 13. maesisti... còtùno stettono... salario espe. 14. avanzo ditta... circha. 15. opere ["d'fama"] per elle... acquelli che uerao. 16. opere [in pive] a per. 18. trovo [come e mi]. 19. richiordà della comission... acquella. 1346. i. [venerabili] e in'grafici fabricieri [parèdo amme fare in parte]. 2. fìciere [volere] avere. 3. richiordò... etuano presti a "affare essa allocazione" [pigliare partito]. 4. tolo "la uia del potere... fare bona eltezione d'opere e maesti; e qualche homo [di pichio] che... abia... vostra. 5. successori... ella vostra eta "ercheialta siasi ui ciedi boni Iglegiu"[d]... vdi-
stra · età · ... givicicado che questa · età fusse mal fornita d'omini · di bon giudizio · di boni · maestri, vedendo le altre città, e massime la città de' Fiorentini, quasi ne' medesimi tèpi, essere 7 dotata di si belle e magnie opere di bronzo, intra le quali le porte del loro Battistero · la qual Fiorètia · si come l'Picciétia, è terra di passo · douce · cocorrono assai forestieri · i quali vedendo le opere belle o bone, belle fanno a se medesimi impressioni: quella città · essere fornita di degni abitatori, vedendo l'opere testimonie d'essa opinione; e per lo contrario di10, vedendo tanta spesa di metallo operata si tristanete, che me uergognia alla città · sarebbe che esse porte fussino di semplice legname, perché la poca spesi della materia · no parebbe meriteuole di grade · spesa di magisterio, ode che ...

13 La principale parte che per le città · si ricerchi · si sono · i domi, i quali appressatisi, le prime · cose · che all'chio appariscono, sono · le porte donde in esse chiese passare si possa.

Guardate · signori · fabbricieri · che la · troppa celerità del volere voi con tata · prestezza · dare · spedizione alla locatione · di tanta magnia opera, quanto io sento che per voi 17 s'è ordinata, non sia cagione che quello · che per onore · di dio · e delli omini si fa · non torni in grà · disonore · de' nostri giuditi e della vostra città, doud, per essere terra degna e di passo, è concorso · d'innumera · bili forestieri; e questo disonore accaderebbe, quia per le · nostre · indiligitie · 9 · vole · prestasti · fede · a qualche vantatore che per le · sue frasche o per fauoare · che di qua · dato li fusse, 12 da uoi ausse e a inpetrare · simile opera · per la quale · a se · a uoi ausse a partorire lunga · gràdissima infamia ·; Chè non posso · fare · che io non mi crucci · a ripensare quali · sieno quelli che abbino · conferito · volere · in simile impresa · e tra · sanza pen- · sare alla loro sofitzia, sanza dinie altro ·; chi è maestro · di boccali · chi di corazze be abused by your descendants, judging that this age was but ill supplied with men of good counsel and with good masters; seeing that other cities, and chiefly the city of the Florentines, has been as it were in these very days, endowed with beautiful and grand works in bronze; among which are the doors of their Baptistery. And this town of Florence, like Piacenza, is a place of intercourse, through which many foreigners pass; who, seeing that the works are fine and of good quality, carry away a good impression, and will say that that city is well filled with worthy inhabitants, seeing the works which bear witness to their opinion; and on the other hand, I say seeing so much metal expended and so badly wrought, it were less shame to the city if the doors had been of plain wood; because, the material, costing so little, would not seem to merit any great outlay of skill ...  

Now the principal parts which are sought for in cities are their cathedrals, and of these the first things which strike the eye are the doors, by which one passes into these churches. 

Beware, gentlemen of the Commission, lest too great speed in your determination, and so much haste to expedite the entrusting of so great a work as that which I hear you have ordered, be the cause that that which was intended for the honour of God and of men should be turned to great dishonour of your judgments, and of your city, which, being a place of mark, is the resort and gathering-place of innumerable foreigners. And this dishonour would result if by your lack of diligence you were to put your trust in some vaunter, who by his tricks or by favour shown to him would attain such great honour than many would have been of advantage to him and to you. Thus I cannot help being angry when I consider what men those are who have conferred with you as wishing to undertake this great work without thinking of their sufficiency for it, not to say more. This one is a potter, that one a maker of cuirasses, this one is a
chi canpanaro, alcuno sonagliere. E insino bombardiere, fra i quali vno Delsignore s’è uàtato che tra l’esser II. lui conpare de Messere Ambrosio Ferrere—chi a qualche commissione—dal quale lui à buone pro-
missioni; e se quello nò basterà 27 che mò- terà à cavallo e àndrà dal signiore e im-
itterà tali lettere, 28 che per uoi mai simile opera nò gli sarà dinegata; o guardate dove i maestri, 29 atti a simili opere, sono ridotti quado con simili omni anno a ga-
reggiare; 30 apri le ochi e vogliate bé uedere che i vostri dinari nò si spédino 31 in conpare • le uostre • vergogne; jo vi so annuiviate che di questa terra voi nò 32 tra-
rete se non è opere di sorte e di vili e grossi magisteri; nò ci è uomo che vaglia; 33 e credetelo a me, salvo Leonardo Fioré-
tino, che fa il cavalo del duca Frácesco di brázo, che non è bisogno fare stima, 34 perché à che fare il tempo di sua vita, è dubito che per l’esser si grade opera che non la finirà mai.

35 I miscri 36 studiosi . . . 41 con che spe-
ranza e’ posso ò no aspettare prenimio di lor virtù?

C. A. 316a 1 958a

Ecco vno il quale il signiore ; per fare questa sua opera à tratto de Firenze 2 che è degni maestro, ma à tátà facièda che non la finirà mai; 3 le credete voi che diffe-
rèòia sia a vedere vna cosa bella da una brutta; salèga Plinio.

Ilmo ac Rímio Dinò Meo Ìnico.
Ferraria.
Ilím ac R. me D. ne mi hu. co. men.
Pochi giorni sono ch’io venni da Milano, e trovando che uno mio fratello maggiore

bell-founder, another a bell ringer, and one
is even a bombardier; and among them one
in his Lordship’s service, who boasted that
he was the gossip of Messer Ambrosio Fer-
riere [26], who has some power and who
has made him some promises; and if this
were not enough he would mount on horse-
back, and go to his Lord and obtain such
letters that you could never refuse to give
him the work. But consider where masters
of real talent and fit for such work are
brought when they have to compete with such
men as these. Open your eyes and look
carefully lest your money should be spent in
buying your own disgrace. I can declare to you
that from that place you will procure none but
average works of inferior and coarse masters.
There is no capable man,—[33] and you may be-
lieve me,—except Leonardo the Florentine, who
is making the equestrian statue in bronze of the
Duke Francesco and who has no need to bring
himself into notice, because he has work for all
his life time; and I doubt, whether being so
great a work, he will ever finish it[34].

The miserable painstaker s . . . with what
hope may they expect a reward of their merit?

1347.

There is one whom his Lordship invited
from Florence to do this work and who is a
worthy master, but with so very much business
he will never finish it; and you may imagine
that a difference there is to be seen between
a beautiful object and an ugly one. Quote Pliny.

1348.

Most Illustrious and most Reverend Lord.
The Lord Ippolito, Cardinal of Este
at Ferrare.

Most Illustrious and most Reverend Lord.
I arrived from Milan but a few days since
and finding that my elder brother refuses to

sino] É insinuato [a vna] bombardiere inti quali vno del . . . trallessere, 26, ferere “ce a qualche comessione” dal . . . esse,
27. che [vel sarà] mòtera a chavallo e andar [attrovare] del signiore e [che vi porterà] impetera” tale. 28. gli sa dinegata
no . . dove [i maestri dìbano ingiegezio]. 29. agimile garegiare. 30. voliate . . vedere [in] che [modo] i vostri dinari [si
debbono speader] nò . . le vostre le vostre vergogni . . avviare . . . tira. 32. nome e hopere di sorte [e vii àbh] e di vila . . homo. 33. salvo [quel] lemar fràcesco” che sta chavallo . . fràc’ “di brázo” che . . isere. 34. nalla. 36. studi-
che spie. 42. possa. 43. aspettare.

1347. 1. Eì . . attratto de fižare. 2. tâta facièda nolla. 3. dïferéa da l’brutta.

1346. 26. Messer Ambrogio Ferrere was Farmer
of the Customs under the Duke. Placenza at that
time belonged to Milan.

1348. This letter addressed to the Cardinal
Ippolito d’Este is here given from Marchese
G. Campori’s publication: Nuovi documenti per la Vita
di Leonardo da Vinci. Atti e Memorie delle R. R. Deput-
tazioni di Storia patria per la provincie modenese e par-
I am afraid lest the small return I have made for the great benefits, I have received from your Excellency, have not made you carry into effect a will, made three years ago when my father died—as also, and no less, because I would not fail in a matter I esteem most important—I cannot forbear to crave of your most Reverend Highness a letter of recommendation and favour to Ser Raphaello Hieronymo, at present one of the illustrious members of the Signoria before whom my cause is being argued; and more particularly it has been laid by his Excellency the Gonfaloniere into the hands of the said Ser Raphaello, that his Worship may have to decide and end it before the festival of All Saints. And therefore, my Lord, I entreat you, as urgently as I know how and am able, that your Highness will write a letter to the said Ser Raphaello in that admirable and pressing manner which your Highness can use, recommending to him Leonardo Vincio, your most humble servant as I am, and shall always be; requesting him and pressing him not only to do me justice but to do so with dispatch; and I have not the least doubt, from many things that I hear, that Ser Raphaello, being most affectionately devoted to your Highness, the matter will issue ad volum. And this I shall attribute to your most Reverend Highness' letter, to whom I once more humbly commend myself. Et bene valeat.

Florence XVIII. 7bris 1507
E. V. R. D.
S. or Humil.
Leonardus Vincius pictor.

C. A. 3502: 0444

Jo ho sospetto che la poca mia remunerazione de'gran benefici che io ho ricevuti da nostra Eccelletia non l'abbinb al momento, Vol. III. It is the only text throughout this work which I have not myself examined and copied from the original. The learned discoverer of this letter—the only letter from Leonardo hitherto known as having been sent—adds these interesting remarks: Coledto Cardinalo nato ad Ercole I. nel 1470, archeschino di Strigonia a sette anni, poi d'Ago, aveva conseguito nel 1497 la plinie ad ambito cattedra di Milano, la dove avra consilito il Vincio, sebbene il poco amore ch'ei professava alle trilli lasci credere che le proteste di servitù di Leonardo più che a gratitudine per favori ricevuti e per opere a lui allogate, accennano a speranza per un favore che si aspetta. Notabile è ancora in questo prezioso documento la ripetuta signature del grande artista che si scrive Vincio e Vincius, non da Vinci come si tiene comunemente, sebbene l'una e l'altra possano volere a significare così il casale come il paese; restando a sapere se il nome del paese di Vici fosse assunto a cognome della famiglia di Leonardo nel quale supposto più propriamente avrebbe a chiamarsi Leonardo Vici, o Vincio (latino Vincius) con gli stessi amò segnarsi in questa lettera, e come scrittori pesci, contentandosi di un, li, il Caso, il Cesario, Giuseppe Torgy, il Giurico, il Bandello, Raffaello Maffe, il Piscio. Per ultimo non lasciò d'avvertire come la lettera del Vincio è assai ben conservata, di nitide e larga scrittura in forma pienamente corrispondente a quella dei suoi manoscritti, sorguta all'uso comune da sinistra a destra, avido contrairemente come fu suo costume; ma indubbiamente autentica e fornita della menzione e del suggello che fresca ancora conserva l'impronta di una testa di profilo da un piccolo antico cammeo. (Compare No. 1368, note.)
LETTERS.

somewhat angry with me, and that is why to so many letters which I have written to your Lordship I have never had an answer. I now send Saia to explain to your Lordship that I am almost at an end of the litigation I had with my brother; that I hope to find myself with you this Easter, and to carry with me two pictures of two Madonnas of different sizes. These were done for our most Christian King, or for whomsoever your Lordship may please. I should be very glad to know on my return thence where I may have to reside, for I would not give any more trouble to your Lordship. Also, as I have worked for the most Christian King, whether my salary is to continue or not. I wrote to the President as to that water which the king granted me, and which I was not put in possession of because at that time there was a dearth in the canal by reason of the great droughts and because its outlets were not regulated; but he certainly promised me that when this was done I should be put in possession. Thus I pray your Lordship that you will take so much trouble, now that these outlets are regulated, as to remind the President of my matter; that is, to give me possession of this water, because on my return I hope to make there instruments and other things which will greatly please our most Christian King. Nothing else occurs to me. I am always yours to command.

C. A. 364 A; 1138 A

Drafts of Letters to the Superintendents of Canals and to Fr. Malzi.

Magnifico presiedete, io mando costi Salai mio discépolo, il quale di questa sia apor- tatore e da lui intenderete a bocca la causa del mio tanto sopra (sedere) ...

uostra. 4. lettigio. . fratelgli osssi in questa. 5 passqua opportune commeco, noostre .. quale. 6 cristianis- simo, uostra. 7. coste. . astare per istanza.


1350. Magnaeco presiedete [questa sol per condare] io .. quale [di questa sit]. 2. [la porta] di questa, abostra supra. 3 Ma-

1349. Charles d'Amboise, Maréchal de Chaumont, was Governor of Milan under Louis XII. Leonardo was in personal communication with him so early as in 1503. He was absent from Milan in the autumn of 1506 and from October 1510—when he besieged Pope Julius II. in Bologna—till his death, which took place at Correggio, February 11. 1511. Francesco Vinci, Leonardo's uncle, died—as Amo- retti tells us—in the winter of 1510-11 (or according to Uzielli in 1506?), and Leonardo remained in Florence for business connected with his estate. The letter written with reference to this affair, No. 1348, is undoubtedly earlier than the letters Nos. 1349 and 1350. Amoretti tells us, Memorie Storiche, ch. II, that the following note existed on the same leaf in MS. C. A. I have not however succeeded in finding it. The passage runs thus: 'Jo sono quasi al fine del mio lettigio che io à con mio fratelgli . . . Ancora ricordo a V. Excella la facenda che à com Ser Juliano mio Fratello capo delli altri fratelli ricordandoli come se offese di conciar le cose nostra fra noi fratelli del comun della credito de mio Zio, e quelle curziona alla expidizione, quale contenzia la letetra che lui me mandò.

10. Compare Nos. 1009 and 1010. Leonardo has noted the payment of the pension from the king in 1505.
Magnifico presidente io.

Magnifico President:—Having oftentimes remembered the proposals made many times to me by your Excellency, I take the liberty of writing to remind your Lordship of the promise made to me at my last departure, that is the possession of the twelve inches of water granted to me by the most Christian King. Your Lordship knows that I did not enter into possession, because at that time when it was given to me there was a dearth of water in the canal, as well by reason of the great drought as also because the outlets were not regulated; but your Excellency promised me that as soon as this was done, I should have my rights. Afterwards hearing that the canal was complete I wrote several times to your Lordship and to Messer Girolamo da Cusano, who has in his keeping the deed of this gift; and so also I wrote to Corigero and never had a reply. I now send thither Salai, my pupil, the bearer of this, to whom your Lordship may tell by word of mouth all that happened in the matter about which I petition your Excellency. I expect to go thither this Easter since I am nearly at the end of my lawsuit, and I will take with me two pictures of our Lady which I have begun, and at the present time have brought them on to a very good end; nothing else occurs to me.

My Lord the love which your Excellency has always shown me and the benefits that I have constantly received from you I have hitherto...

I am fearful lest the small return I have made for the great benefits I have received from your Excellency may not have made you somewhat annoyed with me. And this is why, to many letters which I have written to your Excellency I have never had an answer. I now send to you Salai to explain to your Excellency that I am almost at the end of my litigation with my brothers, and that I hope to be with you this Easter and carry with me two pictures on which are two Madonnas of different sizes which I began for the most Christian King, or for whomsoever you please. I should be very glad to...

Magnifico presidente io.

4 Magnifico presidente, essendomi io pio volte ricordato delle proferte fatti di voi, eccellentissima, più volte, è preso a nostro commodo ciò che di scienziare e di ricordare a questa la promessa fatti a l'ultima partita, cioè la posessione di quelle due once d'acqua donatemi dal cristianissimo re; vostra Signoria sa che io non c'era in essa posessione, perché in quel tempo, ch'ela mi fu donata, era carentina d'acqua nel naviglio, si pel grà secco come pel non essere ancora moderati li sua bochelli; ma mi fu promesso da vostra Eccellentia che fatta tal moderazione io avrei l'intento mio; di poi, intendendo essere accoinco il naviglio, io scrisi più volte a vostra signoria e a Messer Girolamo da Cusano, che è a presso di sé la carta di tal donazione, e così scrissi al Corigero, e mai ebbi risposta; Ora io mando costi Salai, mio discepolo, aportatore di questa, al quale vostra Signoria potrà dire a bocca tutto quel che'è seguito, della qual cosa io prego vostra Eccellenza; Jo credo esser costi in questa pasqua per esser presso al fine del mio piaggiare, e porterà così meco due quadri di nostra donata, che io o commiciate, e e le ne' tempi, che mi sono avazati, condotte in assai bò porto; Altro nò mi accade.

11 Magnifico Signore mio, l'amore che uostro Eccellentia m'à senpre dimostrò, e' benlietti ch'io o riceuì da quella al contiuo mi so dinai... 10 Io o sospetto che la poca remuneratiò de'grà benìti ch'io ho riceuìto da uostro Eccellentia non l'abbi12no fatto alquato turbare con meco, e questo è che di piu lettere che io o scritte a vostra Eccellentia io non o mai 12avuta risposto, ora io mando costi Salai per fare intenderci a vostra signoria, come io o son quasi al fine del mio 13letigio co mia fratelli, e come io credo essere costi in questa pasqua eportare con meco due quadri dove sono 12due Nostre donne di varie gradezze, le quali io o commiciato pel cristianissimo rè, o per chi a uoi piacerà; avrei ben caro di sa26pere...
alla mia tornata di cost, dove io o a stare per stanza, perché nò urorle dare più noia a uostra Signoria, e a cora, auendo io lavorato pel cristianissimo Rè, se la mia prouisio è per correre o no; io scriu a preside di quell' acqua che mi donò il rè, della quale no fui messo in possessione per esserne carestia nel navilio per cara de' grà secchi, e perché i suoi bocchelli non erà moderati; ma bè mi promíse che, fatta tal moderatione, i'ne sarei messo in possessione, sicché io vi prego che, conttrandovi in esso presidente, no vi incresca che ora, che tali bocchelli sò moderati, di ricordare a detto presidente di farmi dare la possessione d'essa acqua, che mi parue intedere che in grà par te staua a lui; altro no mi accade; sono sempre a uostri comàdè.

Buò di, messer Francesco, può lo fare Iddio che di tante lettere ch'io vò scritte che mai voi non m'abbiate risposto; Or aspettate ch'io venga costà, per Dio, ch'io vi farò tanto scrivere che forse vi rincrescerà.

Caro mio, messer Francesco, io mado costi Salai per intendere dalla magnificentia del presidente che fine a avuta quella moderatione dell'acque che alla mia partita fu ordinata per li bocchelli del navilio, perché el magnifico presedète mi promiisse che subito fatta tal moderatione, io sarei spedito; Ora egli è più tempo che io intesi che il naiulio s'accosca, e similmente i suoi bocchelli, e immedie sti scrisi al presidente e a uoi, e poi replicai, e mai ebbi risposta; aduque vi degerete di rispondermi quel ch'è seguito, e non essendo per spedirsi nò u'ircesca per mio a38 more di sollicitarne un poco il presidente e così messer Girolamo da Cusano, al quale uoi mi racomàdere e offrirtemi a sua magnificetia.

Dear Messer Francesco. I am sending thither Salai to learn from His Magnificence the President to what end the regulation of the water has come since, at my departure this regulation of the outlets of the canal had been ordered, because His Magnificence the President promised me that as soon as this was done I should be satisfied. It is now some time since I heard that the canal was in order, as also its outlets, and I immediately wrote to the President and to you, and then I repeated it, and never had an answer. So you will have the goodness to answer me as to that which happened, and as I am not to hurry the matter, would you take the trouble, for the love of me, to urge the President a little, and also Messer Girolamo Cusano, to whom you will commend me and offer my duty to his Magnificence.

25. priego chescontrandorsi. 26. possessione . . . acq'a. . . . 27. albii . . . nomabbiate risposta. 29. vengha . . . che sforse vi rincresca. 30. chrio . . . messer Francesco . . . chesfine a nta. . . . della cpa. . . . parita . . . che nafulo sacch. . . . 33. caua essemsìmente . . . scrisi [o auoi el] . . . riprici.
31. risposta . . . rispondermi . . . ispedirsi. 35. pocho. 36. offererete assa magnificetia.

1350. 28—36. Draft of a letter to Francesco Melzi, born 1493—a youth therefore of about 17 in 1510. Leonardo addresses his young friend as "Messer", as being the son of a noble house. Melzi practised art under Leonardo as a dilettante and not as a pupil, like Cesare da Sesto and others (See Leonolff, Die Galerion &c., p. 470).
1351. 1353. It is clear from the contents of this notes that they refer to Leonardo's residence in Rome in 1513-1515. Nor can there be any doubt that they were addressed to Leonardo's patron at the time: Giuliano de' Medici, third son of Lorenzo the Magnificent and brother of Pope Leo X (born 1478). In 1512 he became the head of the Florentine Republic. The Pope invited him to Rome, where he settled; in 1513 he was named patron with much splendid ceremonial. The medal struck in honour of the event bears the words MAG. IVLIAN. MEDICES. Leonardo too uses the style "Magnifico", in his letter. Compare also No. 1377.

Gino Capponi (Storia della Repubblica di Firenze, Vol. III, p. 139) thus describes the character of Giuliano de' Medici, who died in 1516: Era il migliore della famiglia, di vita placida, grande spenditore, tenendo intorno a sì uomini ingegnosi, ed ogni nuova cosa voler provare.


Julian vor der euldest aller damaligen Medici, ein Mensch von innerlicher Richtig, unbefriedigt durch das Leben, mitten im Sommenglaur der Herrlichkeit Leo's X. eine dunkle Gestalt, die wie ein Schatten vorüberzog. Giuliano lived in the Vatican, and it may be safely inferred from No. 1352 l. 2, and No. 1353 l. 4, that Leonardo did the same.

From the following unpublished notice in the Vatican archives, which M. Eug. Münz, librarian of the Ecole des Beaux Arts, Paris, has done me the favour to communicate to me, we get a more accurate view of Leonardo's relation to the often named Giorgio Todesco:

Nota delle prozioni (sic) a da pagare per me in nome del nostro il. S. Bernardo Bini e choppo di Como, e prima della illusia sua consorte ogni mese d. 800. A Leò da Viuci per sua provisione d. XXXIII, e più d. VII al detto per la provisione di Giorgio tedauch, che sono in tutto d. 40.

From this we learn, that seven ducats formed the German monthly wages, but according to No. 1353 l. 7 he pretended that eight ducats had been agreed upon.
presso di me, perchè oltre al conto elli acquisterebbe il linguaggio italiano; [lui sempre lo promesse e mai lo volle fare]; E questo facievo ancora, perchè quel Giov* tedesco che fa li spechi ogni di li era in bottega, e volleua vedere e intendere ciò che si facieva e pubblicava per la forte biasimando; e perchè lui mägiava co quelli della guardia del papa, e poi se n'adava in compagnia colli scoppiette, amazzó vecielli per queste anticaglie e così seguitava da dopo desinare a sera; E se io mandavo Lorëz 11 a sollecitarli il lavoro lui si creava e diceva che no volea tanti maestri sopra capo, e che il lavorar suo era 12 per la guardaroba di vostra Ecclesiètta, e passò dua mesi e così seguitava e indi, trovando Giannicò della 13 guardaroba, domádailo s'el Tedesco avea finito l'opere del magnifico, e lui mi disse non esser vero, ma che so14lamentè li avea data a nettar dua scoppiette; di poi faciedolo io sollecitare lui lasciò la bettega, e cominciò a lavorare i came15ra, e perde assai tèpo nel fare vn altra morsa e lime e altri strumèti a vite; e quiui lavorava mulinelli da tortere seta, 16 li quali nascódeva, quado un de'mia v'etrava, e con mille bestemio e imbrotiti, in modo che nessù de mia povea piv catrare.

Tanto mi sò rallegrato, jllustrissimo mio Signore, del disiderato acquisto di vostra sanità che quasi il male mio da me 18 s'è fugito; Ma assai mi rincresce il non avere io potuto integralmente tutto desideri di vostra Eccellenza 19 mediante la malignità di cotesto inganatore tedesco, per il quale non è lasciato indiretta cosa alcuna, 20 colla quale lo abbia creduto farli piacere; e secondarnente invitarlo ad abitar e vivere con meco, per la qual cosa io ve21crei al continuo l'opera che lui faciesse, e co' felicità ricorreggerei li errori; e oltre di ques'o inparcerebbe la lingua italiana, 22 mediante la quale lui cò facilità potrebbe parlare sanza interpetre; e li sua danari li

would acquire the Italian language. He always promised, but would never do so. And this I did also, because that Giovanni, the German who makes the mirrors, was there always in the workshop, and wanted to see and to know all that was being done there and made it known outside . . . strongly criticising it; and because he dined with those of the Pope's guard, and then they went out with guns killing birds among the ruins; and this went on from after dinner till the evening; and when I sent Lorenzo to urge him to work he said that he would not have so many masters over him, and that his work was for your Excellency's Wardrobe; and thus two months passed and so it went on; and one day finding Gian Niccoli of the Wardrobe and asking whether the German had finished the work for your Magnificence, he told me this was not true, but only that he had given him two guns to clean. Afterwards, when I had urged him farther, he left the workshop and began to work in his room, and lost much time in making another pair of pincers and files and other tools with screws; and there he worked at mills for twisting silk which he hid when any one of my people went in, and with a thousand oaths and mutterings, so that none of them would go there any more.

I was so greatly rejoiced, most Illustrious Lord, by the desired restoration of your health, that my own illness almost left me. But I am greatly vexed at not having been able to completely satisfy your Excellency's wishes by reason of the wickedness of that German deceiver, for whom I left nothing undone by which I could have hope to please him; and secondly I invited him to lodge and board with me, by which means I should constantly see the work he was doing and with greater ease correct his errors while, besides this, he would learn the Italian tongue, by means of which he could with more ease talk without an interpreter; his moneys were always given him in advance of the
The next thing was that he made himself another workshop and pincers and tools in his room where he slept, and there he worked for others; afterwards he went to dine with the Swiss of the guard, where there are idle fellows, in which he beat them all; and most times they went two or three together with guns, to shoot birds among the ruins, and this went on till evening.

At last I found how this master Giovanni the mirror-maker was he who had done it all, for two reasons; the first because he had said that my coming here had deprived him of the countenance and favour of your Lordship which always... The other is that he said that his iron-workers' rooms suited him for working at his mirrors, and of this he gave proof; for besides making him my enemy, he had made him sell all he had and leave his workshop to him, where he works with a number of workmen making numerous mirrors to send to the fairs.

I was so greatly rejoiced, most Illustrious Lord, by the wished for recovery of your health, that my own ills have almost left me; and I say God be praised for it. But it vexes me greatly that I have not been able completely to satisfy your Excellency's wishes by reason of the wickedness of that German deceiver, for whom I left nothing undone by which I could hope to please him; and secondly I invited him to lodge and board with me, by which means I should see constantly the work he was doing,
C. A. 1796; 544

Questo altro m’ha ipedito l’anatomia 2 col papa biasiamâdola, e così all’o-spedale, e epie di botteghe da spechi 4 tutto questo Beluedere o di lavorâti; e così à fatto nella stàtia di ma’estro Giorgio; 7 disse che otto du’cati li furon promes9si ogni mese, comi11 ciâdo il primo di 11 che si mise in via, 13 o il più tardo qua11do e’ui parlò, e che 14 voì l’accettaste; 15 Vedêdo io costui rare volte stà’re a bottega e che cósumava assai, jo 11 li feci dire che se li piaceva che io farei 18 con lui mercato di ciascuna cosa che 19 lui facesse, e a stima tanto li darei 20 quâto noi fussimo d’accordo; elli 21 si cósigliò col uicino e lasciò li la stà22’tia, vendendo ogni cosa, e venne a trovare...

C. A. 3044; 1959

Caro Benedetto de’ Pertarti. 2 Caduto il fier gigàte per la cagione della jsagunata 3 e fangosa terra, parve che cadesse vna motagna; 4 onde la capagnia guassata di terremoto, e spavêto 5 Plutone jfernale; e per la grà percossa risistette 9 sulla piana terra alquato stordito; e subîo 11 il popolo, credêdo fusse morto di qualche saetta,— 10 tornato la gran turba, a guisa di formiche che scorrono a 11 furia, quando per il corpo del caduto robore 13; così questi 13 scorredo per l’ampie membra e le râvrd o con spesse 17 ferite; onde

for which purpose I would have a table fixed at the foot of one of these windows, where he could work with the file and finish the things made below; and so I should constantly see the work he might do, and it could be corrected with greater ease.

This other hindered me in anatomy, blaming it before the Pope; and likewise at the hospital; and he has filled [4] this whole Belvedere with workshops for mirrors; and he did the same thing in Maestro Giorgio’s room. He said that he had been promised [7] eight ducats every month, beginning with the first day, when he set out, or at latest when he spoke with you; and that you agreed.

Seeing that he seldom stayed in the workshop, and that he ate a great deal, I sent him word that, if he liked I could deal with him separately for each thing that he might make, and would give him what we might agree to be a fair valuation. He took counsel with his neighbour and gave up his room, selling every thing, and went to find...

Dear Benedetto de’ Pertarti. When the proud giant fell because of the bloody and miry state of the ground it was as though a mountain had fallen so that the country shook as with an earthquake, and terror fell on Pluto in hell. From the violence of the shock he lay as stunned on the level ground. Suddenly the people, seeing him as one killed by a thunderbolt, turned back; like ants running wildly over the body of the fallen oak, so these rushing over his ample limbs . . . . . . . . . . . . . . with renewing his strength whenever he fell and came in contact with his mother earth; but that Hercules lifted him up and so conquered and strangled him. Lucan gives a full account of the struggle. Pharsalia IV, 617. The reading of this passage, which is very indistinctly written, is in many places doubtful.

1354. A puzzling passage, meant, as it would seem, for a jest. Compare the description of Giants in Dante, Inf. XXI and XXII. Perhaps Leonardo had the Giant Antaeus in his mind. Of him the myth relates that he was a son of Gê, that he fed on lions; that he hunted in Libya and killed the inhabitants. He enjoyed the peculiarity of

1352. 2. chosi. 3. dasspechi. 4. ollavre. 5. aifato. 6. esso giorgio. 8. fu. 9. sa. 11. mise. 16. abotegha . assal.
17. chessell piaacea che i farei. 18. collui merchanto . casscuna. 19. facessi e assimma attato. 20. dachordo. 21. eisacioli
22. vendeda ogni cosa e vene nitrovare.

1354. 1. benedetto petarli. 2. dela. 3. tera . caderis. 4. gussa de tere moto. 5. plutone jfernale . percossa. 6. sula . tera
. stordito on sobito. 7. il popo rededu fusì. 8. grà turba . scorano. 9. furì 0]1]])ndo per ocoloro del caduto uogore
cosi. 10. per larpee mebra e tera vrdio conisipese. 11. ferie. 12. daile . sedesel. 13. wamiglo. 14. furì . le + (4?)
risentito il gigàte e scettòsi quasi coperto dalla molitudine, subito sentesi cuorecere per le pietre; mise un muggiolo che parve fosse vno spaventoso tono, e posto le sue mani in terra, e levatosi il pavroso volto, e posto vna delle mani j capo trovò solo 17 pieno d'uomini appiccati e canna glio a similitudine de' mini anti animali, che fra que 21 gli sogliono nascere; onde scuotendo il capo gli omini lì accanto non altramente per l'aria che si facia 24 la gradine, quado va è co furor di vèti, e trovossi molti 25 di questi omini esser morti da quegli che gli stavano so' ratti; coi piedi calpestàdo ...

27È tenèdosì a capeggi egieniàdosì nascondere tra quegli, facievano a similitudine de' marinaì quado è fortuna, che corrono super le corde 29 per abbasar la a poco vèto, 30 Nuove delle cose 31 di levàte; 32 sappi come 33 nel mese 34 di givignio e apparito 36a gigàte che vie dalla 37deserta Libìa, 38 a similitudine delle 39formiche furiàdo... 41 abbatu'to dall... 47 rigido villano.

40 Questo gigàte era nato nel Mot' Atalate, ed era 41 un eroe, e ebbe còstrastare cogli Egitì e Arabi 45 Medi e Persì; viveva j mare delle bale 46ne de' grà capidogli e de' navili.

42 Marte, tèmdo della 48 vita, s'era fugito sotto le 39 ... di Giove.
50 È per la grà caduta parve la provìcia 51 tutta tremasse.

Il quale spirito ritrova il cerebro, dòde partito s'era, con alta voce có tali parole mosse...

È se alcuno uomo bëcché abbi discretione o botà... dalli altri omini... 3... e peggio se da esso son remote.

This spirit returns to the brain whence it had departed, with a loud voice and with these words, it moved...

And if any man though he may have wisdom or goodness...
O felice; o avvertuto spirito, dòde
dati 4 partiti! io ho questo uomo a male mio
 grado bë conoscevò; Questo è ricetto 
di villanìa, questo è proprio ammonitoa di
 somma ingratitude, e in cògnazìa di tutti
i viti; ma che mi vo io cò parole indarno
affaticadòmi? la somma dé peccati 7 solo
in lui trovato sono; E se alcuno infra loro
si trova, che alcuna bontà posseggia, non
altri mete come che me dalli altri uomini
trattati sono; e in effetto io ho questa co-
clusione ch’è 9 male s’eli sono nimici e peggio
s’eli son amici.

Tutti i mali che sono ² e che furono,
6 essendo messi in opera da costui 7 non sa-
risarebbero al desiderio del suo iniquo
animo; 9 no potrei con lunghezza di tempo
descriverui la natura di costui 11, ma bë
cochivdo che . . .

Io ho uno che per auersi di me pro-
presso comse assai; me che debite, ² essendo
rimasto inganàtò dello suo prosontuosò desidero,
à testamentò di torni tutti li amici e per-
ché li à trovato saui e non leggerìeri al suo
volere mi à minaciato che trouate le anmu-
tìazioni ⁵ che mi torrà i benefattori; ³de io
ho di questo informato ⁶ vostra Signoria
accio che, volendo questo li usati ⁷ scadoli,
non troui terreno ato a seminare pensieri e li ⁸ atti
della sua mala natura; ⁹ che, tentàdo lui fare di vostra
signoria strumèto della sua iniqua e ma-
lugia natura ¹⁰ rimàga ingannato di suo
desiderio.

E in questo caso io so che io ne acqui-
sterò non poco nemici, concòsia che nessù
credèra ch’io posse amico di lui, perché pechi
chono. ⁵ ulanía . . . amy nitone. ⁶ chìspagula . . . voi chò . . . affaticàdòmi lassoma de pechati. ⁷ solo nello trovati sono
Esse alcuhò . . . alcuna . . . possegà. ⁸ chone . . . omini . . . effetti . . . chòclusione. ⁹ male seli sonimiche e pegio seli
son trattadamente.

O blessed and happy spirit whence com-
est thou? Well have I known this man,
much against my will. This one is a receptacle of
villainy; he is a perfect heap of the utmost
ingratitude combined with every vice. But
of what use is it to fatigue myself with vain
words? Nothing is to be found in them but
every form of sin . . And if there should
be found among them any that possesses any
good, they will not be treated differently to
myself by other men; and in fine, I come to
the conclusion that it is bad if they are hos-
tile, and worse if they are friendy.

All the ills that are or ever were, if
they could be set to work by him, would not
satisfy the desires of his iniquitous
soul; and I could not in any length of
time describe his nature to you, but I con-
clude . . .

I know one who, having promised me
much, less than my due, being disappointed
of his presumptuous desires, has tried to
deprive me of all my friends; and as he
has found them wise and not pliable to his
will, he has menaced me that, having found
means of denouncing me, he would deprive
me of my benefactors. Hence I have in-
formed your Lordship of this, to the end
[that this man who wishes to sow the usual
scandals, may find no soil fit for sowing the
thoughts and deeds of his evil nature] so
that he, trying to make your Lordship,
the instrument of his iniquitous and malicious
nature may be disappointed of his desire.

And in this case I know that I shall make
few enemies seeing that no one will believe
what I can say of him; for they are but
quoted (No. 1210, l. 48). The two have however no
real connection.
son quelli a chi i suoi viti dispiacciono; anzi solamente a quelli omini li dispiacionso che son di natura còtraria a tali uij; e molti odioano li padri e guastan le amicicé, represori de' sua viti e non vogliono esempi contrari a essi, né nessuno vma consiglio.

2 E se alcuno si ne trova virtuoso e bono, non lo scacciare da voi; fatteli onore, acciò che non abbia a fugirsi da voi e ridursi neli eremi, o spelonche, o altri lochi soletamente, per fugirsi dalle vostre inside; e se alcun di questi tali si trova, fatteli onore, perché questi sono li uostri Iddee terrestri, questi meritii da uoi le statue e li simulacri; ma che ui ricordo che li lor simulacri nò sia da uoi màgiati come àcora in alcuna regione del India; chè quâdo li simulacri operano alcuno màrculo secondo loro, li sacerdoti li tagliano in pezzi, essenzo di legno, e ne danno a tutti quelli del paese nò senza premio, e ciascù raspa sottilmète la sua parte e mette sopra la prima vivanda che màgano; e così tëgono per fede aversì màgiato il suo santo, e credono che lui li guardi poi da tutti li pericoli che ti pare, uomo, qui della tua specie? sei tu così saizio, come tu ti tieni? son queste cose da esser fatte da omini?

3 Francesco d'Antonio
Bernardo di Maestro Jacopo.

4 C. A. 4 b; 11 b]

As I told you in past days, you know that I am without any. . .
Francesco d'Antonio.

Bernardo di Maestro Jacopo.

5 Dimmi come le cose sono passate.

Tell me how the things happened.

6 C. A. 38 b; 124 a]

I. 15. In explanation of this passage I have received the following communication from Dr. G. W. Lethner of Lahore: "So far as Indian customs are known to us, this practice spoken of by Leonardo as 'still existing in some parts of India' is perfectly unknown; and it is equally opposed to the spirit of Hinduism, Mohammedanism and Sikhism. In central Thibet the ashes of the dead, when burnt, are mixed with dough, and small figures—usually of Buddha—are stamped out of them and some are laid in the grave while others are distributed among the relations. The custom spoken of by Leonardo may have prevailed there but I never heard of it." Possibly Leonardo refers here to customs of nations of America.
1361. This seems to be the beginning of a letter, but only the first words of the lines have been preserved, the leaf being torn down the middle. No translation is possible.

1362. A preparatory note for the passage given as No. 798, II. 41—42.

1363. This note probably refers to the text No. 1221.

1367. This note seems to be a quotation.
1368. So Leonardo writes his name on a sheet with sundry short notes, evidently to try a pen. Compare the signature with those in Nos. 1341, 1348 and 1374 (see also No. 1346, l. 33). The form "Leonardo" does not occur in the autographs. The Portrait of the Master in the Royal Library at Turin, which is reproduced—slightly diminished—on Pl. I, has in the original two lines of writing underneath; one in red chalk of two or three words is partly effaced: "Leonardo e... im (or lui?)"; the second written in pencil is as follows: "fatto da lui stesso assai secco. In both of these the writing is very like the Master's, but is certainly only an imitation.

1369. This date is on a drawing of a rocky landscape. See Chronique des Arts 1881 no. 23: "Léonard de Vinci a-t-il été au Righi le 5 août 1473?" letter by H. de Geymüller. The next following date in the MSS. is 1478 (see No. 663).

1370. While the letters in the MS. notes of 1473 and 1478 are very ornate, this note and the texts on anatomy on the same sheet (for instance No. 805) are in the same simple hand as we see on Pl. CXVI and CXIX. No 1370 is the only dated note of the years between 1480 and 1489, and the characters are in all essential points identical with those that we see in the latest manuscripts written in France (compare the facsimiles on Pl. CXV and p. 254), so that it is hardly possible to determine exactly the date of a manuscript from the style of the handwriting, if it does not betray the peculiarities of style as displayed in the few notes dated previous to 1480.—Compare the facsimile of the manuscripts 1479 on Pl. LXII, No. 2; No. 664, note, Vol. I p. 346. This shows already a marked simplicity as compared with the calligraphy of 1478.

The text No. 720 belongs to the year 1490; No. 1310 to the year 1492; No. 1459, No. 1384 and No. 1460 to the year 1493; No. 1463, No. 1517, No. 1024, 1025 and 1461 to the year 1494; Nos. 1523 and 1524 to the year 1497.

1371. "Scrissi qui. Leonardo does not say where; still we may assume that it was not in Milan. Amoretti writes, Memorie Storiche, chap. XIX: "Sembrò portato che non nel 1499 ma nel 1500, dopo il ritorno e la prigionia del duca, sia da qui partito Léonardo per andare a Firenze; ed è quindi probabile, che i mesi di governo nuovo e incerto abbiano passati coll'amico suo Francesco Melzi a Vaprio, ove maggio che altrove studiar potesse la natura, e soprattutto le acque, e l'Adda specialmente, che gia era stato l'oggetto delle sue idrostatiche ricerche. At that time Melzi was only six years of age. The next date is 1502; to this year belong No. 1034, 1040, 1042, 1048 and 1053. The note No. 1525 belongs to the year 1503.
A di 9 di luglio 1504, mercoledì a ore 7 mori Ser Piero da Vinci, notaio al Palazzo del Podestà, mio padre, a ore 7, era d'età d'anni 80, lasciò 10 figlioli maschi e 2 femmine.

On the 9th of July 1504, Wednesday, at seven o'clock, died Ser Piero da Vinci, notary at the Palazzo del Podestà, my father, at seven o'clock, being eighty years old, leaving behind ten sons and two daughters.

On Wednesday at seven o'clock died Ser Piero da Vinci on the 9th of July 1504.

Begun by me, Leonardo da Vinci, on the 12th of July 1505.

Begun at Milan on the 12th of September 1508.

On the 9th of January 1513.

1372. This statement of Ser Piero’s age contradicts that of the Riassunto della morta di Antonio da Vinci (Leonardo’s grandfather), who speaks of Ser Piero as being thirty years old in 1457; and that of the Riassunto della morta di Ser Piero e Francesca, sons of Antonio da Vinci, where Ser Piero is mentioned as being forty in 1469. These documents were published by G. Uzielli, Ricerche intorno a L. da Vinci, Firenze, 1872, pp. 144 and 146. Leonardo was, as is well known, a natural son. His mother ‘La Catarina’ was married in 1457 to Acciastrabriga di Piero del Vacca da Vinci. She died in 1519. Leonardo never mentions her in the Manuscripts. In the year of Leonardo’s birth Ser Piero married Albiera di Giovanni Amadoci, and after her death at the age of thirty eight he again married, Francesca, daughter of Ser Giovanni Lanfredi, then only fifteen. Their children were Leonardo’s half-brothers, Antonio (b. 1476), Ser Giuliano (b. 1479), Lorenzo (b. 1484), a girl, Violante (b. 1485), and another boy Domenico (b. 1480); Domenico’s descendants still exist as a family. Ser Piero married for the third time Lucrezia di Guglielmo Cortigiani by whom he had six children: Margherita (b. 1491), Benedetto (b. 1492), Pandolfo (b. 1494), Guglielmo (b. 1496), Bartolommeo (b. 1497), and Giovanni (date of birth unknown). Pierino da Vinci the sculptor (about 1520—1554) was the son of Bartolommeo, the fifth of these children. The dates of their deaths are not known, but we may infer from the above passage that they were all still living in 1505.

1373. This and the previous text it may be remarked are the only mention made by Leonardo of his father; Nos. 1526, 1527 and No. 1463 are of the year 1504.

1374. Thus he writes on the first page of the MS. The title is on the foregoing coversheet as follows: Libro titolato distrazione e (cioè) d’un corpo nato (in un) altro senza diminuzione e arescimento di materia.

1375. No. 1528 and No. 1529 belong to the same year. The text Vol. I, No. 4 belongs to the following year 1509 (1508 old style); so also does No. 1009—Nos. 1022, 1057 and 1464 belong to 1511.

1376. No. 1465 belongs to the same year. No. 1665 has the next date 1514.
1377.

Partissi il magnifico Giuliano de' Medici a di 9 di gennaio 1515 in sull'aurora da Roma per adare a sposare la moglie in Savoia; e in tal di ci fu la morte del re di Francia.

1378.

A 24 di giugno il di di san Giovanni 1518 in Abosa nel palazzo del cilli.

1377. The Magnifico Giuliano de' Medici left Rome on the 9th of January 1515, just at daybreak, to take a wife in Savoy; and on the same day fell the death of the king of France.

1378. On the 24th of June, St-John's day, 1518 at Amboise, in the palace of . . .

1377. Giuliano de Medici, brother to Pope Leo X.; see note to Nos. 1351—1353. In February, 1515, he was married to Filiberta, daughter of Filippo, Duke of Savoy, and aunt to Francis I, Louis XII's successor on the throne of France. Louis XII died on Jan. 1st, and not on Jan. 9th as is here stated.—This addition is written in paler ink and evidently at a later date.

1378. Castello del cilli. The meaning of this word is obscure; it is perhaps not written at full length.
XXII.

Miscellaneous Notes.

The incidental memoranda scattered here and there throughout the MSS. can have been for the most part intelligible to the writer only; in many cases their meaning and connection are all the more obscure because we are in ignorance about the persons with whom Leonardo used to converse nor can we say what part he may have played in the various events of his time. Vasari and other early biographers give us a very superficial and far from accurate picture of Leonardo's private life. Though his own memoranda, referring for the most part to incidents of no permanent interest, do not go far towards supplying this deficiency, they are nevertheless of some importance and interest as helping us to solve the numerous mysteries in which the history of Leonardo's long life remains involved. We may at any rate assume, from Leonardo's having committed to paper notes on more or less trivial matters on his pupils, on his house-keeping, on various known and unknown personages, and a hundred other trifles—that at the time they must have been in some way important to him.

I have endeavoured to make these 'Miscellaneous Notes' as complete as possible, for in many cases an incidental memorandum will help to explain the meaning of some other note of a similar kind. The first portion of these notes (Nos. 1379—1457), as well as those referring to his pupils and to other artists and artificers who lived in his house (1458—1468) are arranged in chronological order. A considerable proportion of these notes belong to the period between 1490 and 1500, when Leonardo was living at Milan under the patronage of Lodovico il Moro, a time concerning which we have otherwise only very scanty information. If Leonardo did really—as has always been supposed,—spend also the greater part of the preceding decade in Milan, it seems hardly likely that we should not find a single note indicative of the fact, or referring to any event of that period, on the numerous loose leaves in his writing that exist. Leonardo's life in Milan between 1489 and 1500 must have been comparatively uneventful. The MSS. and memoranda of those years seem to prove that it was a tranquil period of intellectual and artistic labour rather than of bustling court life. Whatever may
have been the fate of the MSS. and note books of the foregoing years—whether they were destroyed by Leonardo himself or have been lost—it is certainly strange that nothing whatever exists to inform us as to his life and doings in Milan earlier than the consecutive series of manuscripts which begin in the year 1489.

There is nothing surprising in the fact that the notes regarding his pupils are few and meagre. Excepting for the record of money transactions only very exceptional circumstances would have prompted him to make any written observations on the persons with whom he was in daily intercourse, among whom, of course, were his pupils. Of them all none is so frequently mentioned as Salai, but the character of the notes does not—as it seems to me—justify us in supposing that he was any thing more than a sort of factotum of Leonardo’s (see 1519, note).

Leonardo’s quotations from books and his lists of titles supply nothing more than a hint as to his occasional literary studies or recreations. It was evidently no part of his ambition to be deeply read (see Nrs. 10, 11, 1159) and he more than once expressly states (in various passages which will be found in the foregoing sections) that he did not recognise the authority of the Ancients, on scientific questions, which in his day was held paramount. Archimedes is the sole exception, and Leonardo frankly owns his admiration for the illustrious Greek to whose genius his own was so much akin (see No. 1476). All his notes on various authors, excepting those which have already been inserted in the previous section, have been arranged alphabetically for the sake of convenience (1469—1508).

The passages next in order contain accounts and inventories principally of household property. The publication of these—often very trivial entries—is only justifiable as proving that the wealth, the splendid mode of life and lavish expenditure which have been attributed to Leonardo are altogether mythical; unless we put forward the very improbable hypothesis that these notes as to money in hand, outlay and receipts, refer throughout to an exceptional state of his affairs, viz. when he was short of money.

The memoranda collected at the end (No. 1505—1565) are, in the original, in the usual writing, from left to right. Besides, the style of the handwriting is at variance with what we should expect it to be, if really Leonardo himself had written these notes. Most of them are to be found in juxtaposition with undoubtedly authentic writing of his. But this may be easily explained, if we take into account the fact, that Leonardo frequently wrote on loose sheets. He may therefore have occasionally used paper on which others had made short memoranda, for the most part as it would seem, for his use. At the end of all I have given Leonardo’s will from the copy of it preserved in the Medici Library. It has already been printed by Amoretti and by Uzielli. It is not known what has become of the original document.
Find Longhi and tell him that you wish Memoranda before 1500

Truova ingol e digli che tu l'aspetti amor a e che tu andrai co seco ilopan a; fatti fare enoiganod al; e toli il libro di Vitolone, e le misure delle edifici publici; fa fare 2 casse coperte da invlattiere, ma meglio fa le coperte da letto, che son 3, delle quali lascierai una a Vinci; togli le fodere (3) delle grattugie (3) da Gio'vá Lombardo il telajuolo di Verona; copra delle tovaglie e mòtili ... ... scarpe, calze 4 para, vn giubbone di cimoza e pelli per fare ne de' novi; il tornio d'Ales-sandro; vendi quel che no si può portare; piglia da Gian di Paris il modo de colorire secco, el modo del sale bianco e del fare le carte impastate; folie in mol'ti doppi;

1379. The mysterious looking words, quite distinctly written, in line 1: ingol, amor a, ilopan a and on line 2: enoiganod at are obviously in cipher and the solution is a simple one; by reading them backwards we find for ingol: logni—probably longi, evidently the name of a person; for amor a: a Roma; for ilopan a: a Napoli. Leonardo has done the same in two passages treating on some secrets of his art Nos. 641 and 729, the only other places in which we find this cipher employed; we may therefore conclude that it was for the sake of secrecy that he used it.

There can be no doubt, from the tenor of this passage, that Leonardo projected a secret excursion to Naples. Nothing has hitherto been known of this journey, but the significance of the passage will be easily understood by a reference to the following notes, from which we may infer that Leonardo really had at the time plans for travelling further than Naples. From lines 3, 4 and 7 it is evident that he purposed, after selling every thing that was not easily portable, to leave a chest in the care of his relations at Vinci. His luggage was to be packed into two trunks especially adapted for transport by mules. The exact meaning of many sentences in the following notes must necessarily remain obscure. These brief remarks on small and irrelevant affairs and so forth are however of no historical value. The notes referring to the preparations for his journey are more intelligible.

2. Libro di Vitolone see No. 1506 note. 7 and fol. It would seem from the text that Leonardo intended to have instructions in painting on paper. It is hardly necessary to point out that the Art of illuminating was quite separate from that of painting.
e la sua cassetta de' colori; inpar la tem-péra delle carnagioni, inpara 16 a disoluere la lacca gommata, lin del seme, de . . . . e dele . . . biache, 11 delli dagli da l'acietta, togli 'De Pöderibus'; tolli l'opere di Leonardo creme'» nese; leva il fornello 13 . . . . . . della 11 semèza de ligli 15 e dell'erba stella, 16 delle zuche marine, 17 vèdi l'asse della sosta, 18 fatti dare la . . . 19 a chi la rubò, pi 30 giala il huellare, 21 quito terreno può 22 cautare l'omo in un di.

C. 194]

Questo fecie Lione in piazza 2 di castello con v vincolo e vna 3 saetta.

D. 205]

NOMI D'IGIENIERI.


Ash. II. 134]

A maestro Lodovico chiedi li còdotti d'acqua.

FL. U6]

j Firenze è copare 1 amantissimo, quant' è mio . . . . . .


1380. 1. questa . piazza. 2. castello chon v ucho' e vas.
1381. 3. sete niense. 4. filosofo. 6. febar di tiria. 7. callimaco architetto.
1382. maestro lodovicchi cieda . . . . . . . .
1383. 1) e echopa j pistoja. 2. domenicho . cöpere. 3. mio jrusiussam (2). 4. jude nom. 5. amante quanto.

11. De Ponderibus. A large number of Leonardo's notes bear this superscription. Compare No. 1436, 3. 1380. This note must have been made in Milan; as we know from the date of the MS.

1381. Callias, Architect of Aradus, mentioned by Vitruvius (X, 16, 5).—Epimachus, of Athens, invented a battering-engine for Demetrius Poliorcetes (Vitruvius X, 16, 4).—Callimachus, the inventor of the Corinthian capital (Vitr. IV, 1, 9), and of the method of boring marble (Paus. I, 26, 7), was also famous for his casts in bronze (Plin. XXXIV, 8, 19). He invented a lamp for the temple of Athene Polias, on the Acropolis of Athens (Paus. I, 26, 7).—The other names, here mentioned, cannot be identified.

1382. Condotti d'acqua. Possibly a book, a MS. or a map.

1383. On the same sheet is the text No. 663.
1384. On the 16th day of July. 

Caterina came on 16th day of July, 1493. 

Messer Mariollo's Morel the Florentin, has a big horse with a fine neck and a beautiful head. 

The white stallion belonging to the falconer has fine hind quarters; it is behind the Comasina Gate. 

The big horse of Cermonino, of Signor Giulio.

1385. Of the instrument.

Any one who spends ones ducat may take the instrument; and he will not pay more than half a ducat as a premium to the inventor of the instrument and one gross to the workman every year. I do not want sub-officials.

1386. Maestro Giuliano da Marliano has a fine herbal. He lives opposite to Strami the Carpenters.

1387. Christofano da Castiglione who lives at the Piotà has a fine head.

1388. Work of . . . of the stable of Galeazzo; by the road of Brera[4]; benefice of Stanghe[5]; benefice of Porta Nuova; benefice of Monza; Indaco's mistake; give first the benefices; then the works; then ingratitude, indignity and lamentations.

1389. Chiliarch—captain of 1000. 

Prefects—captains. 

A legion, six thousand and sixty three men.

1384. Compare Nos. 1522 and 1517. Caterina seems to have been his housekeeper.

1385. Refers perhaps to the regulation of the water in the canals.

1386. Compare No. 616, note. 4. legnamiere (milanese dialect) = legnaiuolo.
1390. A nun lives at La Colomba at Cremona; she works good straw plait, and a friar of Saint Francis.

1391. Needle,—Niccolao,—thread,—Ferrando,—Iacopo Andrea,—canvas,—stone,—colours,—brushes,—pallet,—sponge,—the panel of the Duke.


1393. Conte Francesco Torello.

1394. Giuliano Trombetta,—Antonio di Ferrara,—Oil of . . .

1395. Paul was snatched up to heaven.

1396. Giuliano da Maria, physician, has a steward without hands.

1397. Have some ears of corn of large size sent from Florence.

1390. La Colomba is to this day the name of a small house at Cremona, decorated with frescoes.
1394. Near this text is the sketch of a head drawn in red chalk.
1395. See the facsimile of this note on Pl. XXIII No. 2.
S. K. M. II. 2 52 a]
Vedi la lettera a Scà Maria;  
2 Segreta.  

See the bedstead at Santa Maria.  
Secret.

S. K. M. II. 2 53 a]
*Arrigo de' avere 2 ducati 11 d'oro;*  
3 Arrigo de' avere 4 d'oro 3 a mezzo Agosto.  

Arrigo is to have 11 gold Ducats.  
Arrigo is to have 4 gold ducats in the middle of August.

S. K. M. II. 2 61 a]
Da al patrone lo esèplo 2 del capitan, che nò lui vičie, ma li soldati mediate 4 il suo còsilio, e pur merita il saldo.  

Give your master the instance of a captain who does not himself win the victory, but the soldiers do by his counsels; and so he still deserves the reward.

S. K. M. II. 2 68 a]
Messer Pier Antonio.  

Messer Pier Antonio.

S. K. M. II. 2 69 a]
Olio,—2 giallo,—3 Ambrosio,—4 la bocca,—5 la masseria.  

Oil,—yellow,—Ambrosio,—the mouth,—the farmhouse.

S. K. M. II. 2 75 a]
Alessandro carissimo, 2 da Parma per la mà di...  

My dear Alessandro from Parma, by the hand of...

S. K. M. II. 2 78 a]
Giovannina, viso fantastico, 2 sta a Scà Caterina, all'ospedale.  

Giovannina, has a fantastic face,—is at Santa Caterina, at the Hospital.

1405.

2 4 tavole fanno una pertica;  
2 4 trabocchi fanno una tavola;  
3 4 braccia e mezzo fanno uno trabocco;  
4 vna pertica è 1936 braccia □,  
5 ovvero 1944.  

2 4 tavole make 1 perch.  
4 trabocchi make 1 tavola.  
4 braccia and a half make a trabocco.  
A perch contains 1936 square braccia,  
or 1944.

1398—1405. MISCELLANEOUS NOTES.  

1400—1405. Compare the text on the same page: No. 667.
1406.  
La strada di messer Mariolo è braccia 13 1/4, la casa di Vagelista è 75; 
Entra braccia 7 e 1/2 in nella casa di Mariolo.

The road of Messer Mariolo is 13 1/4 braccia wide; the House of Evangelista is 75. 
It enters 7 1/2 braccia in the house of Mariolo.

1407.  
Domando in che parte del suo moto curvo la cavsa, che move, lascierà la cosa mossa e mobile.

I ask at what part of its curved motion the moving cause will leave the thing moved and moveable.

1408.  
Antonio de' Risi sta al còsiglio di Givstitia.

Antonio de' Risi is at the council of Justice.

1409.  
Disse Paolo che nessuno strumento che move vn altro . . . .

Paolo said that no machine that moves another . . . .

1406.  
1. meser. 2. vägelista. 3. br 7 e 1/2.

1409.  
1. pagolo.

1406. On this page and that which faces it, MS. II2 71β, are two diagrams with numerous reference numbers, evidently relating to the measurements of a street.

1409. The passage, of which the beginning is here given, deals with questions in mechanics. The instances in which Leonardo quotes the opinions of his contemporaries on scientific matters are so rare as to be worth noticing. Compare No. 901.
1410—1414. \( \text{MISCELLANEOUS NOTES.} \)

1410. \( \text{Caravaggio.} \)

1411. \( \text{Caravaggio.} \)

1412. \( \text{Pulleys,—nails,—rope,—mercury,—cloth,} \)

1413. \( \text{Monday.} \)

1414. \( \text{Memorandum.} \)

1415. \( \text{Maghino, Speculus of Master Giovanni} \)

1416. \( \text{the Frenchman; Galenus on utility.} \)

1417. \( \text{Near to Cordusio is Pier Antonio da} \)

1418. \( \text{Tossano and his brother Serafino.} \)

1419. \( \text{L. o} \)

1420. \( \text{Paolo di Vannocio in Siena.} \)

1421. \( \text{La saletta di sopra per li apostoli;} \)

1422. \( \text{4Edifi di Bramate;} \)

1423. \( \text{5Il castellano fatto prigione;} \)

1424. \( \text{6Il Visconte strascinato e poi morto il} \)

1425. \( \text{figliuolo;} \)

1426. \( \text{7Gian della Rosa toltoli i danari;} \)

1427. \( \text{8Borgonzo principiò e nel volle, e però} \)

1428. \( \text{fuggi le fortune;} \)

1429. \( \text{9Il duca perso lo stato e la roba e libertà, e} \)

1430. \( \text{nessuna sua opera si finì per lui.} \)

1431. \( \text{The upper chamber for the apostles.} \)

1432. \( \text{Buildings by Bramante.} \)

1433. \( \text{The governor of the castle made a} \)

1434. \( \text{prisoner,} \)

1435. \( \text{6Visconti carried away and his son} \)

1436. \( \text{killed.} \)

1437. \( \text{Giovanni della Rosa deprived of his money.} \)

1438. \( \text{8Borgonzo began . . . ; and moreover} \)

1439. \( \text{his fortunes fled.} \)

1440. \( \text{The Duke has lost the state, property} \)

1441. \( \text{and liberty and none of his enterprises was} \)

1442. \( \text{carried out by him.} \)

1443. \( \text{[10].} \)

1410. \( \text{Caravaggio, a village not far from the Adda} \)

1411. \( \text{between Milan and Brescia, where Polidoro and Michel-} \)

1412. \( \text{angelo da Caravaggio were born. This note is given} \)

1413. \( \text{in facsimile on Pl. XIII, No. 1 (above, to the left).} \)

1414. \( \text{On Pl. XIII, No. 2 above to the right we read} \)

1415. \( \text{cordusio.} \)

1416. \( \text{This note is written between lines 23} \)

1417. \( \text{and 24 of the text No. 710. Corduso, Cordusio} \)

1418. \( \text{(curia ducis) = Cordus in the Milanese dialect,} \)

1419. \( \text{is the name of} \)

1420. \( \text{a Piazza between the Via del Broletto and the} \)

1421. \( \text{Piazza de Mercanti at Milan. In the time of} \)

1422. \( \text{il Moro it was the centre of the town. The persons} \)

1423. \( \text{here named were members of the noble Milanese} \)

1424. \( \text{family de’Fossani; Ambrogio da Fossano, the} \)

1425. \( \text{contemporary painter, had no connection with them.} \)

1426. \( \text{[10].} \)

1427. \( \text{This passage evidently refers to} \)

1428. \( \text{events in Milan at the time of the overthrow of} \)

1429. \( \text{Ludovico il Moro. Amoretti published it in the} \)

1430. \( \text{Memorie Storiche} \)

1431. \( \text{and added copious notes.} \)

1432. \( \text{6. Visconti. Chi fosse quel Visconte non sapremmo in-} \)

1433. \( \text{divinare fra tanti di questo nome.} \)

1434. \( \text{Arlando narra che allora attaccate furono le case} \)

1435. \( \text{di Visconti, di Castiglioni,} \)

1436. \( \text{di Sanseverini, e di Ratta e non è improbabile che ne} \)

1437. \( \text{fossero insultati e morti i padroni. Molti Visconti} \)

1438. \( \text{annovera lo stesso Cronista che per essersi rallegrati del} \)

1439. \( \text{ritorno del duca in Milano furono da’ Francesi arrestati,} \)

1440. \( \text{e straciniti in France com prigionieri di stato; e fra quei} \)

1441. \( \text{Messer Francesco Visconti, e suo figliuolo Battista.} \)

1442. \( \text{(AMORETTI, Mem. Stor. XIX.)} \)

1443. \( \text{8. Borgonzo o Brawnco Ratta fu reggatore delle} \)

1444. \( \text{ducati entrate sotto il Moro, alla cui fuga la casa sua fu} \)

1445. \( \text{pur messa a sacco da’ partitanti francesi.} \)

1446. \( \text{(AMORETTI, l. c.)} \)
MISCELLANEOUS NOTES. [1415—1420.]

1415.

Ambrosio Petri, St. Mark, 4 boards for the window, 2 . . . . . , 3 the saints of chapels, 5 the Genoese at home.

1416.

Piece of tapestry,—pair of compasses,—Tommaso’s book,—the book of Giovanni Benci,—the box in the custom-house,—to cut the cloth,—the sword-belt,—to sole the boots,—a light hat,—the cane from the ruined houses,—the debt for the table linen,—swimming-belt,—a book of white paper for drawing,—charcoal.—How much is a florin . . . . , a leather bodice.

1417.

Borges shall get for you the Archimedes from the bishop of Padua, and Vitellozzo the one from Borgo a San Sepolcro.

1418.

Marzocco’s tablet.

1419.

Marcello lives in the house of Giacomo da Mengardino.

1420.

Where is Valentino?—boots,—boxes in the custom-house,. . . . . [5] the monk at the Carmine,—squares,—[7] Piero Martelli,—[8] Salvi Borgherini,—send back the bags,—a support for the spectacles,—[11] the nude study of San Gallo,—the cloak.

Porphyry,—groups,—square,—[16] Pandolfino.

1415. 1. 10 omnia (?). 4. ase. 5. quas paris trame. 7. chasa legienovesi.
1416. 1. darazo. 6. tagliare l’aversa. 8. listani valetti. 10. dalle casaccie. 15. e l’6. 18. corsi. 1417. 2. vescevovo. 3. vitellozo. 1420. 4. fallari. 8. borgerini. 11. lognudo.
3. Borgo a San Sepolcro, where Luca Paciolo, Leonardo’s friend, was born.
1420. Valentino. Cesare Borgia is probably meant. After being made Archbishop of Valence by Alexander VI he was commonly called Valentinus or Valentino. With reference to Leonardo's engagements by him see pp. 224 and 243, note.
**MISCELLANEOUS NOTES.**

**F. 60**


1421. Concave mirrors; philosophy of Aristotle; the books of Aviceanna; Messer Ottavieo Palavicino for his lary; Vitruvius bohemian knives; go every Saturday to the Vitruvius; hot bath where you will see naked men; 'Meteora'. Archimedes, on the centre of gravity; increase in width. The Dante of Niccolò and in length, or della Croce; in width diminishing in length. Marliamano, on Calculation, to Bertuccio. Albertus, on heaven and earth [15], from the monk Bernardino. Horace has written on the movements of the heavens.

**F. 274**

De' 3 corpi regolari cótro alci comèta tori che biasimà li atichi ivètori dòde naquero le gramatiche e le scientie... Of the three regular bodies as opposed to some commentators who disparage the Ancients, who were the originators of grammar and the sciences and...

**W. An. III. 217 [G]**

W. An. III. 217 [G]

Camera de'lla Torre da 3 Vaneri. The room in the tower of Vaneri.

**1421.** Specchi cócavi; filosofia d'Aristotile; libri d'Auvicenna; messer Ottavia Palavicino pel suo Vitruvio; Colletti di Boemia; Va ogni sabato alla stufa e vedrai della nudi; Meteora; Archimeòde, de cetro grauitatis; Anotomia, Alesà dro Benedetto; Il Date di Niccolò del lughezza; la Croce.

**1422.** Of the three regular bodies as opposed to some commentators who disparage the Ancients, who were the originators of grammar and the sciences and...

**1423.** Camera de'lla Torre da 3 Vaneri. The room in the tower of Vaneri.

**1421.** Specchi cócavi; filosofia d'Aristotile; libri d'Auvicenna; messer Ottavia Palavicino pel suo Vitruvio; Colletti di Boemia; Va ogni sabato alla stufa e vedrai della nudi; Meteora; Archimeòde, de cetro grauitatis; Anotomia, Alesà dro Benedetto; Il Date di Niccolò del lughezza; la Croce.

**1422.** Of the three regular bodies as opposed to some commentators who disparage the Ancients, who were the originators of grammar and the sciences and...

**1423.** Camera de'lla Torre da 3 Vaneri. The room in the tower of Vaneri.

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W. 232 b (F.)

Riserva all’ultimo dell’òbre le figure che compariranno nello scrittoio di Gerardo miniator a Sà Marco in Firèze.

[Va per il Melso, e allo Ambasciatore e a maestro Bernardo.]

M. o’]

Ermete il filosofo.

M. 8 a]

Suisse set io e calculatore, — Tisber, — Angelo Fossobro, — Alberto.

M. 53 b]

Modo del pòte leuatojo che mi mostrò Domnino, e perché c e d spingano in basso.

Mz. o’]

Piglerà il primo volo il gràde vcello; — sopra del dosso del suo magnio cecero, — empiédo l’universo di stupore, — empiédo di sua fama tutte le scritture e gloria eterna al loco dove nacque.

Tr. 22]

Questo inganno fu vsato dai Galli contro a’ Romani, e segui ne tal mortalità che tutta Roma si vesti a bruno.

1424. The figures you will have to reserve for the last book on shadows that they may appear in the study of Gerardo the illuminator at San Marco at Florence.

[Go to see Melzo, and the Ambassador, and Maestro Bernardo.]

1425. Hermes the philosopher.

1426. Suisse, viz. calculator, — Tisber, — Angelo Fossobron, — Alberto.

1427. The structure of the drawbridge shown me by Domnino, and why c and d thrust downwards.

1428. The great bird will take its first flight; — on the back of his great swan, — filling the universe with wonders; — filling all writings with his fame and bringing eternal glory to his birthplace.

1429. This stratagem was used by the Gauls against the Romans, and so great a mortality ensued that all Rome was dressed in mourning.

1424. serua. 2. ceparirano scrittoio [del] di gera. 3. marcho. 5. bassataore. 6. maestro.

1425. 2. filosofo. 1426. 1. coe calculatore. 3. fossabro. 1427. 1. leuato i che. 2. c he di spingano.

1428. 1. il p’o’ volo [leverasi delge] il. 2. cecero e empiérc. 3. gròria. 4. alaido. 4. [dorej] done.

1429. 2. chonito. 3. esecgii. 4. vessii.

1424, L. 1–3 are in the original written between lines 3 and 4 of No. 292. But the sense is not clear in this connection. It is scarcely possible to divine the meaning of the following sentence.


5. Bernardo, possibly the painter Bernardo Ze nale.

1427. The sketch on the same page as this text represents two poles one across the other. At the ends of the longest are the letter c and d. The sense of the passage is not rendered any clearer.

1428. This seems to be a speculation about the flying machine (compare p. 271).

1429. Leonardo perhaps alludes to the Gauls under Brennus, who laid his sword in the scale when the tribute was weighed.
Alberto da Imola;—algebra, that is, the demonstration of the equality of one thing to another.

Joannes Rubicissa e Robbia.

Ask the wife of Biagio Crivelli how the capone nurtures and hatches the eggs of the hen,—he being drunk.

The book on Water to Messer Marco Antonio.

Have Avicenna's work on useful inventions translated; spectacles with the case, steel and fork and... charcoal, boards, and paper, and chalk and white, and wax;... for glass, a saw for bones with fine teeth, a chisel, inkstand..., three herls, and Agnolo Benedetto. Get a skull, nut,—mustard.

Boots,—gloves, socks, combs, papers, towels, shirts,.. shoe-tapes,—.. shoes, penknife, pens. A skin for the chest.

1436. **Memorandum.**

To make some provisions for my garden,
—Giordano, *De Ponderibus* [3],— the peacemaker, the flow and ebb of the sea,—have two baggage trunks made, look to Beltraffio’s [6] lathe and have taken the stone,—out leave the books belonging to Messer Andrea the German,—make scales of a long reed and weigh the substance when hot and again when cold. The mirror of Master Luigi; *A b* the flow and ebb of the water is shown at the mill of Vaprio,—a cap.

1437.

Giovanni Fabre,—Lazaro del Volpe,—
the common,—Ser Piero.—

1438.

[Quadrat di Carlo Marmocchi,—messer Francesco Araldo,—Ser Benedetto d’Accie perello,—Benedetto, del abbaco,—maestro Pagolo medico,—Domenico di Michelino,—el caldu dei Alberti,—messer Giovanni Argimboli.]

1439.

Quadrat di Carlo Marmocchi,—Messer Francesco Araldo,—Ser Benedetto d’Accie perello,—Benedetto on arithmetic,—Maestro Paolo, physician,—Domenico di Michelino,—. . . . . of the Alberti,—Messer Giovanni Argimboli.

1436. 1. Richordo. 2. provisione. 4. frusso e refrusso. 5. dassoma. 6. effalli. 2. lascia . messere andrea tedesco. 8. rotchata eppoi. 9. losephchio . . maestro. 10. frusso e refrusso . . di uavrio.

1437. 1. giovanni. 2. lazaro . . elule.

1438. 8. careee. 9. streglia. 10. [cavalino.]

1439. 1. charlo. 2. franc'no”. 3. benedetto daccieperello. 4. ablucho. 5. maestro paghlo medicho. 6. domenicho. 7. chaluo. 8. meser argirobolo,

1436. 3. Giordano. Jordanus Nemorarius, a mathematician of the beginning of the XIIIth century. No particulars of his life are known. The title of his principal work is: *Arithmetica decem libris demonstrata,* first published at Paris 1496. In 1523 appeared at Nuremberg: *Liber Jordanii Nemoravii de ponderibus, propositiones XIII et curandam demonstra-
tiones, multisurnaque rerum rationes sine pulcherrimis complectens, unius in lucem editus.*


There are sketches by the side of lines 8 and 10.

1437. These names are inserted on a plan of plots of land adjoining the Arno.
1440.—1444. MISCELLANEOUS NOTES.

1440. Colours, formula, — Archimedes, — Marcantonio; Tinned iron, — pierced iron.

1441. See the shop that was formerly Bartolomeo's, the stationer.

1442. The first book is by Michele di Francesco Nabini; it treats on science.

1443. Messer Francesco, physician of Lucca, with the Cardinal Farnese.

1444. Pandolfino's book[1], — knives, — a pen for ruling, — to have the vest dyed, — The library at St. Mark's, — The library at Santo Spirito, — Lactantius of the Daldi [7], — Antonio Covoni, — A book by Maestro Paolo Infermieri, — Boots, shoes and hose, — (Shell) lac, — An apprentice to do the models for me, Grammar, by Lorenzo de' Medici, — Giovanni del Sodo, — Sansovino [15] — a ruler, — a very sharp knife, — Spectacles, — fractions . . . . . . . . . . . . — repair . . . . . . . . . . . . . . . . . . . . . . Tomasino's book, — Michelagnolo's little chain; Learn the multiplication of roots from Maestro Luca; — my map of the world which Giovanni Benechi has [25]; — Socks, — clothes from the custom-house-officer, — Red Cordova leather, — The map of the world, of Giovanni Benchi, — a print, the districts about Milan — Market book.

1440. 4. cochino. 5. aioditi. 1441. 1. bottega cheffu. 2. bartol.
1442. 2. coltelli. 3. darrigare. 5. marchio. 9. pagolo inferred. 17. sotilissimo. 19. rotti fisici. 20. rifire talbermassio. 22. catenuza. 23. ipara. 24. radice . . maestros. 27. vesta di ghi bellotto. 29. govanni.
1444. 6. Marc Antonio, see No. 1433.
1443. Alessandro Farnese, afterwards Pope Paul III was created in 1493 Cardinal of San Cosimo e San Damianno, by Alexander VI.
1444. 1. Pandolfino, Agnolo, of Florence. It is to this day doubtful whether he or L. B. Alberti was the author of the famous work 'Del Governo della Famiglia'. It is the more probable that Leonardo should have meant this work by the words il libro, because no other book is known to have been written by Pandolfino. This being the case this allusion of Leonardo's is an important evidence in favour of Pandolfino's authorship (compare No. 1454, line 3).

7. The works of Lactantius were published very often in Italy during Leonardo's lifetime. The first edition published in 1463 "in monastero sublacensi" was also the first book printed in Italy.
15. Sansovino, Andrea — the sculptor; 1460 — 1529.
25. Leonardo here probably alludes to the map, not executed by him (see p. 224), which is with the collection of his MSS. at Windsor, and was published in the Archaeologia Vol. XI (see p. 224).
434 MISCELLANEOUS NOTES. [1445—1448.

C. A. 1450; 432 a]

1445.

"Di quel di Pavia si lauda · piv · il movimento · che nessun altra cosa;—

2 L'imitazione · delle cose · antiche · è piv laudabile · che quella · delle · moderne;—

3 No può essere bellezza · e utilità · come appare nelle fortezze 4 e nel nelli omni;—

4 Il trotto · è quasi di qualità · di cavallo libero;—

5 Dove · manca · la vivacità · naturale · bisognia farne · una accidètale.".

In that at Pavia the movement is more to be admired than any thing else.
The imitation of antique work is better than that of the modern things.
Beauty and utility cannot exist together, as seen in fortresses and in men.
The trot is almost the nature of the free horse.
Where natural vivacity is lacking it must be supplied by art.

C. A. 176 a; 539]

Salvatore materassaio 2 sta in sulla piazza di Sco Andreea; entra da pellicciati . . .

C. A. 185 b; 557 a]

Monsignore de' Pazzi, — 2 ser Atonio Pacini.

Salvatore, the matress maker, lives on the Piazza di Sant'Andrea, you enter by the furrier's.

C. A. 222 a; 66 a]

Algebra che'è apresso i Mariani fatta dal loro padre;—

2 Dell'osso, de' Mariani,

3 Dell'osso che fora, Gian Giacomo da Bellinzona, e tirare fori il chiodo có facilità,—

4 Misura di Boccadino,—

5 Misura di Milano e borghi,—

6 Libro che tratta di Milano e sua chiese, che à l'ultimo cartolario fuerso il Cordusio,—

7 Misura della corte vechia,—

8 Misura del castello,—

9 Fatti mostrare al maestro · d'abbaco · riquadrare · uno . . . . ,—

10 Fatti mostrare a messer Fatio 'di proportione',—

An algebra, which the Mariani have, written by their father, [1]—

On the bone, by the Mariani,—

On the bone which penetrates, Gian Giacomo da Bellinzona, to draw out the nail with facility,—

The measurement of Boccadino,—

The measurement of Milan and the suburbs,[5]—

A book, treating of Milan and its churches which is to be had at the last stationer's on the way to Cordusio[6],—

The measurement of the Corte Vecchia,—

The measurement of the Castle,—

Get the master of arithmetic to show you how to square a . . . ,—

Get Messer Fazio to show you [the book] on proportion,—

1445. 1. ladda · chosa. 2. chose · loydadable chelle. 3. pro essere belleza · chome apare. 5. trocto · chavallo. 6. mancha . . . fare l'accidètale.
1446. 2. piazza di sco[illi]. 3. pellicciati[ili]. 4. detare a franc' paio[illi]. 5. i di lassola e per sol[illi].
1447. pari.
1448. 1. algebra. 3. cheffora giaiatchom da bellinchona ettrare · ciody chò. 4. bochalinio. 6. chettatta · essa · cartolario . . . · chorduso. 7. chorte. 8. castello. 9. dabbacho · riquadrare l'maglotto(i). 11. mostrare . . . fratte. 13. fraffilippo.

1445. Quel di Pavia. Pavia is possibly a clerical error for Padua, and if so the meaning of the passage is easily arrived at: Quel di Padua would be the bronze equestrian statue of Gattamelata, on the Piazza del Santo at Padua executed by Donatello in 1443 (see pp. 2 and 3).

1448. 1. 2. Mariani; an old Milanese family, now extinct.
5. 21. See Pl. CIX and No. 1016.
6. Cordusio, see No. 1413, note.
29. Francesco si known to the Friar di Brera ‘de pòderibus’,
13. Della misura di Sco Lorenzo,
14. A fra Filippo di Brera prestai certi gruppi,
15. Ricorda a Giouanino bombardieri del modo, come si mvò la torre di Ferrara, sàza buche,
16. Dimàda, maestro Antonio, come si piantò bobarde e bastioni di di o di notte,
17. Domanda Benedetto Portinari in che modo si corre per lo ghiaccio in Fiàdra,
18. Le proporzioni d’Alchino colle cosiderazioni del Marliano da messer Fatio,
19. Balestra di maestro Gianetto,
20. Il libro di Giovanni Taverna che a messer Fatio,
21. Ritrarai Milano,
22. Misura di navilio, conche e sostegno e barche maggiori e spesa,
23. Milano i fondameto,
24. Gruppi di Bramàte,
25. Meteora d’Aristotile vulgare,
26. Fa d’avere Vitolone ch’è nella librerìa di Pauia che tratta della matematica,
27. Teneva uno maestro d’acqua, e fatti dire i riparo d’essa, e quello ch’è costa, vn riparo, e una conca, e uno navilio, e uno molino alla lombarda,
29. Un nipote di Gian Ágelo di dipitore à uno libro d’acque che fu del padre;
30. Paolino Scarpellino, detto Assiolo, è bono maestro d’acque.

Get the Friar di Brera to show you [the book] ‘de Ponderibus’ [11],
Of the measurement of San Lorenzo,
I lent certain groups to Fra Filippo di Brera, [13]
Memorandum: to ask Maestro Giovanni as to the mode in which the tower of Ferrara is walled without loopholes,
Ask Maestro Antonio how mortars are placed on bastions by day or by night,
Ask Benedetto Portinari how the people go on the ice in Flanders,
On proportions by Alchino, with notes by Marliano, from Messer Fazio,
The measurement of the sun, promised me. by Maestro Giovanni, the Frenchman,
The cross bow of Maestro Gianetto,
The book by Giovanni Taverna that Messer Fazio,
You will draw Milan [21],
The measurement of the canal, locks and supports, and large boats; and the expense,
Plan of Milan [23],
Groups by Bramante [24],
The book on celestial phenomena by Aristoteles, in Italian [25],
Try to get Vitolone, which is in the library at Pavia [26] and which treats of Mathematics,—He had a master [learned] in waterworks and get him to explain the repairs and the costs, and a lock and a canal and a mill in the Lombard fashion.
A grandson of Gian Angelo’s, the painter has a book on water which was his fathers.
Paolino Scarpellino, called Assiolo has great knowledge of water works.

Francesco d’Antonio at Firenze.

Francesco d’Antonio at Florence.

1449.

11. Brera, now Palazzo delle Scienze ed Arti. Until 1571 it was the monastery of the order of the Umilati and afterwards of the Jesuits.
12. Si Lorenzo. A church at Milan, see pp. 39, 40 and 50.
14. The Portinari were one of the great merchant-families of Florence.
23. Fondamanto is commonly used by Leonardo to mean ground-plan. See for instance p. 53.

25. Meteora. By this Leonardo means no doubt the four books τὰ μετέωρα, i.e. He must refer here to a MS. translation, as no Italian translation is known to have been published (see No. 1477 note).
26. Vitolone see No. 1506, note.
1450. Giulliano Gondi, —2 Tomaso Ridolfi, —
3 Tomaso Paganelli, —4 Nicolo' del Nero, —
5 Simo Guasti, —6 Nasi, —7 erede di Lionardo
Manelli, —8 Guglielmo di Ser Martino, —
9 Bartolomeo del Tovaglia, —10 Andrea Arri- 
gucci, —11 Nicolo' Capponi, —12 Giovan Porti- 
neri.

1451. Pandolfino.

1452. Il Vespuccio mi vol dare un libro di 
geometric.

1453. Marcantonio Colonna in Sco Apostolo.

1454.

Cassa, —
2 Liulello, —
3 Libro del Pandolfino, —
4 Coltellini, —
A box, —
far l'uccello, —
grasselino, —
Venieri per la
Pandolfino's book, mortar [2], —
Small knives, —
Venieri for the

1450. 1. Guillian Gondi. Ser Piero da Vinci,
Leonardo's father, lived till 1480, in a house 
belonging to Giulliano Gondi. In 1498 this was pulled 
down to make room for the fine Palazzo built on 
the Piazza San Fiorenzo by Giuliano di San Gallo, 
which still exists. In the Raccunto del Castello di Ser 
Piero da Vinci, 1480, Leonardo is not mentioned; it 
is evident therefore that he was living elsewhere. 
It may be noticed incidentally that in the Raccunto 
del Giuliano Gondi of the same year the following men-
tion is made of his four eldest sons:
Leonardo mio figliuolo d'et' d'anni 29, non fa nulla, 
Giornobistata d'et' d'anni 28 in Gostantinopoli, 
Biliachsa d'et' d'anni 24 a Napoli, 
Simone d'et' d'anni 23 in Ungheria. 
He himself was a merchant of gold filigree (succe-
iamo lavorare una bottega d'arte di seta . . . fucciamo 
un pocho di trofo a Napoli). As he was 59 years 
old in 1480, he certainly would not have been alive 
at the time of Leonardo's death. But Leonardo must 
have been on intimate terms with the family till the 
end of his life, for in a letter dated June 1. 1519, in 
which Fr. Melzi, writing from Amboise, announces 
Leonardo's death to Giuliano da Vinci at Florence 
(see p. 284), he says at the end "Datemene risposta per 
i Gondi" (see Uzielli, Ricerche, passim).

Most of the other names on the list are those 
of well-known Florentine families.

1452. See No. 544, note, p. 130.

1453. In July 1506 Pope Julius II gave Donna 
Lucrezia della Rovere, the daughter of his sister 
Lucchina, in marriage to the youthful Marcantonio 
Colonna, who, like his brothers Prospero and 
Fabrizio, became one of the most famous Captains 
of his family. He gave to him Frascati and made 
him a present of the palazzo he had 
built, when Cardinal, near the church of Santi 
Apotstoli which is now known as the Palazzo Col-
onna (see Gregorovius, Gesch. der Stadt Rom, 
Vol. VIII, book XIV 1, 3. And Coppit, Mem. Co-
lonese p. 251).

1454. Much of No. 1444 is repeated in this 
memorandum.

2. Vasari states that Leonardo invented mechanical 
birds which moved through the air. Compare 
No. 703.
5. Penna da rizzare, pietra,—stella,—
6. Tignere la uesta, la tazza d' Alfieri,—
7. Librerie, la Meteora,—
8. Lattantio de' va a casa de' Daldi,—
9. Libro di maestro cassetta,—
10. Paolo Infermieri,—
11. Stualetti, calze e suchiellino,—
12. Scarpe, —
13. Lacca, —
14. Garzone pe' modelli,—
15. Grammatica di la valuta del.
16. Giovanni del Sodo per ...
17. Sansauino, valuta del ... —
18. Pier di Cosimo, per l'alie,—
19. Filippo e Lorenzo,—riga,—ochiali,—
20. rifare la ...—libro di Maso,—
21. catena di Michelagnolo,—mutilplicatione di radici,—di corda e arco,—mappamondo de' Benci,—caltetti,—vesta dal gabellotto,—cordovano,—libri di mercato,—acque del Cronaca,—ache del Tanaglino,—...
22. le berrette,—
23. specchio del Rosso vederlo fare,—di che n'o 5/6,—Meteora d'Aristotele,—
24. casse di Lorczo di Pier Francesco,—maestro Piero del Borgo,—legare il mio libro,—
25. noce muscato,—gommà,—squadra,—
26. Giovà Batista a la piazza de' Mozzi,—
27. Giovanni Benci il libro mio, e' diaspri, ottoone per li ochiali.

Pen for ruling, stone,—star,—
To have the vestdyed, Alfieri's tazza,—
The Libraries, the book on celestial phenomena,—
Lactantius of the go to the house of Daldi,—
The Pazzi,—
Book from Maestro small box,—
Paolo Infermieri,—
Boots, shoes and small gimlet,—
hose,
Lac,—
An apprentice for ... ... ... ...
models,
Grammar of the amount of the renzo de' Medici, ...
Giovanni del Sodo ...
for ... the broken
Sansovino, the ...
Piero di Cosino[16], the wings,—
Filippo and Lorenzo[17], A ruler,—
Spectacles,—to do the ... again,—
Tomaso's book,—Michelagnolo's chain,—The multiplication of roots,—Of the bow and strinch,—The map of the world from Benci,—Socks,—The clothes from the custom-house officier,—Cordova leather,—Market books,—waters of Cronaca,—waters of Tanaglino ... the caps,—Rosso's mirror; to see him make it,—1/2 of which I have 5/6,—on the celestial phenomena, by Aristotle[36], —boxes of Lorenzo di Pier Francesco[37], Maestro Piero of the Borgo,—To have my book bound,—Show the book to Serigatto,—and get the rule of the clock[41], ring,—nutmeg,—gum,—the square,—Giovan' Batista at the piazza de' Mozzi,—Giovanni Benci has my book and jaspers,—brass for the spectacles.

Cerca in Firenze della ...

Search in Florence for ...
Mi. A.]

Bernardo da Pote... Val di Lugà al fìc disce... e questo e mostr... molte, venne per l’antonomia.

Br. M. P. J.

Paolo da Tavechia, per vedere le macchie delle pietre tedesche.

C. 156 (1) [Notes on pupils (1458–1458.)]

Jaco mo venne a stare con meco jì di della Maddalena nel mille 490, d’età d’anni 10; il secondo di li feci tagliare 2 camice, uno pajo di calze e vn giubbone, e quando mi posi i dinari al lato per pagare dette cose lui mi lire 4 detti dinari dalla scarsella, e mai fu possibile farli le confessare, bench’io n’avessi vera cier tezza;—ladro, bugiardo, ostinato, ghiotto. —

1 Il di seguenti andai a ciena con Jacomo, Andrea e detto Iacomo: cienò per 2 e fecè male per 4, improchè rupe 3 ampolline, versò il uino, e dopo questo venne a ciena do meu... 6 lìtè a di 7 di setèbre rùbò uno gra fio di valuta di 22 soldi a Marco che stava con meco, jì quale era lire 4 d’argièto e tolse gli lo dal suo studiòlo, e poi che detto Marco n’ebbe assai ciercato, lo trovò nascosto in nella cassa di detto Iacomo lire 4.

1456. 1. pòte[...]. 2. al fìc disce[...]. 3. e mostr[...]. 4. In not[...]. 5. paro sa di sì posa[...].

1457. Paolo of Tavechia, to see the marks in the German stones.

1458. Giacomo came to live with me on St.-Mary Magdalen’s[1] day, 1490, aged 10 years. The second day I had two shirts cut out for him, a pair of hose, and a jerkin, and when I put aside some money to pay for these things he stole lire the money out of the purse; and I could never make him confess, though I was quite certain of the fact.—Thief, liar, obstinate, glutton.

The day after, I went to sup with Giacomolo Andrea, and the said Giacomo supposed for two and did mischief for four; for he brake 3 cruets, spilled the wine, and after this came to sup where I... Item: on the 7th day of September he stole a silver point of the value of 22 soldi from Marco[6] who was living with me, lire 4 this being of silver, and he took it from his studio, and when the said Marco had searched for it a long while he found it hidden in the said Giacomo’s box lire 4.

1456. This fragmentary note is written on the margin of a drawing of two legs.

1457. This note occurs on a pen and ink drawing made by Leonardo as a sketch for the celebrated large cartoon in the possession of the Royal Academy of Arts, in London. This cartoon is commonly supposed to be identical with that described and lauded by Vasari, which was exhibited in Florence at the time and which now seems to be lost. Mr. Alfred Marks, of Long Ditton, in his valuable paper (read before the Royal Soc. of Literature, June 28, 1882) “On the St. Anne of Leonardo da Vinci”, has adduced proof that the cartoon now in the Royal Academy was executed earlier at Milan. The note here given, which is written on the sheet containing the study for the said cartoon, has evidently no reference to the drawing on which it is written but is obviously of the same date. Though I have not any opening here for discussing this question of the cartoon, it seemed to me important to point out that the character of the writing in this note does not confirm the opinion hitherto held that the Royal Academy cartoon was the one described by Vasari, but, on the contrary, supports the hypothesis put forward by Mr. Marks.

1458. Il di della Maddalena, July 22. 6. Marco, probably Leonardo’s pupil Marco d’Ognionno; 1470 is supposed to be the date of his birth and 1540 of his death.

Che stava con meco. We may infer from this that he left the master shortly after this, his term of study having perhaps expired.
Item a di 26 di gienaro seguëte, essendo io in casa di messer Galeazzo da San Severino a ordinare la festa 10 della sua giostra, e spogliandosi iost certi staffieri per prouarsi alcune vesti d’omini salutatici ch’ha detta lire 2 S 4

11 festa accadeano, Giacomo s’accostò alla scarsella d’uno di loro, la qual era ì sul letto con altri panni, 12 e tolse quelli d’nari che detro vi trovò.

13 Ìtè essendomi da maestro Agostino da Pavia donato in detta casa una pelle turcesca da fare uno . lire 2.

14 pajo di stiualetti, esso Giacomo infra uno mese me la rubò, e vendè la a uno conciatore di 15 scarpe per 20 soldi, de’ quali danari secondo che lui proprio mi cofesso, ne cóprò anci cofetti.

16 Ìtè ancora a di 2 d’april, lasciando Già Atonio uno grafo d’argietto sopra uno suo disegnio, 17 esso Giacomo gli lo rubò, il qual era di ululata di soldi 24 lire 1 S 4.

18 Il primo 19 anno
20 ν máełlo, lire 2
21 camicie 6, lire 4
22 3 givboni, lire 6
23 4 paja di calze lire, 7 S 8
24 vestito foderato, lire 5
25 24 paja di scarpè, lire 6 S 5
26 vna baretta, lire 1
27 strighe lire, 1.

Item: on the 26th January following, I, being in the house of Messer Galeazzo da San Severino[9], was arranging the festival for his jousting, and certain footmen having undressed to try on some costumes of wild men for the said festival, Giacomo went to the purse of one of them which lay on the bed with other clothes, 2 lire 4 S, and took out such money as was in it.

Item: when I was in the same house, Maestro Agostino da Pavia gave to me a Turkish hide to have 2 lire, a pair of short boots made of it; this Giacomo stole it of me within a month and sold it to a cobbler for 20 soldi, with which money, by his own confession, he bought anise comfits.

Item: again, on the 2nd April, Giovan Antonio[16] having left a silver point on a drawing of his, Giacomo stole it, and this was of the value of 24 soldi 1 lira 4 S.

The first year—
A cloak, 2 lire,
6 shirts, 4 lire,
3 jerkins, 6 lire,
4 pairs of hose, 7 lire 8 soldi,
1 lined doublet, 5 lire,
24 pairs of shoes, 6 lire 5 soldi,
A cap, 1 lira,
laces, 1 lira.

A di penultimo di settembre;
2 giobia, a di 27 di settebre, 3 tornò maestro Tommaso, 4 lavorò per se insino a di penultimo di febbre; 5 a di 18 di marzo 1493 venne Iulio tedesco 7 a stare meco; Lucia,—Piero,—Lionard. 9 A di 6 d’ottobre.


On the last day but one of September; Thursday the 27th day of September Maestro Tommaso came back and worked for himself until the last day but one of February. On the 18th day of March, 1493, Giulio, a German, came to live with me, — Lucio, Piero, Leonardo.

On the 6th day of October.


Leonardo here gives a detailed account not only of the loss he and others incurred through Giacomo but of the wild tricks of the youth, and we may therefore assume that the note was not made merely as a record for his own use, but as a report to be forwarded to the lad’s father or other responsible guardian.
1460.

On the 1st day of November we settled accounts. Giulio had to pay 4 months; and Maestro Tommaso 9 months; Maestro Tommaso afterwards made 6 candlesticks, 10 days' work; Giulio some fire-tongs 15 days work. Then he worked for himself till the 27th May, and worked for me at a lever till the 18th July; then for himself till the 7th of August, and for one day, on the fifteenth, for a lady. Then again for me at 2 locks until the 20th of August.

1461.

On the 23rd day of August, 12 lire from Pulisona. On the 14th of March 1494, Galeazzo came to live with me, agreeing to pay 5 lire a month for his cost paying on the 14th day of each month.

His father gave me 2 Rhenish florins. On the 14th of July, I had from Galeazzo 2 Rhenish florins.

1462.

A di 15 di 3 settembre Giulio cominciò la serratura del mio studio 1494.

On the 15th day of September Giulio began the lock of my studio 1494.

1463.

Saturday morning the 3rd of August 1504 Jacopo the German came to live with me in the house, and agreed with me that I should charge him a carlino a day.

1464.

On the 26th of September Antonio broke his leg; he must rest 40 days.

1464. This note refers possibly to Beltraffio.
1465. I left Milan for Rome on the 24th day of September, 1513, with Giovanni[2], Francesco di Melzi [3], Salai, Lorenzo and il Fainoia.

1466. On the 3rd day of January, Benedetto came on the 17th of October; he stayed with me two months and 13 days of last year[4], in which time he earned 38 lire, 18 soldi and 8 dinari; he had of this 26 lire and 8 soldi, and there remains to be paid for the past year 12 lire 10 soldi.

Giovanni (?) came on the 8th day of September, at 4 soldi a month, and stayed with me 3 months and 24 days, and earned 50 lire 14 soldi and 8 dinari; he has had 43 lire, 4 soldi, there remains to pay 16 lire, 10 soldi and 8 dinari.

Benedetto, 24 grossoni.

1467. Gian Maria 4,
Benedetto 4,
Gian Pietro [5] 3,
Salai 3,
Bartolomeo 3,
Gherardo 4.

extracts made by Oltrocchi before the Leonardo MSS. were conveyed to Paris on the responsibility of the first French Republic. Lorenzo, by this, must have been born in 1487. The sculptor Lorenzetto was born in 1490. Amoretti has been led by the above passage to make the following absurd observations:

Cortese Lorenzo, che poi gli fu sempre compagna, almeno si che stette in Italia, sarebbe egli Lorenzo Lotto bergamasco? Sappiamo essere stato questo valente dipintore uno de' bravi zolari del Vosci (?)

Il Fainoia, perhaps a nickname, Cesare da Sesto, Leonardo's pupil, seems to have been in Rome in these years, as we learn from a drawing by him in the Louvre.

1466. This seems to be an account for two assistants. The name of the second is scarcely legible. The year is not given. The note is nevertheless of chronological value. The first line tells us the date when the note was registered, January 3rd, and the
observations that follow refer to events of the previous month 'of last year' (dell'anno passato). Leonardo cannot therefore have written thus in Florence where the year was, at that period, calculated as beginning in the month of March (see Vol. I, No. 4, note 2). He must then have been in Milan. What is more important is that we thus learn how to date the beginning of the year in all the notes written at Milan. This clears up Uzielli's doubts: A Milano facevansi cominciare l'anno ai principi Maggio, cioè il 25 Maggio e a novembre, cioè il 25 November. Ci siamo dimenticato che Leonardo desse pressoquesto il titolo che era in uso a Firenze. (Ricovero, p. 84, note.) [1467].

5. See No. 1465, 2.

1469. The late Marchese Girolamo d'Adda published a highly valuable and interesting disquisition on this passage under the title: Leonardo da Vinci e la sua Liberatio, note di un bibliotecario (Milano 1873. Ed. di soli 75 esemplari; privately printed). In the autumn of 1880 the Marchese d'Adda showed me a considerable mass of additional notes prepared for a second edition. This, as he then intended, was to come out after the publication of this work of mine. After the much regretted death of the elder Marchese, his son, the Marchese Giovanni d'Adda was able to place these MS. materials at my disposal for the present work, through the kind intervention of Signor Gustavo Frizzone. The following passages, with the initials G. d'A. are prints from the valuable notes in that publication, the MS. additions I have marked*. I did not however think myself justified in reproducing here the acute and interesting observations on the contents of most of the rare books here enumerated.


1468.

Salai, 20 lire, Bonifacio, 2 lire, Bartolomeo, 4 lire, Arrigo [Harry], 15 lire.

La seconda edizione è di Bologna, 1483, ristam-pata a Parigi nel 1532, e poi nuovamente nel 1533.

Paolo Ramusio la volgex in italiano e la pubblicò di nuovo in Verona co tipi del Paganino, sempre in-fol., 1483 (le stampe di formato più piccolo), e Luigi Maegret la tradusse in lingua francese nel 1555 a Parigi.

"Mediolinii per Leon. Puchel & Ulric. Sciniosderii 1484" in-fol.,


Vedasi il Manual del Brunci o meglio il Repertorium dell' Haiin ed il Fanzer. (G. d'A.)


6. L'Acerbo (da acerbo, cumulo), il noto poema di Francesco Stabili, astrologo nemico degli Alleghieri. Numerous edizioni del secolo XV e XVI. È una vera enciclopedia in versi, ripiena di idee ardimentose e che volsero all'infelice penatore il rago nel 1347. In questo poema trovansi delineate le origini di molti trovati moderni, ed in particolare della circolazione del sangue, due scoli primi del Michele Servito. Della prima edizione di Brescia Ferrandus s. a. in-fol. non si conosce che un solo esemplare nella Spenceriana. V. Dolidin. (G. d'A.)


- L. Guili de Soma rhetorical nova, S. Abano, in-4o 1490 (Laurentius Guidelius). È libro d'è più rari (Brunet, Tours V, col. 137). S. Alban, Alban Villa, Verulan-tium, Bordo inglese nella contea di Hertfordshire, la patria di Basco Francesco. (G. d'A.)


   Justinus, [12] On the immortality of the soul,
   Guido,[13] Burchiello,
   'Doctrinale' [14] Driadeo,
   John de Mandeville[16] 'On honest recreation' [17]
   The Epistles of Ovid, [20]
   Epistles of Filofo, [21]
   Sphere, [22]

16. Sono i viaggi del cavaliere "Mandeville," gentiluomo inglese. Scrive il suo libro in lingua francese. Fu stampato repentinamente nel secolo XV in francese, in inglese ed in italiano; ed in tedesco; del secolo XV ne annoverano forse più di 27 edizioni, di cui ne conosciamo 8 in francese, quattro in latino, sei in tedesco e molte altre in volgare. (G. d.\')

17. II Platina (Bartholomae Secchi) la versione italiana "de la honesta voluptate, & valetudine (Sce de il Ixconseni) Veneta (senza nome di tipografo) 1487," piccolo in-4° gerto. (G. d.'A.)— Compare No. 844, 21.

18. Il Manganello: Satura eccessivamente vivace contro le donne ad invito della Sesta di Gienenne. Manganello non è soltanto il titolo del librino, sua ban se non quel nome dell'autore ove era un "milancese". Di questo libro, rarissimo, che sembra impresso a Venezia dallo Zoppino (Nicola d'Alvise detto il), senza data, ma dei primissimi anni del secolo XVI, e forse più antico, come vedremo in appresso, non se ne conoscono fra biblioteche pubbliche e private che due soli esemplari in Europa. (G. d.'A.)


21. See l. 4.

The Jests of Poggio[23]
Chiromancy,[24]
Formulary of letters,[25] 

Nonius Marcellus, Festus Pompeius, Marcus Varro.

Map of Elephanta in India which Antonello Merciaio has from maestro Maffeo;—there for seven years it rises and for seven years it sinks;—Enquire at the stations about Vitruvius.

See ‘On Ships’ Messer Battista, and Frontinus ‘On Aqueducts’[2].

23. Facietie di Poggio,
24. De chironomia,
25. Formulario di pistole.

F. o”)
Piatta d’Elefante d’India che à Antonello Merciaio da maestro Maffeo; perché 7 anni la terra alza e 7 abbassa;— cerca di Vetrutio fra cartolaj.

Leic. 1460
Vedi de naui messer Battista e Frontino de’ aquiridoti.

L. 356b; 1668a
Anasagora; ogni cosa vié da ogni cosa, ed ogni cosa si fa ogni cosa, e ogni cosa torna in ogni cosa, perché ciò ch’è nelli eleméti è fatto da essi eleméti.

26. * "Die Kunst Cyromantia etc. in tedesco. 26 ff. di testo e figure il tutto eseguito su tavole di legno verso la fine del secolo XV, tutte senza data. “Facietie de Poggio fiorentino tradotte de latino in vulgare ornatusissimo," in-4°, segn. a—e in caratteri romani; l’altra: “Facietie tradotte de latino in vulgare,” in-4°, caratteri gotici, etc. (G. d’A.)

27. Compare No. 1113, 25.
2. Vitruvius de Arch., et Frontinus de Aqueductibus. Florence, 1513.—This is the earliest edition of Frontinus.—The note referring to this author thus suggests a solution of the problem of the date of the Leicester Manuscript.

Five books out of this list are noted by Leonardo in another MS. (Tr. 3): donato, — lapidario, — pilin, — abacha, — morgante.

1470. Nonius Marcellus and Sextus Pompeius Festus were Roman grammarians of about the fourth century A.D. Early publications of the works of Marcellus are: De proprietate sermonum, Rome (about 1470), and 1471 (place of publication unknown). Commentoria doctrina, ad filium, de proprietate sermonum. Venice, 1476. Brunet, Manuel du libraire (IV, p. 97) notes: Le texte de cet ancien gramairien a eté réimprimé plusieurs fois à la fin du XVe siècle, avec ceux de Pompeius Festus et de Terentius Varro. La plus ancienne edition qui réussisse ces trois auteurs est celle de Parme, 1480 ... Cellae de Venice, 1483, 1490, 1498, et de Milan, 1500, toutes in fol., ont peu de valeur.
Archimede del uescuo 3 di Padua.

The Archimedes belonging to the Bishop of Padua.

Archimede gave the quadrature of a polygonal figure, but not of the circle. Hence Archimedes never squared any figure with curved sides. He squared the circle minus the smallest portion that the intellect can conceive, that is the smallest point visible.

If any man could have discovered the utmost powers of the cannon, in all its various forms and have given such a secret to the Romans, with what rapidity would they have conquered every country and have vanquished every army, and what reward could have been great enough for such a service! Archimedes indeed, although he had greatly damaged the Romans in the siege of Syracuse, nevertheless did not fail of being offered great rewards from these very Romans; and when Syracuse was taken, diligent search was made for Archimedes; and he being found dead greater lamentation was made for him by the Senate and people of Rome than if they had lost all their army; and they did not fail to honour him with burial and with a statue. At their head was Marcus Marcellus. And after the second destruction of Syracuse, the sepulchre of Archimedes was found again by Cato [25], in the ruins of a temple. So Cato had the temple restored and the sepulchre he so highly honoured .... Whence it is written that Cato said that he was not so proud of any thing he had done as of having paid such honour to Archimedes.
Aristotele 3o della fisica, and Alberto e Tomaso, 2e li altri de risaltatione, j 7a della fisica, 3de cielo e mvdo.

Aristotle, Book 3 of the Physics, and Albertus Magnus, and Thomas Aquinas and the others on the rebound of bodiies, in the 7th on Physics, on heaven and earth.

Dice Aristotile che se una potentia move v 3*corpo vn tanto spatio in tanto tèpo, la me^desima potentia moverà la metà di quel 4corpo due tanti di spatio nel medesimo tèpo.5

Aristotle says that if a force can move a body a given distance in a given time, the same force will move half the same body twice as far in the same time.

Aristotle nel terzo dell’etica: 2l'uomo - è degni di lode e di uituperio solo j nelle cose che sono j sua potestà 4di fare e di no fare.

Aristotle in Book 3 of the Ethics: Man merits praise or blame solely in such matters as lie within his option to do or not to do.

'Dicie Aristotele che ogni cosa desidera mantenere la sua natura.

Aristotle says that every body tends to maintain its nature.

De incremento 2Nili, opera d’Aristotile piccola.

On the increase of the Nile, a small book by Aristotle.

Avicenna vole 2 che l’anima partorisca l'anima, e l'corpo il corpo, 3e ogni membro per rata.

Avicenna will have it that soul gives birth to soul as body to body, and each member to itself.

Avicenna on liquids.

De inundatione Nili, is quoted here and by others as a work of Aristotle. The Greek original is lost, but a Latin version of the beginning exists (Arist. Opp. IV p. 213 ed. Did. Par.). In his quotations from Aristotle Leonardo possibly refers to one of the following editions: Aristotelis libri IV de coelo et mundo; de anima libri III; libri VIII physi -
corum; libri de generatione et corruptione; de sensu et sensato ... omnia latina, interpretè dieroe. Venetiis 1483 (first Latin edition). There is also a separate edition of Liber de coelo et mundo, dated 1473.

Avicenna, sec too No. 1421, l. 2.
MISCELLANEOUS NOTES.

1484. Rugiero Bacono fatto in istampa.

Roger Bacon, done in print.

1485. Cleomete filosofo.

Cleomedes the philosopher.

1486. Cornelio Celso.

The highest good is wisdom, the chief evil is suffering in the body. Because, as we are composed of two things, that is soul and body, of which the first is the better, the body is the inferior; wisdom belongs to the better part, and the chief evil belongs to the worse part and is the worst of all. As the best thing of all in the soul is wisdom, so the worst in the body is suffering. Therefore just as bodily pain is the chief evil, wisdom is the chief good of the soul, that is with the wise man; and nothing else can be compared with it.

Demetrius was wont to say that there was no difference between the speech and words of the foolish and ignorant, and the noises and rumblings of the wind in an inflated stomach. Nor did he say so without reason, for he saw no difference between the parts whence the noise issued; whether their lower parts or their mouth, since one and the other were of equal use and importance.

1484. The earliest printed edition known to Brunet of the works of Roger Bacon, is a French translation, which appeared about forty years after Leonardo's death.

1485. Cleomede. A Greek mathematician of the IVth century B.C. We have a Cyclic theory of Meteorica by him. His works were not published before Leonardo's death.

1486. Aulus Cornelius Celsus, a Roman physician, known as the Roman Hippocrates, probably contemporary with Augustus. Only his eight Books 'De Medicina', are preserved. The earliest editions are: Cornelius Celsus, de medicina libr. VIII., Milan 1481 Venice 1493 and 1497.

Maestro Stefano Caponi, a physician, lives at the piscina, and has Euclid De Ponderibus.

5th Book of Euclid. First definition: a part is a quantity of less magnitude than the greater magnitude when the less is contained a certain number of times in the greater.

A part properly speaking is that which may be multiplied, that is, when, being multiplied by a certain number, it forms exactly the whole. A common aggregate part . . .

Second definition. A greater magnitude is said to be a multiple of a less, when the greater is measured by the less.

By the first we define the lesser magnitude and by the second the greater is defined. A part is spoken of in relation to the whole; and all their relations lie between these two extremes, and are called multiples.

Hippocrates says that the origin of men's sperm derives from the brain, and from the lungs and testicles of our parents, where the final decocture is made, and all the other limbs transmit their substance to this sperm by means of expiration, because there are no channels through which they might come to the sperm.

The works of Hippocrates were printed first after Leonardo's death.
1492.

Lucretius in his third [book] ‘De Rerum Natura’. The hands, nails and teeth were (165) the weapons of ancient man. They also use for a standard a bunch of grass tied to a pole (167).

1493.

Ammianus Marcellinus asserts that seven hundred thousand volumes of books were burnt in the siege of Alexandria in the time of Julius Cesar.

W. XXIII.

Mondino says that the muscles which raise the toes are in the outward side of the thigh, and he adds that there are no muscles in the back [upper side] of the feet, because nature desired to make them light, so as to move with ease; and if they had been fleshy they would be heavier; and here experience shows...

1494.

Of the error of those who practice without knowledge;—[3] See first the ‘Ars poetica’ of Horace [5].

1495.

Del’ error di quelli che vsano la pratica senza scienza;—[3] vedi primo la poetica d’Oratio.

1492. Lucretius, De Rerum Natura libri VI were printed first about 1473, at Verona in 1486, at Brescia in 1495, at Venice in 1500 and in 1515, and at Florence in 1515. The numbers 165 and 167 noted by Leonardo at the end of the two passages seem to indicate pages, but if so, none of the editions just mentioned can here be meant, nor do these numbers refer to the verses in the poems of Lucretius.

1493. Ammianus Marcellinus historiarum libri qui extant XIII, published at Rome in 1474.


1495. A 3—5 are written on the margin at the side of the title line of the text given, entire as No. 19.
The heirs of Maestro Giovanni Ghiringallo have the works of Pelacanico.

The catapult, as we are told by Nonius and Pliny, is a machine devised by those &c.

I have found in a history of the Spaniards that in their wars with the English ArchimeDES of Syracuse who at that time was living at the court of Ecliderides, King of the Ciro-" dastri. And in maritime warfare he ordered that the ships should have tall masts, and that on their tops there should be a spar fixed of 40 feet long and one third of a foot thick. At one end of this was a small grappling iron and at the other a counterpoise; and there was also attached 12 feet of chain; and, at the end of this chain, as much rope as would reach from the chain to the base of the mast—where a very strong spar was attached and to this was fastened the end of the rope. But to go on to the use of his machine; I say that below this grappling iron was a fire which, with tremendous noise, threw down its rays and a shower of burning pitch; which, pouring down on the enemy's top, compelled the men who were in it to abandon the top to which the grappling-iron had clung. This was hooked on to the edges of the top and then suddenly the cord attached at the base of the top to support the cord which went from the grappling iron, was cut, giving way and drawing in the enemy's ship; and if the anchor—was cast...

1496. 1. maestro jov. 2. ghirgallo ano. 3. lachano. 1498. 1. chone. 2. diere deiloro. 3. inglesi fu archimede. 4. cholunghi albori. 5. essopra. 6. gaggia. 6. cholillo. 7. antenneta di ligezza. 8. grosseza. 8. contrapeso. 9. era apicato. 9. cagliato. 10. assimelo. 10. gaggia. The following words are written on the margin: chera attaca stacate eumma cordella. 11. assimelo. 12. assimelo delo albor. 13. albor o albor. 13. assimelo. 14. chon corres. 15. jido. 16. a la gaggia costrigineva. 17. abbandonare. 18. gaggia. 19. albor catena chele achiu rano(?). 18. gaggia essubito. 19. assostenere. a noscimeto della gaggia. 20. cvella. 20. navilio dani(i) essi(i) penova(i) dancora(i).
1499. Theophrastus on the ebb and flow of the tide, and of eddies, and on water.

1500. Tryphon of Alexandria, who spent his life at Apollonia, a city of Albania (163).

1501. Messer Vincenzo Aliprando, who lives near the Inn of the Bear, has Giacomo Andrea's Vitruvius.

1502. Vitruvius says that small models are of no avail for ascertaining the effects of large ones; and I here propose to prove that this conclusion is a false one. And chiefly by bringing forward the very same argument which led him to this conclusion; that is, by an experiment with an auger. For he proves that if a man, by a certain exertion of strength, makes a hole of a given diameter, and afterwards another hole of double the diameter, this cannot be made with only double the exertion of the man's strength, but needs much more. To this it may very well be answered that an auger

1503. of double the diameter cannot be moved by double the exertion, because the superficialies of a body of the same form but twice as large has four times the extent of the superficialies of the smaller, as is shown in the two figures a and n.

1499. The Greek philosophers had no opportunity to study the phenomenon of the ebb and flow of the tide and none of them wrote about it. The movement of the waters in the Eurius however was to a few of them a puzzling problem.
1504.

Of squaring the circle, and who it was that first discovered it by accident.

Vitruvius, measuring miles by means of the repeated revolutions of the wheels which move vehicles, extended over many Stadia the lines of the circumferences of the circles of these wheels. He became aware of them by the animals that moved the vehicles. But he did not discern that this was a means of finding a square equal to a circle. This was first done by Archimedes of Syracuse, who by multiplying the second diameter of a circle by half its circumference produced a rectangular quadrilateral equal figure to the circle[10].

1505.

Virgil says that a blank shield is devoid of merit because among the people of Athens the true recognition confirmed by testimonies...

1506.

In Vitelone there are 805 conclusions [problems] in perspective.

1507.

Vitolone, at Saint Mark's.

1504.  de €" del ci ch... chellla. 2. achaso. 3. chelle. 4. movano i charr... nelle sue stadii. 5. cihurferètiali del c. di... malloi. 6. charr... chonid... mezo. 8. chellla... dun c. cholla. 9. cir... chonobbe. 10. al c.

1505.  sanza laule. 2. atici lale chonobbe ta testimoni del|||monu. 3. colegati ciraversati e per molificati cògniure().

1506.  vitollone he 805 chonchisioni in prospettiva.

1507.

Vitolone, see also Nos. 1113 and 343. 10. Compare No. 1475.

1505.  The end of the text cannot be deciphered.


1507.  Marcho.
Come Xenofonte pro\textsuperscript{pose} il falso.
\textsuperscript{3} Se a cose disequali si leuano cose disequali, le quali sieno nella medesima proportione ecc.

How this proposition of Xenophon is false. If you take away unequal quantities from unequal quantities, but in the same proportion, &c.

A di 23 d'aprile ebbe da Marchesino\textsuperscript{.} lire 103 e S. 12.

On the 28\textsuperscript{th} day of April I received from the Marchesino 103 lire and 12 dinari.

A di 10 di luglio 1492 i fiori di re 135 l. 445
\textsuperscript{2} i dinari di 6 S l. 112 S. 16
\textsuperscript{3} i dinari di \textsuperscript{5} e \textsuperscript{1/2} l. 29 S. 13
\textsuperscript{4} i dinari 9 d'oro e scudi 3 l. 53
\textsuperscript{5} l. 811 i somma.

On the 10\textsuperscript{th} day of July 1492 in 135 Rhenish florins l. 445
in dinari 6 soldi l. 112 S 16
in dinari 5\textsuperscript{1/2} soldi l. 29 S 13
9 in gold and 3 scudi l. 53
l. 811 in all.

A di primo di febraio lire 1200.

On the first day of February, lire 1200.

126 passi è la sala di corte, larga braccia 27.

The hall towards the court is 126 paces long and 27 braccia wide.

La gronda stretta sopra la sala lire 30;
\textsuperscript{3} le grôde sotto a di questa \textsuperscript{.} sieno, ciascuno \textsuperscript{4} quadro per se, lire 7, e di spesa tra azzurro, \textsuperscript{5} oro, bianca \textsuperscript{.} giesso, indaco e colla lire 3; \textsuperscript{6} di tèpo giornate \textsuperscript{.} 3;
\textsuperscript{7} le storie sotto a esse grôde coi suoi \textsuperscript{8} pilastri lire 12 per ciascuna;
\textsuperscript{8} stimo la spesa fra smalto, azzurro c oro, \textsuperscript{10} e altri colori lire una e \textsuperscript{1/2};
\textsuperscript{9} le giornate stimo \textsuperscript{3} tralla investigazione \textsuperscript{12} del coponimeto, pilastrello e altre cose.

The narrow cornice above the hall lire 30.
The cornice beneath that, being one for each picture, lire 7, and for the cost of blue, gold, white, plaster, indigo and glue 3 lire; time 3 days.
The pictures below these mouldings with their pilasters, 12 lire each.
I calculate the cost for small, blue and gold and other colours at 1\textsuperscript{1/2} lire.
The days I calculate at 3, for the invention of the composition, pilasters and other things.

1508. Xenophon's works were published several times during Leonardo's lifetime.

1509. Instead of the indication of the year there is a blank space after \textit{d'aprile}.—Marchesino Stange was one of Lodovico il Moro's officials.—Campare No. 1388.
INVENTORIES AND ACCOUNTS.

1514.

Item for each vault 7 lire
outlay for blue and gold 3½ lire
time, 4 days
for the windows 1½ lire
The cornice below the windows 16 soldi per braccio

item for 24 pictures of Roman history 14 lire each
The philosophers 10 lire
the pilasters, one ounce of blue 10 soldi for gold 15 soldi
Total 2 and ½ lire.

1515.

The cornice above lire 30
The cornice below lire 7
The compositions, one with another lire 13

1516.

Salai, 6 lire ... 4 soldi ... 10 soldi for a chain; —
On the 14th of March I had 13 lire S. 4; 16 lire remain.

1517.

How many braccia high is the level of the walls? —
123 braccia
How large is the hall?
How large is the garland?
30 ducats.

Salai, 6 lire ... 4 soldi ... 10 soldi for

On the 29th day of January, 1494
cloth for hose lire 4 S 3
lining S 10
making S 8
to Salai S 3
a jasper ring S 13
a sparkling stone S 11
to Caterina S 10
to Caterina S 10.
1518.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>The wheel</td>
<td>lire 7</td>
</tr>
<tr>
<td>The tire</td>
<td>lire 10</td>
</tr>
<tr>
<td>The shield</td>
<td>lire 4</td>
</tr>
<tr>
<td>The cushion</td>
<td>lire 8</td>
</tr>
<tr>
<td>The ends of the axle-tree</td>
<td>lire 2</td>
</tr>
<tr>
<td>Bed and frame</td>
<td>lire 30</td>
</tr>
<tr>
<td>Conduit</td>
<td>lire 10</td>
</tr>
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S. K. M. II.² 32a.

<table>
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<tbody>
<tr>
<td>La rota</td>
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</tr>
<tr>
<td>Labro</td>
<td>lire 10</td>
</tr>
<tr>
<td>Scudo</td>
<td>lire 4</td>
</tr>
<tr>
<td>Carello</td>
<td>lire 8</td>
</tr>
<tr>
<td>Poli del’albero</td>
<td>lire 2</td>
</tr>
<tr>
<td>Letto e telaio</td>
<td>lire 30</td>
</tr>
<tr>
<td>Canale</td>
<td>lire 10</td>
</tr>
</tbody>
</table>

1519.

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Parsley</td>
<td>10 parts</td>
</tr>
<tr>
<td>Mint</td>
<td>1 part</td>
</tr>
<tr>
<td>Thyme</td>
<td>1 part</td>
</tr>
<tr>
<td>Vinegar . . . and a little salt two pieces of canvas for Salai.</td>
<td></td>
</tr>
</tbody>
</table>

S. K. M. II.² 91d.

<table>
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<tbody>
<tr>
<td>Piscina . . . . . . . . . .</td>
<td></td>
</tr>
<tr>
<td>Ducati 2, — 3 fave, — 4 melica biáca, — 5 melica rossa, — 6 panico, — 7 miglio, — 8 fagiuli, — 9 fave, — 10 pisegli.</td>
<td></td>
</tr>
</tbody>
</table>

1520.

On Tuesday I bought wine for morning [drinking]; on Friday the 4th day of September the same.

S. K. M. II.² 95a.

<table>
<thead>
<tr>
<th>Item</th>
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</thead>
<tbody>
<tr>
<td>Spese per la sotteratura di Caterina.</td>
<td></td>
</tr>
<tr>
<td>Libbre di cera</td>
<td>S 27</td>
</tr>
<tr>
<td>Per lo cataletto</td>
<td>S 8</td>
</tr>
<tr>
<td>Pale sopra il cataletto</td>
<td>S 12</td>
</tr>
<tr>
<td>Portata e portata di croce</td>
<td>S 4</td>
</tr>
<tr>
<td>Per la postatura del morto</td>
<td>S 8</td>
</tr>
<tr>
<td>Per 4 preti e 4 cherici</td>
<td>S 20</td>
</tr>
<tr>
<td>Canpana, libri, spuga</td>
<td>S 2</td>
</tr>
<tr>
<td>Per li sotteratori</td>
<td>S 16</td>
</tr>
<tr>
<td>All’ atiano</td>
<td>S 8</td>
</tr>
<tr>
<td>Per la licetià, ali ufitali</td>
<td>S 1</td>
</tr>
</tbody>
</table>

1522.

<table>
<thead>
<tr>
<th>Item</th>
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<tbody>
<tr>
<td>Expenses of the interment of Caterina.</td>
<td></td>
</tr>
<tr>
<td>Il medico</td>
<td>S 2</td>
</tr>
<tr>
<td>Zucchero e càdele</td>
<td>S 12</td>
</tr>
</tbody>
</table>

1519. This note, of about the year 1494, is the earliest mention of Salai, and the last is of the year 1513 (see No. 1465, 3). From the various notes in the MSS, he seems to have been Leonardo's assistant and keeper only, and scarcely himself a painter. At any rate no signed or otherwise authenticated picture by him is known to exist. Vasari speaks somewhat doubtfully on this point.

1520. This note enables us to fix the date of the Manuscript, in which it is to be found. In 1495 the 4th of September fell on a Friday; the contents of the Manuscript do not permit us to assign it to a much earlier or later date (Compare No. 1522, and Note).

1522. See Nos. 1384 and 1517.
INVENTORIES AND ACCOUNTS.

1523.

La cappa di Salai a di 4 d’apriile 1497.
Salai’s cloak, the 4th of April 1497.

24 braccia di panno argiètino  l. 15 S 4
5 velluto verde per ornare  l. 9 S
4 bindelli  l. S 9
3 magliette  l. S 12
6 manifattura  l. 1 S 5
7 bindello per dinazi  li. S 5
9 ecco di suo grossoni 13  li 26 S 5
10 Salai ruba li soldi.

Lunedì còprai braccia 4 di tela, lire 13 S 14 e 1/5, à di 17 di ottobre 1497.
On Monday I bought 4 braccia of cloth lire 13 S 14 1/5 on the 17th of October 1497.

Ricordo come a di 8 d’apriile 1503 io Leonardo da Vinci prestai a Vate mi-ni-ataore ducati 4 d’oro in oro; portògli Salai e li dette in sua propia mano; disse rendermale infra lo spatio di 40 giorni;
Memorandum. That on the 8th day of April 1503, I, Leonardo da Vinci, lent to Vante, miniature painter 4 gold ducats, in gold. Salai carried them to him and gave them into his own hand, and he said he would repay within the space of 40 days.

Ricordo come nel sopradetto giorno io rëdei a Salai ducati 3 d’oro, i quali disse volersene fare vn paito di calze rot-sate co’ sua fornimici, e li restai à dare 6 ducati 9, posto che lui ne de’ dare a me ducati 20, cioè 17 prestai li à Milano e 3 a Venezia;
Memorandum. That on the same day I paid to Salai 3 gold ducats which he said he wanted for a pair of rose-coloured hose with their trimming; and there remain 9 ducats due to him—excepting that he owes me 20 ducats, that is 17 I lent him at Milan, and 3 at Venice.

Ricordo come io diedi a Salai braccia 21 di tela da fare camice, a S. 10 il braccio, 8 le quali li diedi à di 20 d’apriile 1503.
Memorandum. That I gave Salai 21 braccia of cloth to make a shirt, at 10 soldi the braccio, which I gave him on the 20th day of April 1503.

La mattina di Scò Pietro a di 29 di giuno 1504 4 tolse ducati 10, de’ quali ne diedi uno a Tomaso, mio famiglio, per spèdere;

1523-2. 4 br di. 9. ecci di suo. 10. P. 1523-1. br 4.
1525-1. chome. 2. isoro . elli detti. 3. losspatto . giorni. 4. assali. 5. ellirestai addare. 6. duchati 9 posso chellui . amme . coe 1 [6] 7 prestali . e [1] 3 a vigna. 7. assali br st . daffare camici a S to li bracco. 8. la quel . addi.
1526. 1-22. Written from left to right.

1525. With regard to Vante or Attavante, the miniature painter (not Nanni as I formerly deciphered this name, which is difficult to read; see Zeitschrift für Bild. Kunst, 1879, p. 155), and Vasari, Lives of Frate Giovanni da Fiesole, of Bartolommeo della Gatta, and of Gherardo, miniatore. He, like Leonardo, was one of the committee of artists who, in 1503, considered the erection and placing of Michel Angelo’s David. The date of his death is not known; he was of the same age as Leonardo. Further details will be found in ‘Notizie di Attavante miniatore, e di alcuni suoi lavori’ (Milanese’s cd. of Vasari, III, 231—233). MMM

C. A. 70 b; 208 a.

On the morning of San Peter’s day, June 29th, 1504, I took 10 ducats, of which I gave one to Tommaso my servant to spend.

1526.

On the morning of San Peter’s day,
On Monday morning 1 florin to Salai to spend on the house.
On Thursday I took 1 florin for my own spending.
Wednesday evening 1 florin to Tommaso, before supper.
Saturday morning 1 florin to Tommaso.
Monday morning 1 florin less 10 soldi. Thursday to Salai 1 florin less 10 soldi.
For a jerkin, 1 florin. For a jerkin 2 florins.
To the hosier, 1 florin.
To Salai, 1 florin.
Friday morning, the 19th of July, 1 florin, less 6 soldi. I have 7 fl. left, and 22 in the box.
Tuesday, the 23rd day of July, 1 florin to Tommaso.
Monday morning, to Tommaso 1 florin.
[Wednesday morning I fl. to Tommaso.] Thursday morning the 1st day of August 1 fl. to Tommaso.
Sunday, the 4th of August, 1 florin.
Friday, the 9th day of August 1504, I took 10 ducats out of the box.

1504.

On the 9th day of August, 1504, I took 10 florins in gold [2] ... [3] on Friday the 9th day of August fifteen grossoni that is 5 S 5 ... given to me 1 florin in gold on the 12th day of August [4] ... on the 14th of August, 32 grossoni to Tommaso. On the 18th of the same 5 grossoni to Salai. On the 8th of September 6 grossoni to the workman to spend; that is on the day of our Lady's birth. On the 16th day of September I gave 4 grossoni to Tommaso: on a Sunday.

1504.

In the original, the passage given as No. 1463 is written between lines 2 and 3 of this text, and it is possible that the entries in lines 3 and 4 refer to the payments of Jacopo Tedesco, who is there mentioned. The first words of these lines are very illegible. The nick-name of Giovanni Francesco Penni, born in Florence in 1456, and subsequently a pupil of Raphael's. According to Vasari he was known by it even as a boy. Whether he is spoken of in this passage, or whether the word Fattore should be translated literally, I will not undertake to decide. The latter seems to me more probably right.
F. 07]

A di d'ottobre 1508 ebbi scudi 30; 13 ne prestai a Salai per copiere la detta alla sorella, e 17 ne restò a me.

1528.

On the day of October, 1508, I had 30 scudi; 13 I lent to Salai to make up his sister's dowry, and 17 I have left.

C. A. 1529.

Ricordo de' danarì che io ho avuto dal re per mta provisìone dal luglio 1508 insino aprile prossimo 1509: prima scudi 100, poi 70, e poi 50, e poi 220, e poi 200 florini a 48 S. per l'uno.

1529.

Memorandum of the money I have had from the King as my salary from July 1508 till April next 1509. First 100 scudi, then 70, then 50, then 200 and then 200 florins at 48 soldi the florin.

C. A. 1530.

Sabato a di 2 di marzo ebbe da Scà Maria Nova 5 ducati 5 d'oro, restò 14 ne 450, de' quali 2 ne 5 detti il medesimo di a Salai, che me li avea prestati.

1530.

Saturday the 2nd day of March I had from Santa Maria Novella 5 gold ducats, leaving 450. Of these I gave 2 the same day to Salai, who had lent them to me.

C. A. 1531.

Giòvedì, a di 8 di givgnio tolsi grossoni 17 S 18, 3 giòvedi detto da mattina a Salai 4 per spendere S 22.

1531.

Thursday, the eighth day of June, I took 17 grossoni, 18 soldi; on the same Thursday in the morning I gave to Salai 22 soldi for the expenses.

W. XXXII.

A Salai grossoni 4, e 1 braccio di velutto 5 lire, e 1/2, 3 sapere S 10, maglie d'argiòto; 4 Salai S 14 per bindelli, 5 fattura della cappa S 25.

1532.

To Salai 4 grossoni, and for one braccio of velvet, 5 lire, and 1/2; viz. 10 soldi for loops of silver; Salai 14 soldi for binding, the making of the cloak 25 soldi.

C. A. 1533.

Detti a Salai lire 93 S 6; 3 soldi ne avuti lire 67, 4 resta dare 26 S 6.

1533.

I gave to Salai 93 lire 6 soldi, of which I have had 67 lire and there remain 26 lire 6 soldi.

1529. Compare No. 1530 and 1561.


1532. Compare No. 1523.
C. A. 313 16; 9496]

A Salai S 42
2 dozzine 2 di stringe S 8
3 in fogli S 3 d. 8
4 vn pajo di scarpe S 14
5 in veluto S 14
6 spada e coltello S 21
7 in barbiere S 11
8 a Paolo per una .... S 20
9 per dire la ventura S 6

1534.

To Salai S 42
2 dozen of laces S 8
for papers S 3 d 8
a pair of shoes S 14
for velvet S 14
a sword and knife S 21
to the barber S 11
to Paolo for a .... S 20
For having his fortune told S 6

Br. M. 372 6]

Venerdì mattina in pane S...d On Friday morning, bread S...d
per spèdèrce; avuto in uoa S...d one florin to Salai to wine S...d
S 3 4 in funghi S...d spend; 3 soldi re-
5 in frutti S...d grapes S...d
6 in crusca S...d fruit S...d
7 in barbiere S...d [6] bran S...d
8 in scarpe S...d at the barber’s S...d

1535.

Giovedì mattina fiorino uno. On Thursday morning one florin.

C. A. 212 6; 627 4]

1 Di di Scò Ambrosio S 36 da mat-
tina in giovedò. 1

1536.

On Saint Ambrose’s day from the morning
to Thursday 36 soldi.

C. A. 258 1; 781]

I danari ch’io ò avuto da Ser Matteo:
2 prima grossoni 20, poi 13 volte 3 f., e di
poi grossoni 61, 3 e poi 3, di poi 3·3·12.
S 46 grossoni 12.

1537.

The moneys I have had from Ser Matteo;
first 20 grossoni, then on 13 occasions 3 f.
and then 61 grossoni, then 3, and then 3·3·12;
46 soldi 12 grossoni.

E. 6]

I carta S 18
2 tala S 30
3i carta S 10 d 19
4 somma 73

1538.

For paper S 18
for canvas S 30
for paper S 10 d 19
Total S 73

1539.

1534. 1. assalai. 2. dozine o . string. 4. pa di scarpe 8 apagoo per “ a” croetta.
1535. 1–8. Written from left to right. 2. fr. 1 assalai per ispe. 3. ant. — innova. 5. frutte. 6. crusca. 8. inscarpe.
1536. 1. giovedi . . fr. j 1537. ambroso.
1538. 1. chio nuovo. 2. pr grossoni.

1535. 6. Compare Nos. 1545, l. 4 and 5, with similar entries for horse’s fodder.
| 1540. | 20 pounds of German blue, at one ducat the pound lire 80 S d
|       | 60 pounds of white, S .
|       | the pound lire 15 S d
|       | 1½ pound at 4 S the pound lire 6 S d
|       | 2 pounds of cinnabar at S 18 the pound lire 1 S 16 d
|       | 6 pounds of green at S 12 the pound lire 3 S 12 d
|       | 4 pounds of yellow at S 12 the pound lire 2 S 8 d
|       | 1 pound of minium at S 8 the pound lire 0 S 8 d
|       | 4 pounds of . . . . at S 2 the pound lire 0 S 8 d
|       | 6 pounds of ochre at S 1 the pound lire 0 S 6 d
|       | black . . . at S 2 the pound for 20 wax to make the stars
|       | lire 2 S 0 d
|       | 29 pounds at S—the pound lire 0 S 0 d
|       | 40 pounds of oil for painting at 5 soldi the pound lire 10 S 0 d
|       | Altogether lire 120 d 18 without the gold.
|       | 18 tin for putting on the gold 120 18
|       | 58

| 1541. | Two large hatchets and one very small one, 8 brass spoons, 4 tablecloths, 2 towels, 15 small napkins, 2 coarse napkins, 2 coarse cloths, 2 wrappers, 3 pairs of sheets, 2 pairs new and 1 old.

| 1542. | Letto 7 o S.
|       | Bed 7 o S
|       | ring 7 o
|       | crockery 2 5
|       | gardener 1 2
|       | . . . . . . 2 8
|       | porters 2 1
|       | glasses 1
|       | fuel 3 6
|       | a lock 1

---

1540. 1—14. Written from left to right. 1. libra, libbre throughout for libbra; libbra dazurro. 2. biacca S. [6] [7] o la libbra.
1541. 1. scure grande . . . chuchiai. 2. toagli . . . guardanape 14 "15" tovagliolini 2 tovaglione canava. 3. nove e I vechio.
1542. 5. mainardo"o". 8. inferi da fochio.
### 1543

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<td>Peltro novo</td>
<td>3</td>
<td>Paji di lëzuola</td>
</tr>
<tr>
<td>2.6 scodellini</td>
<td></td>
<td>di 4 teli l’uno</td>
</tr>
<tr>
<td>3.6 scodelle</td>
<td></td>
<td>2 lenzoli piccoli</td>
</tr>
<tr>
<td>4.2 piatagli grandi</td>
<td></td>
<td>2 tovaglie e 1/2</td>
</tr>
<tr>
<td>5.2 piatagli mezzani</td>
<td></td>
<td>16 mâtili</td>
</tr>
<tr>
<td>6.2 piatteletti</td>
<td></td>
<td>8 camiec</td>
</tr>
<tr>
<td>Peltro vecchio</td>
<td>9</td>
<td>Pannetti</td>
</tr>
<tr>
<td>8.3 scodellini</td>
<td></td>
<td>2 sciugatoj</td>
</tr>
<tr>
<td>9.4 scodelle</td>
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<td></td>
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<td>10.3 quadretti</td>
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</tr>
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<td></td>
</tr>
<tr>
<td>13 uno piattello</td>
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</tr>
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<td>14 cadellieri</td>
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<tr>
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<tr>
<td>New tin-ware</td>
<td>3 pairs</td>
<td>of sheets</td>
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<tr>
<td>6 small bowls</td>
<td></td>
<td>each of 4 breadths</td>
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<tr>
<td>6 bowls</td>
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<td>2 small sheets</td>
</tr>
<tr>
<td>2 large bowls</td>
<td></td>
<td>2 tablecloths and 1/2</td>
</tr>
<tr>
<td>2 dishes medium size</td>
<td></td>
<td>16 coarse cloths</td>
</tr>
<tr>
<td>2 small ones</td>
<td></td>
<td>8 shirts</td>
</tr>
<tr>
<td>Old tin-ware</td>
<td>3 small</td>
<td>bowls</td>
</tr>
<tr>
<td>3 bowls</td>
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<td>4 candlesticks</td>
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<tr>
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### 1544

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<td>3 biada</td>
<td>S 42</td>
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<td>S 54</td>
<td>wine</td>
</tr>
<tr>
<td>5 pane</td>
<td>S 18</td>
<td>bread</td>
</tr>
<tr>
<td>6 carne</td>
<td>S 54</td>
<td>meat</td>
</tr>
<tr>
<td>7 uova</td>
<td>S 3</td>
<td>eggs</td>
</tr>
<tr>
<td>8 salata</td>
<td>S 3</td>
<td>salad</td>
</tr>
<tr>
<td>9 barbiere</td>
<td>2 d 6</td>
<td>the Barber</td>
</tr>
<tr>
<td>10 cavalli</td>
<td>S 1</td>
<td>horses</td>
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### 1545

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<td>Domenica</td>
<td>carne</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>vino</td>
<td>S 12 d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>crusca</td>
<td>S 5 d 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>erba</td>
<td>S 10 d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ricotta</td>
<td>S 4 d 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>melone</td>
<td>S 3 d 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pane</td>
<td>S 3 d 1</td>
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</tr>
<tr>
<td>lunedì</td>
<td>9</td>
<td>9 8</td>
<td></td>
</tr>
<tr>
<td>10...le</td>
<td>carne</td>
<td>S 6 d</td>
<td></td>
</tr>
<tr>
<td>11 vino</td>
<td>S 12 d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 crusca</td>
<td>S 9 d 4</td>
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</tr>
<tr>
<td>13 ricotta</td>
<td>S 4 d 4</td>
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</tr>
<tr>
<td>14 erba</td>
<td>S 8 d</td>
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<td>Sunday</td>
<td>meat</td>
<td>S 10 d</td>
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<tr>
<td></td>
<td>wine</td>
<td>S 12 d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bran</td>
<td>S 5 d 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>herbs</td>
<td>S 10 d</td>
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</tr>
<tr>
<td></td>
<td>buttermilk</td>
<td>S 4 d 4</td>
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<td>melon</td>
<td>S 3 d</td>
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<td>bread</td>
<td>S 3 d 1</td>
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</tr>
<tr>
<td>Monday</td>
<td>9</td>
<td>9 8</td>
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<tr>
<td>. . .</td>
<td>wine</td>
<td>S 12 d</td>
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</tr>
<tr>
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<td>bran</td>
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<td>buttermilk</td>
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</tr>
<tr>
<td></td>
<td>herbs</td>
<td>S 8 d</td>
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</tr>
</tbody>
</table>

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1543: 1. para. 3. picolo. 6. piatteletti. 8. sciugatto. 12. 1. 13. 1. 15. picolo.
1544: 7. hova.
INVENTORIES AND ACCOUNTS.

1546. 1547.

<table>
<thead>
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<th>Tuesday</th>
<th>S</th>
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<tr>
<td>meat</td>
<td>8</td>
<td>0 d 8</td>
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<tr>
<td>wine</td>
<td>8</td>
<td>0 d 8</td>
</tr>
<tr>
<td>bread</td>
<td>4</td>
<td>5 d 4</td>
</tr>
<tr>
<td>meal</td>
<td>4</td>
<td>5 d 4</td>
</tr>
<tr>
<td>herbes</td>
<td>4</td>
<td>5 d 4</td>
</tr>
</tbody>
</table>

Wednesday

| wine    | 5 | 8 d 8 |
| melt    | 8 | 5 d 8 |

Ash. I. 1881

Miseracione divina sacro sancte Romane ecclesie tituli n. cardinalis 2wulgaris 3municipatus venerabili religioso fratris Johanni Mair d'Nustorf 3ordinis praedicatorum provincie teutonie (?) conuentus Wienensis capellano 4noster commensuali salutem in dio scripserunt Religione zelus rite ac in [ferite?] honestas aliarumque laborablem probatis et virtutum merita quibus apud nos fide digno commendationis testimonio Magistri videlicet ordinis felicis recordacionis Leonardi de Mainsuetis de lerus sigillo suo.... us dans tibi ad... opera virtutum comen(salem)? 5locum et tempus success(ores) cuius similitudinem officium ministratus qui praedecessoris sui donum (?) confirmavit et de novo dedit aliarumque plurima [ludatis] qui opera tua laudant nos inducunt ut tibi (?) reddamus ad gratiam liberalem hinc est quod nos cupientes.

W. XII.

Johannes Antonius d. Johannes Ambrosius de Bolete; 2Chi perde il tempo e' virtù non aquisita; 3quanto più pensa l'animò più s'attrista; 4Virtù non ha in potere lo auere; chi lascia onore per acquistare auere; 5Non vale fortuna a chi non s'affatica; 6Colui si fa felice, che Christum vestiga; 7perfetto dono sà a sanza gran pesa; 8Passano nostri triunfi, nostre pompe; 9la gola e il sonno e l'otiose piuine Anno dal mondo ogni virtù sbandita, 10tal che dal corso suo quasi smarita; Nostra natura è vinta dal costume; 11Ormai con vieni così che tu spolti; Disse il maestro che seggiendo in piuma, 12in fama non si viene, nè sotto coltri. Sanza la qual chi sua vita consuma 13tal uuestigia in terra di se lascia, Qual fumo in aria o nel' acqua la schiuma.

1546—1566. All these texts are written in the ordinary way from left to right.

1547. 1. Ambrosius. 2. penae... satriata. 4. Iusa honore... aquitare haverne. 5. safasich. 6. colay... Xsum. 7. perfecto donisæ. 8. pasmo. 9. elluio... del. 10. choro... ismaria... chóstome. 11. chovien chosi cheetutti spolit... maestro chessiègendo. 12. si uen nessetto coltri. 13. chissua... chosanua. 13. uestigia... lascia... onell' acqua laschiuam.

1546. The meaning of this document, which is very difficult to decipher, and is written in unintelligible Latin, is, that Leonardo di Mansuetis recommends the Rev. Mair of Nusdorf, chaplain at Vienna, to some third person; and says that something, which had to be proved, has been proved. The rest of the passages on the same leaf are undoubtedly in Leonardo's hand. (Nos. 483, 661, 519, 578, 392, 582, 887 and 894.)

1547. From the last sentence we may infer that this text is by the hand of a pupil of Leonardo's.— On the same page are the notes Nos. 1175 and 715 in Leonardo's own handwriting.
La mattina de santo Zanobio a di 29 de maggio nel 1504 ebbe da Lionardo Vinci ducati 15 d’oro, e cominciai a spendere

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A mona Margarita</td>
<td>S 62 d 4</td>
</tr>
<tr>
<td>A rifare l’anello</td>
<td>S 19 d 8</td>
</tr>
<tr>
<td>St.anni</td>
<td>S 13 d</td>
</tr>
<tr>
<td>Bon bove</td>
<td>S 4</td>
</tr>
<tr>
<td>Eova</td>
<td>S 6 d</td>
</tr>
<tr>
<td>Al banco debito</td>
<td>S 7 d</td>
</tr>
<tr>
<td>Velluto</td>
<td>S 12</td>
</tr>
<tr>
<td>Vino</td>
<td>S 6 d 4</td>
</tr>
<tr>
<td>Carne</td>
<td>S 4 d</td>
</tr>
<tr>
<td>More</td>
<td>S 2 d 4</td>
</tr>
<tr>
<td>Funghi</td>
<td>S 3 d 4</td>
</tr>
<tr>
<td>Insalata</td>
<td>S 1 d</td>
</tr>
<tr>
<td>Frutta</td>
<td>S 1 d</td>
</tr>
<tr>
<td>Candele</td>
<td>S 3 d</td>
</tr>
<tr>
<td>Domenica</td>
<td>S 1 d</td>
</tr>
<tr>
<td>Farina</td>
<td>S 2 d</td>
</tr>
<tr>
<td>Domenica</td>
<td>198</td>
</tr>
<tr>
<td>pane</td>
<td>S 6 d</td>
</tr>
<tr>
<td>Vino</td>
<td>S 9 d 4</td>
</tr>
<tr>
<td>Carne</td>
<td>S 7 d</td>
</tr>
<tr>
<td>Minestra</td>
<td>S 2 d</td>
</tr>
<tr>
<td>Frutta</td>
<td>S 3 d 4</td>
</tr>
<tr>
<td>Candele</td>
<td>S 3 d 0</td>
</tr>
<tr>
<td>Lunedi</td>
<td>31</td>
</tr>
<tr>
<td>pane</td>
<td>S 6 d 4</td>
</tr>
<tr>
<td>Carne</td>
<td>S 10 d 8</td>
</tr>
<tr>
<td>Vino</td>
<td>S 9 d 4</td>
</tr>
<tr>
<td>Frutta</td>
<td>S 4 d</td>
</tr>
<tr>
<td>Minestra</td>
<td>S 1 d 8</td>
</tr>
</tbody>
</table>

On the morning of Santo Zanobio the 29th of May 1504, I had from Lionardo Vinci 15 gold ducats and began to spend them.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A mona Margarita</td>
<td>S 62 d 4</td>
</tr>
<tr>
<td>To remake the ring</td>
<td>S 19 d 8</td>
</tr>
<tr>
<td>Clothes</td>
<td>S 13</td>
</tr>
<tr>
<td>Good beef</td>
<td>S 4</td>
</tr>
<tr>
<td>Eggs</td>
<td>S 6</td>
</tr>
<tr>
<td>Debt at the bank</td>
<td>S 7</td>
</tr>
<tr>
<td>Velvet</td>
<td>S 12</td>
</tr>
<tr>
<td>Wine</td>
<td>S 6 d 4</td>
</tr>
<tr>
<td>Meat</td>
<td>S 4</td>
</tr>
<tr>
<td>Mulberries</td>
<td>S 2 d 4</td>
</tr>
<tr>
<td>Mushrooms</td>
<td>S 3 d 4</td>
</tr>
<tr>
<td>Salad</td>
<td>S 1</td>
</tr>
<tr>
<td>Fruit</td>
<td>S 1 d 4</td>
</tr>
<tr>
<td>Candles</td>
<td>S 3</td>
</tr>
<tr>
<td>Flour</td>
<td>S 2</td>
</tr>
</tbody>
</table>

**Sunday**

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread</td>
<td>S 6</td>
</tr>
<tr>
<td>Wine</td>
<td>S 9 d 4</td>
</tr>
<tr>
<td>Meat</td>
<td>S 7</td>
</tr>
<tr>
<td>Soup</td>
<td>S 2</td>
</tr>
<tr>
<td>Fruit</td>
<td>S 3 d 4</td>
</tr>
<tr>
<td>Candles</td>
<td>S 3 d</td>
</tr>
</tbody>
</table>

**Monday**

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread</td>
<td>S 6 d 4</td>
</tr>
<tr>
<td>Meat</td>
<td>S 10 d 8</td>
</tr>
<tr>
<td>Wine</td>
<td>S 9 d 4</td>
</tr>
<tr>
<td>Fruit</td>
<td>S 4</td>
</tr>
<tr>
<td>Soup</td>
<td>S 1 d 8</td>
</tr>
</tbody>
</table>

1548-1549. On the same sheet is the text No. 1015 in Leonardo's own handwriting.
Br. M. 190[1]

A Mona Margarita d 5 a Tomaso S 14
a mona Margarita di 5 S 2
el di di san Zanobi
resta .....
6 di pagamento di 13 S 2 d 4
di mona Margarita
in somma 9 d 14 S 5 d 4

1550.

To Mona Margarita S 5 to Tomaso S 14
to Mona Margarita d 5 S 2
on the day of San Zanobi left . . . . after
payment of Mona Margarita d 13 S 2 d 4
altogether d 14 S 5 d 4

Br. M. 271[9]

Il lunedi a di 13 di febraio prestai lire
S 7 a Lionardo per spendere 2 venerdi d 7.

1551.

On Monday, the 13th of February, I lent
lire S 7 to Lionardo to spend, Friday d 7.


Stephano, Chigi, Canonico . . . . fami-
lare del chiarissimo Conte Grimani; a
santo Apostolo.

1552.

Stephano Chigi, Canonico . . . . serv-
ant of the honorable Count Grimani at S.
Apostoli.

C. A. 34[1]; 11[4]

Essendomi sollecitato; 2 d’amor non ne
che dionique . . . . Bernardo di Simone, Sil-
uestro di Stefano, Bernardo di Jacopo,
Francesco di Matteo Bonciani, Antonio
di Giovanni Ruberti; Antonio da Pistoia . . . .
Antonio; ch’io tempo à e tempo aspetta
perde l’amico e’ danari.

1553.

Having become anxious . . . . . , Bern-
ardo di Simone, Silvestro di Stefano, Ber-
ardo di Jacopo, Francesco di Matteo Bon-
ciani, Antonio di Giovanni Ruberti, Antonio
da Pistoia . . . . Antonio; He who has time
and waits for time, will lose his friends and
his money.

C. A. 34[1]; 109[4]

Reverendissimo maestro domino Giovani
come fratello io parlai a maestro Zacaria di
quella facenda et l’ho fatto esser contento di
quella ordinazione ch’io ho voluto, cioè
in quato alla commissione ch’io ho dalle
parti, et dico che tra noi nò ha ¼a corre
denari inquanto alli quadri della

1554.

Reverend Maestro, Domino Giovanni, I
spoke to Maestro Zacaria as a brother about
this business, and I made him satisfied with
the arrangement that I had wished; that is,
as regards the commission that I had from
the parties and I say that between us there
is no need to pay money down, as regard
the pictures of the

1550. 1. margarita d 5[1/2;] 2. 4. ganoesi. 5. resta se mo da ior. 6. de. 7. di ca’(?) di mona malgarita. 8. soma. 10. [mone
margarita S. 7.]

1551. 1. c. 1/2 prestai . . . . 2. vermandi d 7 nel 1. 3. di pei imposi di chosto nòebbi mi se niiepepochi
soldini foris.

1552. 2. de da. c (f) cegno. l’ho mo".

1553. 3. br bernardo. 4. saluestro. 5. dia chopo. 6. franc“o”. 7. ant“o”. 8. pistaia ghangha diche. 9. aspetta. 10. lamicho
denari van. 11. chiasmo e acierbi o esser surado (’).

1554. R “do” matr dò . . . . como fràllo mro. 3. dicochtra. 4. denari inquato . . quadri. Here the text breaks off.

1551. This note is followed by an account very like the one given as No. 1549.

1552. Compare No. 674, 21—23.

Vol. II.
Delle cose vedute infra la nebbia quella parte che sarà più vicina alli estremi, sarà manco visibile, e tanto meno quanto più remote.

Theodoricus Rex semper Augustus.

Neither you say Hesperia alone, and it will mean Italy, or you add ultima, and it will mean Spain. Umbria, part of Tuscany.

Canonica of . . . . on the 5th of July 1507; my dearly beloved mother, sisters and cousin I herewith inform you that thanks to God I am . . . . . about the sword which I . . . . . bring it to Maso at the piazza . . . . and I will settle the business of Piero so that . . . .

Ut bene respondet Naturae ars docta! dedisset Vincius, ut tribuit cetera . . sic animam.

Noluit ut similis magis haec foret: altera sic est: Possidet illius Maurus amans animam.

1555. Of things seen through a mist that which is nearest its farthest limit will be least visible, and all the more so as they are more remote.

1556. Theodoricus Rex Semper Augustus.

1557. Either you say Hesperia alone, and it will mean Italy, or you add ultima, and it will mean Spain. Umbria, part of Tuscany.

1558.

1560. These three epigrams on the portrait of Lucrezia Crivelli, a picture by Leonardo which must have been lost at a very early date, seem to have been dedicated to Leonardo by the poet. Leonardo used the reverse of the sheet for notes on geometry,
Hujus quam cernis nomen Lucretia, Divi
Omnia cui larga contribuere manu.
Rara huic forma data est; pinxit Leonardus, amavit
Maurus, pictorum primus hic, ille ducum.

Naturam, ac superas haec laesit imagine Divas
Pictor: tantum hominis posse manum haec doluit,
illae longa dari tam magnae temporae formae,
Quae spatio fuerat deperita brevi.

C. A. 1561. 515 ö]
Egidius Romanus de formatione corporis humani in utero matris.
2 A Mons. le Vintic, des chevaux (?)
de l'escuyer du Roy… laissez payement continuer a Ms. 5 Lyonard Painter du Roy.
Amboise.

C. A. 1562. 526 ö]
P r o v o m a t a o o ἄνθρωπος τοῖς ἕρωις ἁγοραί.

C. A. 1563. 527 ö; 685 ö]
Memoria a maestro Lionardi di avere 
. . . . . . . . . . lo stato di Firenze . . . .

C. A. 1564. 534 ö; 1057 ö]
Ricordo a Vostra Eccellentia come Ridolfo 3 Manini condusse a Firenze una somma 3 di cristallo… altre pietre come sono …

1562. 1. a m "et o" Lio ando dihavere pito la nolo stato.

1561. 1. Libr magistri Egidii de pulibus matrice comparatis (cum commentario Gentilis de Fulcino) published in 1554 at Padova, in 1594 and in 1514 at Venice, and in 1505 at Lyons.
2. This text appears to be in a handwriting different from that in the note, 1. 1. Here the reading is not so simple as AMORETTI gave it, Mem. Stor. XV: A Monsieur Lyonard Painter du Roy pour Amboise. He says too that this address is of the year 1509, and Mr. Ravaisson remarks: "De cette signature il semble qu'on peut inférer que Léonard était alors en France, à la cour de Louis XII . . . Pour conclure je crois qu'il n'est pas prouvé que Léonard de Vinci n'eût pas fait un voyage de quelques mois en France sous Louis XII, entre le printemps de 1509 et l'automne de 1510."—I must confess that I myself have not succeeded in deciphering completely this French writing of which two words remain to me doubtful. But so much seems to be quite evident that this is not an address of a letter at all, but a certificate or note. Amboise [L. 6] I believe to be the signature of Charles d'Amboise the Governor of Milan. If this explanation is the right one, it can be easily explained by the contents of Nos. 1530 and 1529. The note, line 1, was perhaps added later by another hand; and Leonardio himself wrote afterwards on the same sheet some geometrical explanations. I must also point out that the statement that this sheet belongs to the year 1509 has absolutely no foundation in fact. There is no clue whatever for giving a precise date to this note.
1565. XVII C. 6 de Cittate Dei. \"se Antipodes.\"

1566.

Be it known to all persons, present and to come that at the court of our Lord the King at Amboise before ourselves in person, Messer Leonardo da Vinci painter to the King, at present staying at the place known as Cloux near Amboise, duly considering the certainty of death and the uncertainty of its time, has acknowledged and declared in the said court and before us that he has made, according to the tenor of these presents, his testament and the declaration of his last will, as follows. And first he commends his soul to our Lord, Almighty God, and to the Glorious Virgin Mary, and to our lord Saint Michael, to all the blessed Angels and Saints male and female in Paradise.

Item. The said Testator desires to be buried within the church of Saint Florentin at Amboise, and that his body shall be borne thither by the chaplains of the church.

Item. That his body may be followed from the said place to the said church of Saint Florentin by the collegium of the said church, that is to say by the rector and the prior, or by their vicars and chaplains of the church of Saint Denis of Amboise, also the lesser friars of the place, and before his body shall be carried to the said church this Testator desires, that in the said church of Saint Florentin three grand masses shall be celebrated by the deacon and sub-deacon and that on the day when these three high masses are celebrated, thirty low masses shall also be performed at Saint Gregoire.

Item. That in the said church of Saint Denis similar services shall be performed, as above.

Item. That the same shall be done in the church of the said friars and lesser brethren.

Item. The aforesaid Testator gives and bequeaths to Messer Francesco da Melzo, nobleman, of Milan, in remuneration for services and favours done to him in the past, each
sato, tutti et ciascununo li libri, che il 
dicto Testatore ha de presente et altri In-
strumenti et Portracti circa l’arte sua et 
industria de Pictori.

Item epso Testatore dona et concede a 
sempre mai perpetuamente a Battista de 
Vilans suo servitore la metà zoë medietà 
de uno iardino, che ha fora a le mura de 
Milano et l’altra metà de epso iardino ad 
Salay suo servitore nel qual iardino il pre-
fato Salay ha edificata et constructa una 
casa, la qual sarà e resterà similmente a 
sempremai perpetudine al dicto Salay, soi 
heredi et successori, et ciò in remuneration 
de boni et grati servitii, che dicti de Vil-
alis et Salay dicti suoi servitori lui hano 
facio de qui inanzi.

Item epso Testatore dona a Maturina 
sua fantescha una veste de bon pan negro 
foderata de pelle, una socha de panno et 
doy ducati per una volta solamente pagati; 
et ciò in remuneration simulmente de boni 
servitii a lui facti epsa Maturina de qui 
inanzi.

Item vole che ale sue exequie siano 
sexanta torchie, le quali seranno portate 
per sexanta poveri, ali quali seranno dati 
danari per portarle a discrezione del dicto 
Melzo le quali torzi seranno divise nelle 
quattro chiesie sopradicte.

Item el dicto Testatore dona ad cia-
scheduna de dicte chiesie sopradicte diece 
libre cera in candele grosse che saranno 
messe nelle dicte chiesie per servire al di 
che se celebranno dicti servitii.

Item che sia dato ali poveri del ospe-
dale di Dio alli poveri de Sancto Lazaro 
de Amboysia, et a ciò fare sia dato et 
pagato alli Tesorieri d’epsa confraternità 
la summa et quantità de soyante dece soldi 
tornesi.

Item epso Testatore dona et concede 
al dicto Messer Francesco Melzo presente 
et aceptante il resto della sua pensione et 
summa de’ danari qual a lui sono debiti 
del passato fino al di della sua morte per 
il ricevoir, ovvero, Tesaurario generál M. 
Johan Sapin, et tutte et ciaschaduna summe 
de’ danari che ha recepito dal p.’ Sapin 
de la dicta sua pensione, e in caxo chel 
decede inanzi al prefato Melzo, e non al-
tramente li quali danari sono al presente 
ella possessione del dicto Testatore nel 
dicto loco de Cloux como el dice. Et si-
imilmente el dona et concede al dicto de 
Melze tucti et ciaschaduni suoi vestimenti 
quali ha al presente ne lo dicto loco de 
Cloux tam per remuneration de boni et 
and all of the books the Testator is at pre-
sent possessed of, and the instruments and 
portraits appertaining to his art and calling 
as a painter.

Item. The same Testator gives and bequeaths 
therefore for ever to Battista de Vilans 
his servant one half, that is the moiety, of his 
garden which is outside the walls of Milan, 
and the other half of the same garden to 
Salai his servant; in which garden aforesaid 
Salai has built and constructed a house which 
shall be and remain henceforth in all per-
petuity the property of the said Salai, his 
heirs and successors; and this is in remune-
ration for the good and kind services which 
the said de Vilans and Salai, his servants 
have done him in past times until now.

Item. The said Testator gives to Matu-
rina his waiting woman a cloak of good 
black cloth lined with fur, a . . . . . of cloth 
and two ducats paid once only; and this 
likewise is in remuneration for good service 
rendered to him in past times by the said 
Maturina.

Item. He desires that at his funeral 
sixty tapers shall be carried which shall be 
borne by sixty poor men, to whom shall be given 
money for carrying them; at the discretion 
of the said Melzo, and these tapers shall be 
distributed among the four above mentioned 
churches.

Item. The said Testator gives to each 
of the said churches ten lbs. of wax in thick 
tapers, which shall be placed in the said 
churches to be used on the day when those 
said services are celebrated.

Item. That alms shall be given to 
the poor of the Hotel-Dieu, to the poor of Saint 
Lazare d’Amboise and, to that end, there 
shall be given and paid to the treasurers of 
that same fraternity the sum and amount of 
seventy soldi of Tours.

Item. The said Testator gives and be-
queths to the said Messer Francesco Melzo, 
being present and agreeing, the remainder of 
his pension and the sums of money which are 
owing to him from the past time till 
the day of his death by the receiver or 
treasurer-general M. Johan Sapin, and 
each and every sum of money that he has 
already received from the aforesaid Sapin 
of his said pension, and in case he should 
die before the said Melzo and not otherwise; 
which monies are at present in the pos-
session of the said Testator in the said place 
called Cloux, as he says. And he likewise 
gives and bequeaths to the said Melzo all and 
each of his clothes which he at present pos-
sesses at the said place of Cloux, and all in
Leonardo's will.

grati servitii, a lui facti da qui inanzi, che per li suoi salari vacationi et fatiches cheł potrà avere percià la execuzione del presente Testamento, il tutto però ale spese del dicto Testatore.

Ordina et vole, che la summa de quattrocento scudi del sole che ha in deposito in man del Camarlingo de Sancta Maria de Nova, nela città de Fiorenza, siano dati ali so fratelli carnali residenti in Fiorenza con el profitto et emolumento che ne po essere debitolo fino al presente da prefati Camarlinghi al prefato Testatore per casone de dicti scudi quattrocento da poi el di che furono per el prefato Testatore dati et consignati alli dicti Camarlinghi.

Item vole et ordina dicto Testatore che dicto Messer Francesco de Melzo sia et remana solo et in sol per il tutto executor del Testamento del prefato Testatore, et che questo dicto Testamento sortisce suo pieno et integro effetto, et circa ciò che è narrato et dicto havere tenere guardar et observare epso Messer Leonardo de Vince Testatore constittuto ha obbligato et obbliga per le presente epsi soy heredi et successori con ogni so beni mobili et immobili presenti et advenire et ha renunciato et renuncia per la presente expressamente ad tute et ciaschaduna le cohe ad ciò contrarie. Datum nelo dicto loco de Cloux ne la presenza de magistro Spirito Fleri Vicario nella chiesia de Sancto Dionisio de Amboydisa, M. Gulielmo Croysant prete et capellani, magistro Cipriane Fulchini, Fratre Francesco de Corton et Francesco de Milano religioso del convento de fratri minori de Amboydisa, testimonii ad ciò chiamati et vocati ad tenire per il judicio de la dicta Corte in presentia del prefato M. Francesco de Melze acceptante et consentiente il quale ha promesso per fede et sacramento del corpo suo per lui dati corporalmente ne le mane nostre di non mai fare venire, dire, ne andare in contrario. Et sigillato a sua requesta dal sigillo regale statuito a li contracti legali d'Amboysia, et in segno de verità.

Dat. a di XXIII de Aprile MDXVIII avanti la Pasqua.

Et a di XXIII d'epso mese de Aprile MDXVIII ne la presentia di M. Gulielmo Borian notario regio ne la corte de Baliagio d'Amboysia il prefato M. Leonardo de Vince ha donato et concesso per il suo testamento et ordinanza de ultima volunta supradicta al dicto M. Baptista de Vilanis presente et acceptante il dritto de laqua

renumeration for the good and kind services done by him in past times till now, as well as in payment for the trouble and annoyance he may incur with regard to the execution of this present testament, which however, shall all be at the expense of the said Testator.

And he orders and desires that the sum of four hundred scudi del Sole, which he has deposited in the hands of the treasurer of Santa Maria Nuova in the city of Florence, may be given to his brothers now living in Florence with all the interest and usufruct that may have accrued up to the present time, and be due from the aforesaid treasurer to the aforesaid Testator on account of the said four hundred crowns, since they were given and consigned by the Testator to the said treasurers.

Item. He desires and orders that the said Messer Francesco de Melzo shall be and remain the sole and only executor of the said will of the said Testator; and that the said testament shall be executed in its full and complete meaning and according to that which is here narrated and said, to have, hold, keep and observe, the said Messer Leonardo da Vinci, constituted Testator, has obliged and obliges by these presents the said his heirs and successors with all his goods moveable and immovable present and to come, and has renounced and expressly renounced by these presents all and each of the things which to that are contrary. Given at the said place of Cloux in the presence of Magister Spirito Fleri vicar, of the church of Saint Denis at Amboise, of M. Gulielmo Croysant priest and chaplain, of Magister Cipriane Fulchini, Brother Francesco de Corton, and of Francesco de Milano, a brother of the Convent of the Minorites at Amboise, witnesses summoned and required to that end by the indictment of the said court in the presence of the aforesaid M. Francesco de Melze who accepting and agreeing to the same has promised by his faith and his oath which he has administered to us personally and has sworn to us never to do nor say nor act in any way to the contrary. And it is sealed by his request with the royal seal apposed to legal contracts at Amboise, and in token of good faith.

Given on the XXIIIrd day of April MDXVIII, before Easter.

And on the XXIIIrd day of this month of April MDXVIII, in the presence of M. Gulielmo Borian, Royal notary in the court of the bailiwick of Amboise, the aforesaid M. Leonardo de Vinci gave and bequeathed, by his last will and testament, as aforesaid, to the said M. Baptista de Vilanis, being present and agreeing, the right of water which
che qdam bone memorie Re Ludovico XII ultimo defuncto ha alias dato a epso de Vinci suxo il fiume del naviglio di Santo Cristoforo ne lo Ducato de Milano per gauerdlo per epso De Vilanis a sempre mai in tal modo et forma che dicto Signore ne ha facto dono in presentia di M. Francesco da Melzo Gentilhomo de Milano et io.

Et a di prefato nel dicto mese de Aprile ne lo dicto anno MDXVIII epso M. Leonardo de Vinci per il suo testamento et ordinanza de ultima volunta sopradecta ha donato al prefato M. Baptista de Vilanis presente et acceptante tutti et ciaschaduni mobili et utensili de caxa soy de presente ne lo dicto loco du Cloux, in caxo però che el dicto de Vilanis surviva al prefato M. Leonardo de Vince, in presentia del prefato M. Francesco da Melzo et io Notario etc. Borean.

the King Louis XII, of pious memory lately deceased gave to this same de Vinci, the stream of the canal of Santo Cristoforo in the duchy of Milan, to belong to the said Vilanis for ever in such wise and manner that the said gentleman made him this gift in the presence of M. Francesco da Melzo, gentleman, of Milan and in mine.

And on the aforesaid day in the said month of April in the said year MDXVIII the same M. Leonardo de Vinci by his last will and testament gave to the aforesaid M. Baptista de Vilanis, being present and agreeing, each and all of the articles of furniture and utensils of his house at present at the said place of Cloux, in the event of the said de Vilanis surviving the aforesaid M. Leonardo de Vinci, in the presence of the said M. Francesco Melzo and of me Notary &c. Borean.
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<td>Br. M. 42 b</td>
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<td>1542</td>
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<td>C. A. 262 a; 87 a</td>
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<td>Br. M. 148 b</td>
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<td>1550</td>
<td>Br. M. 149 b</td>
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<td>1551</td>
<td>Br. M. 271 a</td>
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<td>1552</td>
<td>Br. M. 274 a</td>
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<td>C. A. 334 b; 1017 b</td>
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<td>C. A. 329 b; 993 a</td>
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<td>1566</td>
<td>Bibl. Melzi</td>
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APPENDIX

I.

THE HISTORY OF THE MANUSCRIPTS.

1. Leonardo by his will expressly devised all his MSS. and drawings to his younger friend Francesco Melzi, who carried them back to Milan. Four years after Leonardo's death Alberto Benedeto wrote from Milan to Alfonso d'Este, Duke of Ferrara: "Et perché ho fatto menzione de la casa de Melzi, aviso a V. Ex. che un fratello di questo che ha gioistrato fu creato de Lionardo da Vinci, et herede et ha molti de' suoi secreti, et tutte le sue opinioni . . . Crede ch'egli habbia quelli libriccini de Lionardo de la Medici, et de molte altre belle cose." See G. Campori, Nuovi Documenti.

When Vasari visited Milan—probably in 1566—he saw Leonardo's MSS. in Francesco Melzi's possession, and wrote as follows: Lionardo . . . di brutti caratteri scrisse lettere, che sono fatte con la mano mancina a rovescio; e chi non ha pratica a leggere, non l'intende, perché non si leggono se non con lo specchio. Di queste carte della notomia degli uomini è gran parte nelle mani di messer Francesco da Melzo gentiluomo milanese, che nel tempo di Lionardo era bellissimo fanciullo e molto amato da lui, così come oggi è bello e gentile vecchio, che le ha cura e tiene come per relique tal carte, insieme con il ritratto della felice memoria di Lionardo: e chi legge quegli scritti, par impossibile che quel divino spirito abbi così ben ragionato dell'arte e de' muscoli e nervi e vene, e con tanta diligenza d'ogni cosa. Come anche sono nelle mani di . . . pittor milanese, alcuni scritti di Lionardo, pur di caratteri scritti con la mancina a rovescio, che trattano della pittura e de' modi del disegno e colorire. Costui non è molto che venne a Firenza a vedermi, desiderando stampar questa opera, e la condusse a Roma per dargli esito; nè so poi che di ciò sia seguito. (Ed. Sansoni, IV. 37).

In another place Vasari mentions that he himself possessed some drawings by Leonardo.

Lomazzo, the Milanese painter, writes, in 1590 (Idea del Tempio della pittura, 2nd Ed., p. 15):

Ma sopra a tutti questi scrittori è degno di memoria Lionardo Vinci, il qual insegnò l'Anatomia dei corpi umani, e dei cavalli, ch'io ho veduto appresso a Francesco Melzi, designata divinamente di sua mano. Dimostro anche in figura tutte le proporzioni dei membri del corpo umano; scrisse della prospettiva dei lumi, del modo di tirare le figure maggior del naturale, e molti altri libri . . . Ma di tante cose niusa se ne ritrova in stampa; ma solamente di mano di lui, che in buona parte sono pervenute nelle mani di Pompeo Leoni, statutore del Cattolico Rè di Spagna, che già ebbe dal figliuolo di Francesco Melzi, e n'è venuto di questi libri ancora nelle mani del Sig. Guido Mas cinto, Dottore virtuosisimo, il quale gli tiene molto cari.

2. In the short anonymous biography of Leonardo which, as it seems to me, must have been written somewhat earlier than Vasari's Vita (published by Milanesi, Arch. Stor. Ital. XVI) the MSS. are mentioned in these terms: (Leonardo) tornossene a Milano et dipoi in Francia al servizio del re Francesco, dove portò assai de' suoi disegni, de quali anco ve lasciò in Firenze nello Spolato di S. Maria Nueva con altre mas-
The references to them, which are the oldest known, may be supplemented by some information which I owe to the kindness of Signor Enrico Stevenson, Scriptor in the Library of the Vatican. MS. 71 Boncompagni (previously Albani 511), XVIth century, contains the catalogue of MSS. belonging to "Sangallo." In this catalogue a MS. volume, T. XXIX, is thus described: Opinione di Leonardo da Vinci nel dipingioure prospettive, ombre, lontanane, alteze, bassese d'apresso o da lontano, et altrio.

It seems therefore doubtful whether after the death of Francesco Melzi, about 1570, the Melzi family still possessed Leonardo's literary bequest intact, or at any rate, were the sole possessors of it. We have fuller information at the beginning of the XVIIth century, for Leonardo's MSS. had by that time become famous and were sought after as relics and curiosities. Guido Mazenta, who is mentioned by Lonazzo as possessing MSS. by Leonardo, was the brother of the author of an interesting memoir entitled: Alcune memorie de fatti da Leonardo da Vinci a Milano e de suoi libri del P. D. Gio. Ambro Mazzenta, Milanese, Chericolo Regg' minore di S. Paolo all'rimo detti Barnabiti. An exact translation of this into French has been given by M. Eugène Piot in the Cabinet de l'Amateur (1863, p. 61—63). I quote from it the following passage relating to the history of the MSS.

"A la mort de Melzi... les manuscrits restèrent dans sa villa de Vaprio, où ses héritiers, qui avaient des goûts et des occupations bien différents,..."
3. Le MSS. in the possession of the brothers Mazenta, had, it would seem, been gradually reduced to three. Guido Mazenta whose name is to be seen in the MS. given by him to Cardinal Borromeo (see Bibl. No. 2), died in 1613.

In 1636, Count Galeazzo Arconati—who is named in Mazenta's report—presented twelve MS. volumes by Leonardo to the Ambrosian Library at Milan. The explicit deed of gift may be seen, translated into French in the Cabinet de l'Amateur, 1861, pp. 53—59. In the catalogue of these MSS. the binding is more particularly described than the contents. The following twelve MSS. were included in this gift. 1. the Codex Atlanticus (Bibl. 38). 2. a MS. now lost, but described as follows: Le deuxième est un livre in-folio ordinaire, de la grandeur du papier coupé ordinaire. Il est relié en bois covert de cuir rouge, orné de frises et de fleurs d'or. Le volume est entièrement composé de feuillets de vélin et commence par ces paroles, écrites en rouge: TAVOLA DELLA PRESENTE. Suivent huit feuillets sans pagination. Elles commencent au suivant, qui a un crunom en tête qui dit: Eccellentis s. principe, etc., et la pagination suit jusqu'au cet vingtïème feuillet, quatre-vingt-sept pour le texte, trois blancs et le reste des dessins divers coloriés, le premier desquels est intitulé: Sfera solida, et le dernier: Piramis laterata exagona vacua; au fond du feuillet est un texte grec qui exprime la même chose. 3. Le troisième est un livre in-quarto, relié en vélin, sur le dos d'un on lit les paroles suivantes: DI LEONARDO DA VINCI; il est de cent feuillets juste, mais le premier manque; sur le second il y a quelques erés noires, feuillets et fruits couvrés. Dans l'intérieur du volume, au feuillet 49, on a inséré cinq feuillets de dessins variés, armes de hast pour la plupart, et à la fin un autre petit volume (volumetto) de diverses figures de mathématiques et d'oiseaux, de dix-huit feuillets, qui a été cousu dans la même reliure en vélin. Bibl. 3, 4. Ash. II and B. The appendix (volumetto) is now lost; the last mention of it occurs in Venturi's Essai (1796). Compare No. 1465, Note 4.

5. Le cinquième est un autre livre semblable, in-quarto, couvert, comme le précédent, de cinquante-quatre feuillets. Sur le premier sont des diverses titres brouillons, et sur le dernier quatre colonnes de texte, écrites à rebours. Il est marqué sur le dos LEONARDO DA VINCI.

This description corresponds with the MS., Bibl. 28 Tr. 6.

6. MS. see Bibl. 25, E.

7. MS. see Bibl. 22, F.

8. MS. see Bibl. 26, G.

9. Three MSS. bound in one vol.; see Bibl. 8—10, H', H; H'.

10. Two small MSS. bound in one, see Bibl. 13, 14.

11. MS. see Bibl. 18, I.

12. MS. see Bibl. 27, M.

In 1674 Count Orazio Archinti presented to the same Library a MS. by Leonardo, consisting of three small note-books in one Vol.; Bibl. 32—34.

In 1790, Stefano Bonzignori made a short catalogue of the MSS. in the Ambrosian Library at Milan. It includes 1. MS. C. A, see Bibl. 28; 2. MS. B and Ash. II. see Bibl. 3, 4; 3. MS. Ash. I and A, Bibl. 5; 6. MS. D, Bibl. 31; 5. MS. E, Bibl. 25; 7. MS. G, Bibl. 26; 8. MSS. H', H, H', Bibl. 8—10.

The descriptions of the others are too vague and slight to admit of our indentifying by them any MSS. now existing: 6. Miscellanea; idrostatica, etc. È in—8 piccolo, in cartone rustico. 9. Miscellanea. Moto, machina, macchinette da forar cristali, etc. È in—16, legato in pergamen. 10. Miscellanea in—16, in cartone rustico. 11. Miscellanea. Abbozzi informi, moto ecc. È in—16, pergamen (see Dosio, degli scritti ... di Leonardo da Vinci. Milano 1871, pp. 21—24). It will be observed that one MS. fewer is here named than in the deed of gift from Count Arconati; on the other hand a MS. D, not previously mentioned, is now included. The fifth MS. of Arconati's list is evidently wanting in this list. The volume given to the Ambrosian Library by Cardinal Borromeo in 1603 (Bibl. 2, C) seem also to have been omitted. It is evident that we cannot exactly determine how many of these MSS. were to be found in the Ambrosian Library in the year 1796. At the suggestion of Bonaparte the Directory of the French Republic conveyed many works of art from Italy into France. So much as this is, at any rate certain: in August 1796 the Codex Atlanticus was in the Bibliothèque Nationale; and "Douze petits MSS. de Leonardo da Vinci, sur les sciences" were in the Institut National (Institut de France). The authors of the catalogue of the pictures and MSS. removed from the Ambrosian Library—Peignion, commissaire de guerre et le Citoyen Timet, agent des Arts (dated Milan, May 24, 1796) either do not mention Leonardo's MSS. at all, or—which is more probable—include them under the following somewhat vague designation "Le Carton des ouvrages de Leonardo d'azincis". It is certain, on the other hand, that in 1815 the commissary of the
Austrian government demanded the restoration to the Ambrosian Library of thirteen (or fourteen?) MSS., being the number stated in Venturi’s Essay written in 1796. (Venturi says in his essay: Les Manuscrits sont au nombre de quatre, parce que le Volume B contient un appendice de dix-huit feuillets qu’on peut separer et considérer comme le quatorzième volume).

However, only the Codex Atlanticus found its way back again; the other twelve MSS. remain in the possession of the Institut de France. These facts cover all that is known of the history and fate of the volumes now on the continent, that is to say in France and Italy.

I am unfortunately not in a position to give so full an account of the vicissitudes of such of Leonardo’s MSS. as are now in England. Of the MS. volume at Windsor, W. L. Chamberlain tells us (Original Designs, London, 1812): It was one of the three volumes, which became the property of Pompeo Leoni and is now in his Majesty’s possession. It is rather probable than certain that this great curiosity was acquired for King Charles I. by the Earl of Arundel, when he went an Ambassador to the Emperor Ferdinand II. in 1636, as may indeed be inferred from an instructive inscription over the place, where the volumes are kept, which sets forth that James King of England offered three thousand pistoles for one of the volumes of Leonardo’s works. And some documents in the Ambrosian Library give colour to this conjecture. This volume was happily preserved, during the civil wars of the last century, among other specimens of the fine arts, which the munificence of Charles I. had amassed with a diligence equal to his taste. And it was discovered soon after his present Majesty’s accession, in the same cabinet, where Queen Caroline found the fine portraits of the court of Henry VIII. by Hans Holbein, which the King’s liberality permitted me lately to lay before public.

Chamberlain, apparently misled by the well-known inscription* in the Ambrosian Library seems to assume that Lord Arundel must have derived the Leonardo MSS. in his possession from Arconati, and not from Spain; but Mr. Alfred Marks of Long Ditton, has lately disproved this clearly in two contributions to the Athenaeum, Nos. 2626 and 2645. John Evelyn in his Memoirs (Vol. I, p. 213 ed. 1818) tells us that when travelling in Italy in 1646 he received from Lord Arundel, then sick at Padua, where he died in the course of this year, advice as to what he should try to see. Afterwards, visiting the Ambrosian Library, Evelyn writes:—

“In this room stands the glorious (boasting) inscription of Cavaliere Galeazzo Arconati, valuing his gift to the librarie of several drawings by Da Vinci, but these we could not see, the keeper of them being out of town and he always carrying the keys with him, but my Lord Martial, who had seen them, told me all but one book are small, that an huge folio contains 500 leaves full of sketches of Indians [sketches of engines?] &c., but whereas the inscription pretends that our King Charles had offer’d 1,000l. for them, my Lord himself told me that it was he who treated with Galeazzo for himself in the name and by permission of the King, and that the Duke of Feria, who was then Governor, should make the bargain: but my Lord having seen them since did not think them of so much worth.”

The leaves of the Codex Atlanticus are numbered up to 393; hence it is probable that in giving this description Lord Arundel had this single MS. in his mind. The MS. W. L. at Windsor which, with the MS. C. A. formerly belonged to Pompeo Leoni now consists of only 234 folio leaves. Arconati (see above) mentions, it is true, one collection only of MSS. i.e. MS. C. A. as being in the hands of Pompeo Leoni; but it can hardly be doubted that the MSS. and drawings W. L. were also in his possession, since Leoni’s name is given in the inscription on the old binding of the two volumes in the same way.

“Pompeo Leoni of Arezzo, Court sculptor to King Philip II. of Spain, died in Madrid A.D. 1610, as we learn from Carducho ‘Dialogos de la Pintura’ (1633). Part of his property was publicly sold at Madrid; some works which had belonged to it being afterwards purchased by Charles the First when, as Prince of Wales, he visited Spain in 1623.

From the Spanish portion of Pompeo’s collection thus sold came, in all probability, the two volumes of Leonardo’s of which Carducho speaks as being then in the possession of Don Juan de Espina; ‘Alíi vi dos libros dibuixados y manuscritos de mano del gran Leonardo de Vincí, de particular curiosidad y doctrina” (“two
books," may we say? "one of sketches, one manuscript"), which the Prince of Wales had in vain sought to purchase. The contents of these volumes Carducho unfortunately describes only in very general terms. In Mr. Sainsbury's 'Original Unpublished Papers illustrative of the Life of Rubens,' we find evidence that Lord Arundel was subsequently in treaty for these very books, or, perhaps, for one of them only. On p. 294 will be found a note of Eddy-mion Porter's "of such things as my Lord Embassador St Francis Cottington is to send out of Spaine for my Lord of Arondell; and not to forget the booke of drawings of Leonardo de Vinze wth is in Don Juan de Espinas hands." This is of the date 1629, when Sir Francis was for the third time setting out for Spain as ambassador. His negotiations for the book were unsuccessful, for on January 19th, 1636-37, we find (p. 299) Lord Arundel writing from Hampton Court to Lord Aston, then Ambassador to Spain,—"I beseech you be mindful of D. John de Spinas booke, if his foolish humor change." There can, I think, be little doubt that, on the change of Don Juan's "foolish humor," a priceless treasure, the object of so many fruitless attempts, at last rewarded the persistence of the great English collector" (A. Marks).

Here, beyond a doubt, only the MS. W. L. is meant, for this, as being a collection of Leonardo's most important drawings, must be regarded as exceptionally precious. But did Lord Arundel ultimately get this Manuscript. We cannot say more than that this seems probable; and for this reason: Hollar engraved drawings of Leonardo's which are now in Windsor and inscribed them "W. Hollar fecit 1646 ex collectione Arundeliana,"—drawings which most probably were included in this W. L. collection before it was divided.

On the other hand it can be positively shown that Lord Arundel possessed the MS. Br. M., Bibl. 23, which was no doubt purchased by him for a relatively small sum in consideration of the smaller artistic interest of the drawings, and for the same reason it is quite intelligible that no mention should be made of it in the correspondence at the time. But whether the MS. W. L. was purchased by Charles II. when Lord Arundel's collections were sold in Holland, or whether Charles I. had previously acquired it after his journey to Spain as Prince of Wales in 1623—when he, in person, purchased some works of art from among Leoni's collection, is not known. So much as this alone is certain, that it has now for a very long period belonged to the Royal collections.

Though Chamberlain's statement as to the acquisition of Leonardo's MSS. and drawings in the Windsor Library is, as we have seen, probably inaccurate, we may still give credit to his information as to the finding of them by Queen Caroline in Kensington Palace, for he—as Royal Librarian at the time—must certainly have been acquainted with the facts. His statement is moreover confirmed by Walpole (Anecdotes of painting I, 84: Soon after the accession of the late King, Queen Caroline found in a bureau at Kensington, a noble collection of Holbein's original drawings for the portraits of some of the chief personages of the court of Henry VIII.).

This, however, is by no means the earliest information we possess regarding Leonardo's MSS. and drawings in the possession of Royalty. In the MS. Department of the British Museum I found an old inventory from which I give the following extracts: List of the drawings in ye Cabinet in His Maj'y Lesser Apartment, in this is marked what has been Delivered for her Maj'y use, Page 28. A list of the Books of drawings and Prints in the bureau in His Majesty's great Closet at Kensington.

No. 3. By Hans Holbein those fram'd hang at Richmond.

No. 5. Prints by Hollar; delivered to her Maj'y Aug. 1735 and by her lent to Lady Burlington, since put in Volumes and laid in ye Library at Kensington.

No. 6. Drawings by Leonardo de Vinci.

No. 13. Drawings by Leonardo de Vinci; these with a cross were delivered for her Maj'y use in ye year 1728.

The oldest inventory in Windsor Castle is only of the beginning of the present century. On p. 23 we find: "Leonardo da Vinci, Tom. I." and a list follows of the drawings, comprised on 41 pages. For instance: page 1 His own portrait, profile, red chalk (a well known drawing in the present collection). Only a few can be identified, for the descriptions are very brief. On p. 26 we come to "Leonardo da Vinci, Tom. II." which is also a list of drawings comprised on 40 pages. It begins: page 1, the last Supper, the Architecture is varied in the painting at Millan where an open door is represented behind our Saviour, black chalk, NB. This Drawing was not in the Vol. compiled by Pompeo Leoni, but in one of the Volumes in the Buonfiluolo Collection bought at Venice. (By the way I mention that the drawing in question, still at Windsor, is not an original drawing, but an old copy). This gives us an incidental clue to a second source whence the treasures of the Windsor collection have been derived. Nothing more, however, is known concerning the Buonfiluolo collection.
On p. 29 of the Inventory we come to a catalogue of the contents of a third Vol. of 205 sheets, in which 549 drawings are named and shortly described, for instance:

<table>
<thead>
<tr>
<th>No.</th>
<th>Heads, of Judas and one of the Apostles for the last supper at Milan.</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>Mechanical Powers</td>
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</tbody>
</table>

NB. All the Leaves from 41 to 142, except those few marked otherwise, are full of very copious and accurate studies in Anatomy which were done with the assistance of Marc Antonio della Torre &c.

143 | Manuscript—Here ends the Anatomical study.

As the reader will have observed, the number of leaves in the MS. W. L. does not correspond to that in either of these three Volumes. There can be no doubt that, at that time most of the drawings had been taken out of it. Recently most of the finest drawings in the Royal collection have been mounted on card-board and arranged in four portfolios, while some of the MS. leaves remain in the folio W. L. (Bibl. 30), and others are mounted on old thin card-board, more particularly the texts W. P., Bibl. 15, and W. An. I, Bibl. 13; others again are not mounted nor even—at the present date—arranged. Their large number rendered it necessary that they should be classified according to their contents and the probable date of their being written, with a view to this present publication. I therefore sorted them under the following heads: W. H., Bibl. 16; W. An. II., Bibl. 17; W. M., Bibl. 19; W. An. III., Bibl. 24; W. An. IV., Bibl. 35; W., Bibl. 37. The loose leaves in the Windsor collection are numbered consecutively (from 1—249) without any reference to their connection, while the Roman numbers refer to those sheets which are mounted. By this means reference to the originals is facilitated.

It will be noticed that Anatomical writings preponderate greatly, and they are the portion which Vasari most admired, when he had the opportunity of seeing Leonardo's MSS. in Melzi's house.

II.

BIBLIOGRAPHY.

The Manuscripts are arranged here in the same chronological order as shown in Vol. I. pp. 5—7. The numbers of the sheets are generally not by the author, but in a more modern handwriting. The few instances when these numbers are by Leonardo will be found mentioned in the lists. The bindings are in parchment, if not otherwise stated. The following abbreviations have been introduced in the description of the contents (the Italian words are headings used by Leonardo):

- \( A = \) Acqua (Water).
- \( Ar = \) Architecture.
- \( F = \) Forza (Force).
- \( Fo = \) Fortezza (Fortress).
- \( Ge = \) Geometry.
- \( M = \) Moto, colpo (on movement &c.).
- \( Ma = \) Mathematics.
- \( Mn = \) Machines.
- \( O = \) Optics.
- \( P = \) Peso (Weight).
- \( Ph = \) Physics.
- \( V = \) Volatili (Flight of Birds).
- \( + = \) blank pages.

1. W. An. I.

1\(^{a}\) 1370, notes on the skull | 1\(^{b}\) 805 | 2\(^{a}\), notes on the skull | 2\(^{b}\) + 3\(^{a}\) on the skull and on the teeth | 3\(^{b}\), 4\(^{a}\) on the skull | 4\(^{b}\) +

2. C.

Inscribed in golden letters on the front cover: \( \cdot \) VIDI \( - \) MAZENTÆ \( \parallel \) PATRITII \( - \) MEDIOLANENSIS \( \parallel \) LIBERALITATE \( \parallel \) AN. M. D. C. III. Inside the cover: C and \( [O]\).—

On the first sheet (by an unknown hand): Autographum Leonardi Vinci | cujus in ejusdem rebus gestis meminit | Raphael Trichet Fres
Binding in pig-skin; marked B inside the front-cover. On the first sheet is a short, indistinct note in Spanish, probably by P. Leoni, stating that Leonardo wrote backwards. The following sheets are numbered by very large numbers from 3—90 (see the facsimile Pl. LXXIX, 2: 3). Drawings in water colours, representing some fruits [3 329, 346, 639, 675, 1188, F 4 a 1509, 1131, Ph 4 b A 1212 Ma 4 a Fo 5 b and 6 a Mn 6 b Mn natura de spechi 7 b and 7 b Mn Fo 8 a 1497 8 b 10 a Arms 10 b da passare un fume, Ge 11 a Mn 11 b Pl. XCVI, No. 2 and No. 3, Mn 12 a Pl. LXXXVIII, No. 6 and No. 7, 751 12 b Ge, Ar 13 a Mn, sketch of flowers 14 b, 14 a Ge and sketch of flowers 14 b, 14 b, 14 a Ge flowers, 15 a Pl. XCLXXXI, No. 1, Fo 15 b Pl. LXXVII, No. 1 and 2, 742, 743 16 a Pl. LXXVII, No. 3, 741 16 b Fo, Me 17 a Ge, 17 b Pl. LXXXIX 18 a Vol. II, p. 47, Fig. 1, and Fig. 2 Mn 18 b Pl. LXXXVII, No. 2, 755, 19 a Fo 19 b 752, Ar 20 a A Mn 20 b A 511 21 a Pl. LXXXVII, No. 3 and No. 4, Fo 20 b Pl. XXXVIII, Nos. 1—5 22 a Pl. XCVI, No. 2, Mn 23 a construction of bridges 23 b Pl. LXXXVII, No. 2 24 a Pl. XCVI, No. 2, 757, 24 b Mn Fo 25 a Mn 25 b Pl. 26 a Mn 26 b Mn 27 a Pl. C, 27 a Pl. No. 5, 27 a arms, drawing of a small figure 28 a Ge, spechi 28 b 762, Pl. CII, 28 a Ge, strade che vano attraverso a vno argine d' u fume 29 b Mn 30 a Ar, Fo 30 b 32 a arms 32 b on passing a river Pl. CII, No. 2, 33 b and 44 a Mn 34 b Vol. II, page 44, Fig. 3 35 a Mn 35 b Vol. II, page 45, Fig. 1, Ar 36 a Pl. LXXIV, No. 2, 746, Mn 36 b Fo 37 a Pl. LXXVII, Nos. 2 and 3 37 b Pl. LXXIX, No. 1, 745 38 a 745 Note 37 b conas 39 a Pl. LXXXVIII, No. 1, 761 39 b Pl. XCVI, No. 1, 753 40 a 131, Fo 40 b 41 a and 41 b Mn 41 a 141, 41 b 42 a and 42 b Mn 42 a 150, 42 b 43 a 43 b Mn 43 a 169, 43 b 44 a 44 b Mn 44 a 179, 44 b 45 a and 45 b Mn 45 a 189, 45 b 46 a and 46 b Mn 46 a 199, 46 b 47 a and 47 b Mn 47 a 209, 47 b 48 a and 48 b Fo 48 a 219, 48 b 49 a and 49 b Mn 49 a 229, 49 b 50 a and 50 b Mn 50 a 239, 50 b 51 a and 51 b Mn 51 a 249, 51 b 52 a Pl. XCVII 52 a Fo, Mn 53 a camino 53 b A Mn 54 a d'alzare acqua, bombarda 54 b A Mn 55 a Vol. II, p. 44 Fig. 2 and p. 56 Fig. I 55 b modo di misurare altere 56 a same subject, modo chome si debbe riparare a una fura di soldati 56 b Pl. XCVII, No. 2 and No. 3, Vol. II, p. 45 Fig. 2 and 57 a Pl. XCV, No. 2 57 b Vol. II, p. 51, Diagram, rivellino 58 a 1506, 1023, Ar, luparano 58 a Fo 59 a Mn 59 b Fo 60 a Pl. LXXIX, No. 3, 750 60 b on passing a river 61 a 1080, A 61 b 1094, 1099 62 a Pl. LXXIV, No. 13, on passing a river 62 b 1000 63 a F. P. 63 b 1081 64 a A Mn 64 b Stivali da acqua, Mn 65 a 65 b 66 a A 68 b schale docipe 69 a per lo chastellano l'altra per i provisionati 69 a—70 a 70 a Mn, Pl. CIII, No. 1 71 a Pl. CII, No. 2 71 b—73 a 74 a 75 a flying machine 75 a Vol. II, p. 56 Fig. 1 75 b—77 b 78 a Fo 78 b—81 a 81 b 117 82 a Ma 82 b 1088 83 a Mn 84 85 roving 88 a Mn 88 b flying machine 89 a Mn 89 b V 90 a Mn 90 b modo di sforlare vn navilio, voce. — Inside the back cover is the mark S.

4. Ash II.

16 sheets, small numbers; one sheet 1 and 16, and 2 and 15 forming originally one sheet, are tinted blue on the inside and have drawings of arms, drawn with the silverpoint; the outside is left blank. On sheet 3 and 14 a are three drawings in water colour, apparently not by Leonardo. They represent instruments. 4 a 1127 4 b 1155, Fo 5 a Fo 5 b 1120, Mn 6 a 1116 6 b Pl. LXXXV, No. 1—11, Vol. II, p. 45

3. B.

Sketches of insects, a caricature &c.
Bound in parchment, marked A outside and inside the cover. The numbers of the sheets 1—64 are in Leonardo's handwriting.

Bound in parchment, marked A outside and inside the cover. The numbers of the sheets 1—64 are in Leonardo's handwriting.
8. H.3

The three small Note books H.3 H.2 H.1 are bound in one volume. From the dirty state of the sheets at the beginning and at the end of each division it becomes apparent that Leonardo had used them separately. The cover is in parchment and is twice marked H. on the outside and once inside, and Q on the back of the first sheet. Inside the back cover is the mark Q.4, and on the last sheet but one N N.48, meaning probably the number of sheets originally belonging to H.3 MSS H.2 and H.3 are numbered throughout. The sheets of H.3 are also numbered 1—47, below the text and in a reversed position. The numbers here given are above the text 47 A 47 b 1389 48 A Ma 48 b dimmi semai, sketch of a man’s head in profile 49 b, 49 b Mn 50 a 670 50 b, 51 a notes 51 b 689 52 a 999 52 b 736 53 a 1264, 690 53 b 55 a Mn 55 b

Sketch reproduced with No. 1112 56 A, 56 b P 57 A, 57 b M sketch of a horse 58 a sketch of horses and oxen drawing a car 58 b 1460 59 a—60 b Mn 61 a 831 Mn 61 b 69 b Mn 70 a 691 70 b 1117 71 a 1119 71 b 73 a Mn 73 b Pl. LXXXV, No. 16, 768 74 b il cieco dell’ ochio fa per del-l’abaco 74 di a. b. 74 b—76 a Mn 76 b 1514 77 a 1513 77 b 78 a + 78 b terminations of Latin verbs 79 a—80 a slight sketches 80 b, 81 A Mn 81 b 1515 82 b Sketch of a car drawn by horses 82 b—84 a Mn 84 b, 85 b—86 a drawings of gars 85 a 27 85 b, 86 b, 87 b, 88 b, 89 a conjugation of the Latin verb 88 b 644 89 a sum, eram &c. 1356 89 b 1543 90 a—92 b amo, amas, amat &c. 93 a amor, amaris &c. 1139 93 b, 94 a amo, legione co.663 persone 94 b 1516.

9.

See introductory note to No. 8. — The first sixty sheets are numbered twice, 1—16 being also written below the texts, but in reversed order 1 a 232 1 b 692 2 a, 2 b A Mn 3 a a sketch 3 b 1265 4 a 11 a A 11 b knots, A 12 a knots, Mn 12 b 1197, a sketch of ornaments 13 a 603 13 b, 14 a A 14 b 1390, 1320, M 15 a M 15 b 694, 1316 16 a A 16 b 1517 17 a A, 1010 Note 17 b Pl. CX, No. 2, 1024 18 a 152 18 b Mn 19 a, 19 b A 20 a A, 464 20 b A 21 a AM 21 b, 22 a A 22 b Mn 23 a 228, A 23 b Mn 24 a Mn 24 b—25 a A Mn 26 a, 26 b A P 27 a Pl. XXIII, No. 3, 377 27 b M Mn 28 a A 28 b 206.

10. H.1

See introductory note to No. 8. — The text is upside-down on the first 28 sheets. 1 a amo, amas amat &c. 1026 1 b + 2 a amabam &c. A 2 b, 3 a + 3 b 4 a forms of amo 4 b SK 5 a 1220 5 b 1221 6 a 1222 6 b 1223 7 a 1224 7 b 1225 8 a 1226 8 b 1227 9 a 1228 9 b 1229 10 a 1230 10 b 78 b Ar 79 a Pl. LXXXV, No. 14, 70 b 1343 80 A P 80 b 1150 81 a Ar 81 b circle 82 e wanting 83 a, 83 b Mn 84 a circles 84 b + 8 b 633, 1367 85 b—87 a sketches of costumes 87 b 1470 88 a circle 88 b centro del mondo, P 89 b Ma 89 b, 90 a 90 b acoustics 91 a 794 91 b, 92 a 1 Ar 92 b A 93 b 1488 93 b 1271 94 a 1387 94 b bonif. — See No. 29 for the history of this M.S.

105, 156 29 a A 29 b A, 304 30 b A, padiglione di legni a vignevine 31 a M 31 b molino 32 a A 32 b A P 33 a 91, 1518 33 b M 34 a—35 b A 36 a Mn 36 b—37 b canale 38 a 828, 31 38 b Mn 39 a, 39 b A 40 a sketch of a barrel on a car, A 32 40 b 671 41 a M A 41 b 845 42 a ricordati quado cometi lacque || delle grava la spiercìa || e poi la ragione || 42 b 134 43 a 1014 43 b 33 44 a P 44 b P A 45 a 45 b Ge 46 a 1391 46 b 620, yhs maria 1493, and by an unknown hand the mark V 46.
APPENDIX.

11. S. K. M. II.*

The two MSS. S. K. M. II* and S. K. M. III* are bound in one volume; the sheets are separately numbered on the top of each front sheet, but the two volumes are placed in the binding in reversed positions, so that the two parts begin at the opposite ends of the volume. 1

Vol. II, p. 62

sketches — 48, 1299 — 59

lib 36b

Pare 80b

88b

68b

34^ 43b

32!^ instru-

knots 47b

35^ 38b — 15

Mn

72a

28a

32b

8b

48b

19b

12b

15a

3

73^ 48

knots site sketches

No. 15. Vol. II, p. 74 below — 12a 1394, 1317, sketch of a head — 12b Ar — 13a knots 13b

Mn 14b

372 | 14b | 15b Mn | 15b Fo | 16a

M | 16b

103, P | 17b Ph | 17b, 18a Mn | 19b

998 | 20a 1395, 376, Pl. LXXXIII, No. 2 | 20b, 21a P | 21b sketchers — 22a 1396 | 22a — 23b sketches — 24a 1196 | 24b — 25b sketches — 26a + | 26b Ma | 27 1397 | 27b + | 28 is want- | 29a + | 29b slight sketch of a woman seated, holding a child in her lap — 30a + | 30b

sketch — 31a P | 31b + | 32, 33, 34 are wanting — 35a V — 35b 1311 — 36a M | 36b Ma

37a acoustics — 37b M | 38—42 are wanting — 43a + | 43b 1291 | 44a 1290 | 44b knots

45, 46, 47 are wanting — 48a — 49a knots

49b + | 50a sketch of a head — 50b, 51a + | 51b, 52a Ge | 52b 1398 | 53a 1399 | 53b, 54a Ge — 54b Mn | 55 is wanting — 56a + | 56b sketch — 57a—59a Ma | 59b sketch of a head — 60a + | 60b, 61a Mn | 62a Ge | 62b Ge — 63a Mn | 65a — 66a Mn | 67a Ar | 68a Mn | 69b 1401 | 69a

1313, 1402 | 69b + | 70, 71, 72 are wanting — 73a + | 73b M | 74a P | 74, 75 a + | 75a 1403 Mn | 76a Ge | 76b 154 | 77a—78a Ge — 78b 667, 1404 | 79a Ma | 80a Mn | 80b knots. — On the same sheet are the marks K K 62 and 25 by an unknown hand.

12. S. K. M. II.'

See preliminary Note of No. 11. — The numbers of the sheets are in Leonardo’s handwriting and begin from the end, going backwards. The first sheet or cover sheet has no number.

1520, M, 612 | 1a 36 | 1b Ge — 2a — 26b P — 26b—28a de confragatione — 28b — 42b P | 43a 1137 | 43b 66a P — 66b 787 — 67a P, 1206 | 67b 784 | 68a — 69a perpetuum mo-

bile — 71b Ar | 72a 793 | 72b—75b P | 76a —

86a Mn | 86b Sketch Vol. I, p. 201 and

Vol. II, p. 99 below — 87a—88b Mn | 89a

793 Note — 89b Mn 90a — 93b peso — 94a centro del mondo, A | 94b 1521 | 95a 733,

627, 1522 | 95b mechanica potissimum in fine incipienda, this note is not in Leonardo’s handwriting; but by a later hand.

13. I."
14. W. P.

Most of these researches are written on loose sheets of unequal size. The dimensions of each sheet are here given in brackets: 1 a (20\# × 30 Cm) 324 | 1 b 322 2 a (21\# × 26\#) 310, 337, Pl. VII, Nos. 1 and 2 | 2 b sketch of a horse's legs, measurements and notes. 3 l a (13\# × 14\#) Cm) Pl. XI, 318 | 3 l b (17 × 15 Cm) Pl. VII, No. 4, 327, 321 | 3 l b, 3 l b + | 4 a (21 × 12\#) Cm) Pl. XIX, No. 1, 347 | 4 b 325 5 a (44 × 32 Cm) 341 ll. 1—4, 317 ll. 1—13, 625, 341 ll. 5—8, 317 ll. 14—17, Pl. XXXV, No. 1, 348 ll. 16—55, ll. 11—15, Pl. XVII, No. 2, 336, 348 ll. i—10 | 707, 348, 56—68 | 8 b Vol. II, p. 44 Fig. 1 and p. 47 Fig. 3 | 6 l a (21\# × 16 Cm) Pl. VIII, No. 2, 332 | 6 l b 333 | 6 l b (22 × 14\#) Cm) Pl. XIV, No. 2, 334 | 6 l b Pl. XVI, No. 1, 335 | 7 a (40 × 28 Cm) 1410, 314, 338, 328, Pl. XIII, 326, 330, Pl. XIV, No. 1 | 7 b 349, Pl. XX, 339, Pl. XVI, No. 2, 342 | 8 a (28 × 20 Cm) Pl. XV, 335, 345. 323 | 8 b + | 9 a (27 × 20 Cm) | 9 b + | 10 b (22 × 16 Cm) Mn | 11 a (29\# × 20 Cm) Pl. LXXXII, 554 | 11 b 685 | 12 a Pl. X, 326. Sheets 9—12 which treat on different subjects are only added here, because in the Windsor collection they form a set with Sheets 1—8. The thin cards, on which these sheets are mounted have a broad ornamental border in water colours.

15. W. H.

With regard to these studies see Vol. II, p. 4. The sheets are numbered 46—68, differing in size, and many not mounted are coloured in various tints: Compare also Lomazzo, Trattato dell'arte della pittore I chap. 20, IV, 23 and Idea del tempio della pittura chap. 16. — Vasari also mentions these studies. 64, 716 | IV. 717.

16. W. An. II.

The sheets forming this treatise are all of the same size and originally formed a small book. At present the sheets are separated. The old numbers and marks which are to be found on most of the sheets are here given in brackets after the new numbers: 36 | 21 | 797 | 36 b muscles of the leg | 37 a 814, Pl. CVIII, No. 4 | 37 b the veins on the head &c. | 38 a (6) 38 b veins of the leg | 39 b veins on the leg and spine | 39 b 801 | 40 b nerves, matrice | 40 b + | 41 a (7) Delli muscholi che mova li labri della bochon | 41 b nerves, matrice | 42 a (10) nerves | 42 b veins of the leg | 43 a (8) Delli muscholi che mova la lingha | 43 b muscles of the foot, 843 | 44 a (3) veins of the arm | 44 b veins | 74 a (12) veins of the womb | 74 b muscles on the arm of the ape (scimmia) and of man (omo) | 75 a (2), 75 b muscles of the leg | 76 a dei vittorio de messolevri | 76 b Pl. CVIII, No. 1, 809 | 77 a (21) muscles of the leg | 77 b, 78 a (11) veins of the leg | 78 b veins of the hand | 81 a (10) 81 b the chest | 85 a the lungs | 85 b albergo di tutti i nervi | 86 a (13) arteries | 86 b veins of the arm | 87 a (14) the lungs, 87 b the heart | 125 a—127 a (4) blood-vessels | 127 b the spine | 128 a (5) the mouth and the lips | 128 b matrice di uaccha | 156 a, 156 b genitals | 173 a (16, 17—two sheets, not separated) intestines | 827 | 173 b 816 | 178 a, 178 b intestines | 183 a veins on the neck | 183 b veins | 201 a (M) bones | 201 b 1215 | 202 a (L) 1412, 838 | 202 b 839 genitals | 203 (23) 1178, 375, Pl. XXIII, No. 1 | 203 b 357, Pl. XXII, No. 1 | 204 a (3) stomacho | 204 b vene, fegato | 205 a della forza de' mvsscholli | 205 b misentero | 206 a (l)polmone | 206 b vessicchia, 817 | 246 (N) 1214 | 242 b 1213.
18. L.

This volume is in the original cover; it is a thin card of light blue colour. It is marked L. on the outside and Q inside: o. 1414, 1323, 1102. 1102 1a 1002, 1415 1b 1416 2a 1417, 648, knights kneeling. 2b Ma 3a sketch of a head. 3b 4a knights kneeling. 4b A 5a a note. 5b knots. 6a 1034 6b 1035 7a, 7b Fo 8a columna. 8b Ma 9a 10a plans. 10b 1036. 11a + 11b 12a Mn 12b, 13a + 13b AO 14a O 14b notes. 15a 1019. 15b 1037. Pl. XCIV. No. 1 16a P Ar 16b Fo 17a A 17b P 18a, 18b Mn 19a Fo 19b Pl. CX, No. 3, left side 1038 20a Pl. CX No. 3, right side 765 20b Ma 21a 1054 21b 23a Ma 23b Mn 24a Fo 24b 26a Mn 26b P 27a Mn 27b P 37b, 38a Mn 38b knots. 5a Fo 5b Mn 30a A 30b Mn 1418 31a—33a A 33b Mn 1039 34a—36a Mn 36b 1040. Pl. CX. No. 4 37a Ar 37b Ma 38a—39a Ar 39b Mn 40a 1041 40b, 41a Mn 41b 35 42a—44b M 45a

Ma | 45b Ar | 46a Fo | 46b 1042 | 47a 1043 | 47b A | 48a, 48b Ar | 49a—52b Mn | 53a M 1503 | 53b 1502 | 54a—60b V | 61a Ar | 61b—62b V | 63—65b Fo | 66a 1109. Pl. CX, No. 1 66b 1044 | 67a 1045 | 68a, 68b Ar | 69a P A | 69b—71a Mn | 71b a sketch. 72a 1046 | 72b 1235 | 73a Ge | 73b, 74a Ar | 74b, 75a Fo | 75b 307 M | 76a 981 | 77a 1047 | 77b 226 | 78a 1048 A | 78b 1049 | 79a 488. citadella. 79b Ge | 80a voice | 80b, drawing of a draped figure, very like the one on Pl. XXVIII, no 7. 81a Ge | 81b sketch of trees. 82a 1047.

Note | 82a and 83a Vol. II, p. 244, sketch 83b, 84a outline sketch of mountains | 84b P 85a Mn | 85b P | 86a Ge | 86b Mn | 87a 449 | 87b 393 | 88a sketch | 88b 1050 | 89a sketches. 89b Mn | 90b 1199 | 91a 1307 | 92a 623, M | 92b Mn | 93a Ma | 93b voca bolo lombardo &c | 94a 1523 | 94b 1474, 1052. O 1053, 1198, 1419, and, by an unknown hand: Le carte sono 94 cioè noutata quart.

19. W. M.

See Vol. II, p. 224 and No. 1051. Note. As to the Maps in M.S. W. L. see No. 36. The following maps are on separate sheets 1. Pl. CXIII. The original is somewhat larger (19 × 13½ in) the whole is executed in water colours. The rivers are in blue. 2. Pl. CXIV, (153, XII, in) 3. Part of the Arno, in water-colours (39 × 22) Pl. CXII. 4 Map of a part of Tuscany, in water colours (40 × 27 cm), including Livorno, Pisa, Lucchca, Volterra. 5. Central Italy (45 × 23 cm) within the limits of Corineto, Rimini, Pesaro, washed in Indian ink. 6. Study for the Map Pl. CXIII, washed in Indian ink; the names are written in Leonardo's ordinary writing (28 × 21 cm).

20. S. K. M. I.

This small MS. is bound in one Volume with MS. S. K. M. I. On the first sheet is the note, written in German: Leonardo da Vinci der große Maler aus der italienischen Schule. 1452 zu Vinci geboren, trat 1502 als streng- baumeister in die Dienste des Grafen Valentin Porgia, und starb 1519. — This volume and the two others now in the Forster Library of the South Kensington Museum, London, were given to Mr Forster by Lord Lytton, who is said to have bought them at Vienna for a low sum. The title of the treatise on sheet 1a is given in 1374. Note; no other subject is discussed on the 38 sheets which form this MS. 1b 1374 jo voglio abbasare la grossezza d'un tavola a data grosseza senza invatione di sua largheza | domando quato cresse in sua ligezza &c | 4a, 6a, 8b, 11a, 12a, 16b are blank. — On the last sheet 39a is the mark 46.

21. S. K. M. I²

See introductory note to No. 20. — At the end of this Note book is the mark B b 14. This MS. has the pages numbered 1—28. — 1—4 Mn | 5 635. 649 | 6 Mn | 385 | 8 650.

636 | 9 Mn | 10 Mn A | 11—15 Mn A | 16 de poderibus, modo di misurare vn alteza 17—28 Mn A.
APPENDIX.

24. W. An. III.

Among the numerous anatomical drawings in the Windsor Collection there is one set which appears to have formed originally a Volume by itself. Here the paper is of a thin greyish blue colour and of a rather rough surface. Leonardo seems to have made use of it exclusively for this particular treatise. All the sheets are of the same size. Each of them is marked by a Roman capital letter, as shown here in brackets. Sheet 217 bears the date 1515. — 115a (B) on veins 115b the heart 116a (K) blood-vessels 116b+ 117a (E) spine and shoulders 117b + 118a (H) blood-vessels 118b + 161a (O) blood-vessels 161b + 192a (T) the arms, A 192b+ 193a (V) vento 193b+ 196a (P) muscles 196b+ 217a (G) polmone 1376, 1423 217b+ 225a (N) battimento del cuore 225b+ 226a (M) 850 226b+ 227a (H) cuore, polmone 227b+ 228a (R) cuore, O 228b the heart and veins 229a (A), 229b the heart 230a (S) discorso delli nerii muscol, corde, ccc. 815 230b+ 232a (P) the heart 232b 121, 265, 292 II. 1—3, 1424, 292 II. 4—11, 59, 287, 209, 195, 204, 158, 1424: The sheet W. L. 136 (N) originally belonged to this series of sheets.

25.

The cover of thin grey card is the original binding. The outside bears the mark E. B. is twice written inside the cover. The compiler of the treatise on painting in the Vatican Library (Urbinas 1700) which was published by Manzi in 1817, and by Ludwig in 1882 gives a few passages from this MS, of which he correctly notes the corresponding number of pages, to which the mark B is added. O' 915, 479 1 1465, 1064, 1020 P 1 Ge, P 2a del cognoscere la parte settentrionale della calamita, M 2b 211 3 de codensatione, 360, 238 3b 117, 467 4a 562, Ge 4a acoustics, 935 5a A 5b, 6a P 6b 366, 470, 493 7a P 7b, 8a Ge 8b 1155, Ma 9 — 11a 1b Mn 12a 930 12b—14a strumenti acquatici 14b per fare l'arco 15a 230, 156, 380 15b 869 16a 108, 825 16b 107 17a 237, 153 268, 153, 355 17b 24 18a 286 18b 440, Pl. XXVIII, No. 3 right side 19a 461, 441, Pl. XXVIII, 3 left side 19b 363, 20a 362, P 20b, 21a P 22a—23b V 24a + 24b 27a Ge, 27b Machina murale 28a Mn, Ph 28b—29b Ph Ma 30a Ge 30b O, 212 31a 161, 31b 135, 190, 197, Pl. XLI, No. 5 32a Pl. IV, No. 1, 162, 198 32b 264, 159, 240, 157 33a Ge, del centro della gravita 33b Da generare vento mirabile 34a Mn 34b, 35a Ph 35b—51a V 51a Ma 52a—54a V 54a P 55a, 55b P 56a Ge 36b—75a P 75a Mn, P 75b, 76a Mn 76b—79b P 79b P 79b 225, 17 80a 222, 1065 80a 15, 223 81a the cover are giusto 96 cioe Nouantei eccetto che ma& i

26.

The cover of thin grey card is the original binding. Inside and outside the cover is the mark G. The numbers of the sheets are in Leonardo's handwriting. O' 1377, the cartone are di numero giusto 96 cioe Nouantei eccetto che ma& i 7 et il 18 col suo compagno 31. This note is by an unknown hand i 1033 li pedali degli alberi anno supericie ... 1b 1057 2a Mn 2b 426 3a 425 3b 127, 827, 427 4a 428 4b 429 II. 1—11, 406, 429 II. 12—14 7a 405, Mn 5b
27. M.

The cover of thin grey card is the original binding, marked M outside the cover. O'1425
1\ b Ge | 4a 659, Pl. LX, No. 1 4a
700, Pl. LX, No. 1 5a 701, Pl. LX, No. 4 5a Ge 6a on the earth 6b 7 Ge | 8a 140b 
| 8b—36a Ma | 36—53a P M | 53a 147b 54a, 54b bombarda, passavolanti | 55a 373 | 55b, 56a ponte | 56b Mn | 57a—58a M | 58b 128b, 1152

59a—61b Ph M | 62a 1478 | 62b—66b Ph Mn | 67a 821 | 67b—76b Ph M | 77a + 77b 420, Pl. XXVIII, No. 1 78a P | 78b 395, Pl. XXVII, No. 1, left side | 79a 396, Pl. XXVII, No. 1, right side | 79b 116b
5a 115 | 80a 8b Ge | 81a—84a Mn | 84b, 85a + 85b Ge | 86a camino | 86b—88a Ge | 88b + | 89a—94b Ph, Mn, O'mark Q.

28. Tr.

Marked S inside the cover and on the first sheet. At the beginning of the Volume is the following note: 1783-5. Gennaro. Questo Codice di Leonardo da Vinci era del Signor Don Gaetano Caccia Cavaliere Nourarese, ma domiciliato in Milano, morto l'anno 1752 alli 9 di Gennaro sotto la Parochia di S. Damianino La Scala. Jo Carlo Triulzio l'acquistai dal detto Cavaliere intorno l'anno 1750 unitamente a un quinario d'oro di Giulio Maporiano e a qualche altra cosa che non più mi ricordo dandoli in cambio un orologio d'argento di ripetizione che io due anni avanti aveva comperato usato per sedici gigliati mache in verità era ottimissimo, che però questo codiceto mi viene a costare sei in sette gigliati. In the MS, the pages are numbered, not the sheets. 2 1493, caricatures, 1332, 1189 | 3 c. 1469 Note, ships, 4 1486 | 5 Mn | 6 P Mn | 7 853 Ar Mn | 8, 9 list of words | 10 + 11 1209 | 12 801 | 13 Fo | 14 840 | 15 Pl. XCIX, No. 1, 758 | 16 Pl. C, No. 1, 17 Vol. II, p. 61 Fig. 1 and 2 | 18, 19 + | 20 lists of words, 144 | 21 Pl. C, No. 2 | 22 1429, 177 | 23—26 lists of

Italian and Latin words | 27 Mn | 28 863, 116b | 29 201, 146 | 30 sketch of a male figure | 31 list of words | 32 1173 | 33, 34 Mn | 35—38 lists of Italian words | 39 1193, Italian words | 40 Italian words | 41 Pl. C, No. 4, Vol. II, p. 61 | 42 Pl. LXXXI, No. 1, 43 sketch of a building resembling the one given on Pl. LXXXII, No. 1 | 44 geometrical sketch | 45 1147, 40 Ph | 46 1183 | 49 854, 640, acoustics | 50 list of Italian words | 51 list of Italian words, 1148 | 52 737 | 53 bombarda, 738 | 54 739 | 55 740 | 56 bombarda | 57 1487, 1181, list of Italian words
59 nulla può essere · scripto per nullo ricerche · equale cosa dite a me stesso prometta, — list of Italian words | 59 sketch of a hound, fornello, list of Italian words | 60 list of Italian words | 61 A, list of Italian words | 62 list of Italian words | 63 Mn | 64 A, list of Italian words | 65 1145, 66 list of Italian words, bombarda | 67 list of Italian words | 68 1209, 43, 1174, list of Italian words | 69 acoustics | 70 1146, 1138, list of Italian words | 71 M, 539 | 72 list of Italian words | 73 1321,
Bound volume in leather cover. On the first five sheets before the beginning of the original MS are the following Notes. On 1st marked in pencil 596: This treatise on the nature, weight and motion of water... has never been printed. On the reverse of the modern title may be found an extract from the life of Leonardo da Vinci, by Dufresne, in which this volume is particularly mentioned. It appears from the title page (although the name of the possessor has been obliterated) that it has belonged to Giuseppe Ghetti, an eminent painter at Rome. — W. Roscoe.


The arrangements of this MS. are somewhat unusual. On the head of many pages are these title lines here placed between 'propositioni scritte' (casi) or subjects treated on the page. Most of these cases are introduced by 'Come' (How, or that). 1st 864 | 2nd 1082, 901 | 3rd 902, Pl. CVIII, No. 5. 2nd Come si debbe volere vno stango che sbocci nel mare, Ph on the moon | 3a A, 985 | 3b A | 4a A, 300, 1060 | 4b A | 5a A | 957, 971, 997, 907, luna | 5b A | 6a libro 2° delle diversità dell'onore dell'acqua | 6b 958, A, 977 | 7a dell'acqua della luna, Ar | 7b A, O | 8a A, 386, Pl. XXIV, No. 3, Ph | 8b 98 | 9a 87 'Carte 10 e conclusioni 853' 988, 921 | 9b 16'989, 721, 1055, 1061, A | 10a '15' 3rd case: 1063, 980, 990, Mn | 10b '15' 991, 1056, 1101, 936, 1085, Mn | 11a 'casi 15' A | 11b 'casi 27', 4th case 1058, 7th 969, 9th 1029 | 12a 'casi, — in queste 7 carte e casi 627 d'acque e di sua fodi' | 12b 'casi 24' A | 13a 'casi 16' 1472, 4th and 5th 959, 15th and 16th 1008 | 13b 'casi 16' A | 14a 'casi 15' A | 14b 'casi 24' A | 15a 'propositione 26' 1st and 2nd 972 | 15b 'propositione 38' 920 on the margin | 16a 'pro positioni 23' A | 16b 'casi 18' 1499 on the margin, 973 | 17a 'casi 29' A | 17b 'hordine del libro delle acque, casi 28 956 | 18a 'casi 32', 22nd 1011 | 18b 'casi 16', 1007 on the margin | 19a 'casi 17' | 19b 'casi 37' | 20a 'casi 32', 2nd 992, 14th and 15th 953, 16th 995, 20a 'casi 24' A | 21a 'propositione 12', 2nd 1027 | 21b 'pro 25', 4th 948, 5th 6th 849, 993, 7th 1096, 8th 933, 11, 7, 8 | 22a 'casi 29' 9th 1097 | 22b 'casi 39, 12th and ff. 1114, t, the last 995 23a 'casi 20' 6th 997 | 23b 'casi 15' A | 24a 'casi 20' 24b A | 25a 'casi 12 questi son casi che anco a stare nel principio' on air and water | 25b 'casi 15' A | 26a 'casi 18' A | 26b 'casi 15' A | 27a 'casi 23 A | 27b 'casi 10', 13th 1071, 7th 1086, 8th 954, 28a 'casi 15' on the margin, 1021 | 28b 'casi 15' A | 29a 'casi 13' A | 29b arie | 30a '899 | 36a A | 31a '900, 5 conclusioni 9' 962 on the margin, 30th 1091, 6th and ff. 1090, 984 on the margin | 31b, 4th 1068, 5th 1108, 8th and 9th 978 | 32a A, 1028 | 32b 1098 | 33a A | 33b 970 | 34a 1000, A | 34b 933, 1095, 1072, A | 35a 960 | 35b 937, 36a 938, centro del mondo, 301, 993, 36b 900, A.
30. Mz.

The grey card cover is original. The sheets are twice numbered, in Leonardo's handwriting and by a more recent hand. The original numbers are here given in brackets, because they are not consecutive, subsequently they have been altered: 1' 728 | 1 a (3) 1154, P | 1 b Ge P | 2 a (4) P | 2 b V | 3 a (6) 1122, V | 3 b V | 4 a (6?), 4 b V | 5 a (8 altered in 7) | 5 b V | 6 a (9 altered in 8) | 6 b, 7 a (10 altered in 9) | 7 b V | 8 a (12 altered in 11) 1168, V, Ge | 8 b, 9 a (13 altered in 12) V | 9 b 1124 | 10 a (14 altered in 13) 705 | 10 b, 11 a (15 altered in 14) | 11 b V | 12 a (16 altered in 15) | 1123 | 12 b V | 13 a (17 altered in 16) V, 1125, 381 | 13 b baga, V | 0" 1428, and the architectural drawing reproduced Vol. II, p. 67.

31. D.

Marked D inside and outside the cover of grey card, S inside the back cover. Four blank sheets are at the beginning. This MS. treats of the eye. The following texts are a selection of the headings. 1 a Perchè la natura non fece egual virtù e potenza nella virtù visiva | 1 b perciò le razze de' corpi luminosi si fan tasto maggiori quanto son più remoti dal lor nasci- miento | 2 a se l'illustro è sinolaco à termi- nato sotto superiore (1) o no . . . come la rettitudine del concorso delle spetie si piega nello entrare nell'occhio | 2 b come le spetie di qualche corpo che per alcuno spiraculo passano all'occhio s'impremono subito sopra nella sua popilla e'l senso le vede diritte | 3 a come le cose destre non pagano destre alla virtù visiva, se le sue spetie non passan per due interse- gazioni | 3 b come le spetie si danno alla virtù visiva con due interseghazioni per necesità | 4 a perciò lo spiraculo scambiam tutti gli animali che leggono per destinati ne' sinistri e li sinistri ne' destri | 4 b che sia vero che ogni parte della popilla abbia virtù visiva | 5 a dell'occhio dellassi animali notturni | 5 b La popilla del- l'occhio si muta in tante varie grandezze quanto son le varietà delle chiere o scortà delle obbietti che dinati se li rappresentano | 6 a Il simu- lauro dell'occhio è visico in tutta la superstite dell'acqua che vede ed è veduta da esso solo ma pare duioso in tante parti quanti son li occhi dei animali che in diversi siti vedono la superficie dell'acqua | 6 b La popilla dell'occhio à virtù visiva tutta per tutto e tutta in ogni sua parte | 7 a come la popilla piglia il simulacri delle cose antiposte all'occhio solamente dalla luce e non dallo obbietto | 7 b perciò la cosa destra non pare sinistra nell'occhio | 8 a 71 | 8 b dimostrazione perciò l'occhio vede adietro a se cose poste nell'opposti laterati | 9 a dell'occhio mnano | 9 b perciò li corpi luminosi mostrano li loro termini pieni di diritti razzi illuminosi | 10 a delle spetie nuolcori che passano per strettì spiracoli in loco oscuro | 10 b delle spetie nuolcori infuse per l'aria. — At the end four blank sheets, two bearing the mark S.

32. K.

The three MSS K1 K2 K3 are bound in one Volume with a leather cover inscribed LEON- NARDI || VINCI || in golden letters. The sheets of each M.S. are separately numbered. Inside the cover are the marks K and 13. On the first sheet is the inscription: Commentarii autografi || Leonardi Vincii || Pictoris Architecti || cerissimi || quo dono dedit || Bibliothecae Ambros. || Comes Horatius Archintus ||

Ingeniarum Artium || studiosissimus || Anno MDCLXXIV || Then follow four blank sheets. 1 a A, and the mark 44 | 1 b Ma | 2 a 1067 | 2 b Ge | 3 a Dividi il trattato dell'occhi in 4 libri &c. | 3 b—14 a V | 14 b sketch of a male figure | 15 a + | 15 b | 31 a Ge ma in black chalk | 31 b—48 a in ink | 47 b has the mark O O 47 | 48 b + |

33. K.

The introductory note No. 32. 1 a P | 1 b 1308 | 2 a 1489 | 2 b 1490 | 3 a Ma | 3 b 1481 | 4 a—8 a Ge | 8 b + | 9 a—11 a V | 11 b de fiumi | 12 a Ma | 13 b 1508 | 13 a Ge | 13 b 14 a + | 15 is wanting | 16 a—17 a Ma | 17 b, 18 a A | 18 b + | 19 a—27 a Ma | 27 b 1430 | 28 a—32 a Ma.
AMENDMENTS.

See introductory Note No. 32. 1a la setola del buco 1 b-g a Ge 1 b Mn 1 c a 11 b
Ge 1 a + 15 a-16 a A 1 b Ma 17 a—
19 a A 1 b 17 a 1 a 10 a 1 b 1 b A 1 a 2 a
di muscoli 1 b 25 a 1 b 1 b 13 a 26 a 1 b

26 a-27 a L 1 b 28 a 80 b 28 b 29 b acqua del
navilio 1 b 29 b 1501, 824 Pl. CVIII, No. 2
20 a M 30 b 657, 31 a M 31 b 175, O

32 a + 32 b 630 33 a, 33 b Mn 34 a, 35 a
calciadonio 35 b manica 36 a colla di riso
36 b 749, Pl. LXXII, No. 2 37 a A 37 b
chemicals 38 a Ph 38 b-40 a O 41 a, 41 b
V 42 a, 42 b O 43 a-44 a M 44 b-47 b
pupilla 48 a vaso 48 b 1431, and the mark
L L 48.

35. W. An. IV.

The treatise is written on loose sheets of equal size (compare No. 24) here the paper is
white in colour. The old marks on some of the sheets are here given in brackets. 157 a (B-)
798, 822 1 157 b muscles of the spine 7 a
(AA) 810 1 b + 80 a (Cu) the spine 80 b
busts of two men 80 a 3 (3) bones of the leg 80 b
muscles of the arm and of the neck 90 a (3)
(Ma), 90 b, 91 a 99 arm and shoulder 91 b
the spine 120 a (P) blood-vessels 120 b pol-
mone 130 a, 130 b figurazione della mano
131 a albero di uene 131 b + 132 a, 132 b
the leg 134 a muscles 134 b + 141 a (17)
uffito del polmone, Ge 1 145 a (O) bones of the
foot 145 b muscles of the arm 146 a (P) the
torso 146 b head and hand 147 a, 147 b mus-
cles 148 a (110) the leg 148 b the torso
149 a on veins 149 b the spine 151 a nervi,
802 1 151 b cotitus, 841, 1482, per queste figure
si dimostrerà la cagione di molti pericoli differite
emalattie 152 a embryos, 1432, cotitus, 658, 152 b
embryos 153 a 1433, intestines 153 b embryos,
29, 818, 153 d di utilità strumentale de' membri
154 a + 155 a cotitus, 155 b + 159 a muscles
159 b + 160 a (18) torso, the heart 160 b
the face 162 a (8) Ge 162 b + 163 a the
heart 163 b 3 the heart; 164 a (D) -165 a del
core 165 b a woman's head, drawn by a pupil
166 a (B) del cuore 166 b the stomach 167 a (O)
on veini, 1434 (1) 1-7, 818, 1434 (11) 1-7, 1796
167 b the heart 170 a (O) the heart 169 b
intestines 170 a (O) albero delle corde 170 b
muscles 171 a (O) albero delle vene 171 a
intestines 172 a Ge, intestines, 1173 1 172 b
Ge 171 a intestines 174 b the neck 177 a the
straight-gut 177 b + 181 a-182 a the heart
182 b + 184 a (7) 832, 837, 184 b seguita
l'articulazione della voce umana 180 a P
189 a muscles of the eye 199 a the ribs 199 b
A 200 a (Ge) 200 b intestines 211 b muscles
of the leg 211 b + 212 a muscles 212 b +
213 a Ge, Anatomy 213 b + 214 a, 214 b Ge,
intestines, 216 a muscles of the torso 216 b
+ 218 a (H) polmone, 570 218 b + 220 a
(14) vino 220 b + 221 a 221 a muscles of the
torso 216 b + 221 a (H) polmone, 570 218 b + 220 a
(14) vino 220 b + 221 a 221 a muscles of the
torso 221 a muscles of the arm 222 b the
torso 223 a Polmone 223 a urice-bladder 224 a
l'impeto del sangue 234 a la revolutione
del sangue nel anteparto del cuore, O 250 a
che vittio faccino li muscoli delle coste 218 b +.

36. W. L.

The history of this Volume is given on pp. 482, 483. Here as in the MS. C. A. the original sheets
were fixed on the sheets of the volume, but most of
them have been taken out again. The following
references are exclusively to such sheets as are still
to be found undetached in this celebrated volume.
The size varies greatly. On the folio No. 124
(containing no drawing at present) is the Spanish
note: ogni falsaustria y noscruita. The back
of some sheets is covered by the mounting. 132 a
886, Ma 136 a Mn 114 a 1436, 141 b 1435,
145 a L 597, Pl. V, 183, B 66, 270, 78, C
276, D St. 24-53, 120, 81 ll. 15-23, ll.
54-97 1 145 b A 288, B 77, C 80, 47, 87, D
79 ll. 1-5, 274, 81 ll. 1-14, 73, 79 ll. 6-12
146 a 62, 130 146 b Ma 198 a 682 198 b
683 199 a 199 b A 200 a sketch of a head.
200 b sketch-maps of the Valle Brembana with
the names and distances of the villages from Bergamo
and Ponte a San Piero up to the Val Tellina,
and of the Val Trompia between Brescia and
the lago d'IlSEO. 203 a 1438, Ge Mn 203 b
sketch for the map on fol. 212 a 212 a part
of the Arno river 1437 212 b sketch-plan of
Florence, 1004 Note, 1016 Note 217 a five
plans, showing the divisions of some fields 217 b
water colour drawing of a villa with gardens
(not by Leonardo) 224 a sketch-map of the Val
di Serio between Bergamo and Ardesie, with
numbers showing the distances between the
The detached sheets of MSS. in the Windsor Collection chiefly treat on Anatomy. They vary greatly in size, nor is there any consecutive order. The following account of the very rich materials must therefore be confined here to general statements. 19, 387, Pl. XXIV, No. 1 | 23 b legs, XIX, No. 2 | 197 a sketches, XV, No. 2 | 215 b + | 216 a, 217 b muscles of the arm, XXI, No. 2 | 241 b drawing of a horse, Vol. II, p. 24 above to the left | 10 a—35 b chiefly small drawings | 36 b legs and muscles | 45 a intestines | 45 b + | 60 a Mn, 60 b + | 70 a Pl. LI, No. 1 | 70 b + | 71 a — 73 b mostly sketches | 79 a 79 b anatomy of the head | 81 a 83 a anatomy | 83 b + | 88 a the muscles | 88 b + | 92 a — 99 a sketches | 100 standing male figure | 100 b + | 101 a Pl. XXXIII, No. 3 | 101 b + | 102 a (19. 21) Pl. XXVIII, No. 7 | 102 b + | 103 a standing male figure | 103 b + | 104 a Pl. VII, No. 5 | 104 b + | 105, 111—114 various sketches | 119 a 313 Pl. VII, No. 3 | 120 a 121 a sketches of heads | 122 a Pl. CI, No. 3 | 123 a a similar drawing | 125 a blood-vessels | 129 b polmone | 136 a — 144 anatomy, various notes and sketches | 158 a 608, Pl. XXXV No. 2 and 3 | 158 b 609 | 165 a cuore di un male | 165 b cuore of a female head, not by Leonardo | 174 a 1362 | 175 a 180 anatomy | 185 a — 187 b anatomy | 188 a Ar | 188 b anatomy | 190 Ar, Ph, 190 b anatomy | 191 a Ge, 1475 | 38 a intestines | 191 b

37.

W.

This best known and most voluminous Volume is composed of loose sheets of various size, each folio containing one or more sheets of original MS. The mounting is the same as in the Volume W. L. Such sheets as have notes on both sides are not fixed by their back to the folio sheets, but set into a paper frame. The numbering of sheets refers only to the folios. In the interest of identification and in order to facilitate a comparison of the writing on the opposite sides of one and the same sheet, I have introduced here, in addition to the numbers of Leoni's folio sheets, second numbers which refer to the separate original sheets.—In the following description it seemed to me desirable to refrain from giving detailed accounts of the contents of such sheets, as do not bear upon the various subjects of the present publication, the more so, as the order of the sheets, being quite accidental, throws no light whatever on the connection of the various sub-

BIBLIOGRAPHY.
APPENDIX.

DIESEL', MACCHINE. DELLE. ARTI.
SEGRETO ET ALTRE. OSSER. LEONARDO DAVINCI. RACCOLTI DA. POMPEO LEO. 

On the back of the cover is the No. 248. 1a, 1a and 1b, 1b 95 ± 2a 2→ 4a 10a Mn | 4a 11a 1553 | 4a 11b 631, 1359. The following drawings and texts nearly all refer to machines |

7 a 19 a 1110 | 11 a 37 a 41 | 11 b 37 b 1439 |

189 a 45^ | 152 a 130 ||

67 a 164 a 78 | 94' IEO-

1293, 147 b 67 | 89 a 179 b 201 |

130=^ | 157 a 111 b On |

222 a 495 | 414 a 1309 |

100 a 136 b 64 a 763, 223» 67 b 164 a 78 |

94' | 462, V | 183 b 555 b 18 9 | 183 a 557 a corda |

187 a 557 a 1447 | 187 a 561 a 490, Ge | 910 |

1211 | 188 b 564 a 136 b 189 a 505 a 1529 |

290, 462, V | 183 b 555 b 18 9 | 183 a 557 a 

124 b 1360 | 41 b 132 a A, Antonius |

Saluichus. 44 a 132 a farai la natomia dell'alte |

dies extending over about thirty years. Outside |

the over is the inscription in golden letters: |

DISEGNI DI MACCHINE. DELLE. ARTI. |

SEGRETO ET ALTRE. OSSER. LEONARDO DAVINCI. RACCOLTI DA. POMPEO LEO. 

BIBLIOGRAPHY.

39. The drawings and MSS. by Leonardo in the Royal Library, Turin, are mounted on card. Card 7 399, Pl. XII | 7 b Mn | 25 Mn | 17 11661 | 11 320 | 1 1369 Note, Pl. I | 5 Pl. XLII | 6 Pl. CXX.

40. Florence, Uffizi Collection of drawings Frame 115 No. 446 663, 1383. A drawing of a machine is on the back.—Drawing of Landscape (28 × 19 1/2 cm) in a portfolio, not exhibited, not mounted nor numbered. 1369.

41. Venice, Academy of Fine Arts, Room VIII, Frame IV, 16, 315. Pl. IX, Frame V | 1 a Notes on P | 1 b Pl. XCIV, No. 4, Frame V | 4 a Pl. LV | 4 b Notes on P, Frame V | 9 a Pl. LIV | 9 b MOTORDECOr, notes | Frame VI 3 Pl. XVIII, 343 Frame 8, Pl. XLVI, 668.—The drawing Pl. LIII is in a portfolio in the library of the Academy (exhibited in 1883).

42. Among the drawings by Leonardo in the Gallery of the Ambrosian Library there is only one with a M.S. note: 1456.

43. Collection of drawings, made by P. Resta, a large bound volume in the Ambrosian Library contains an anatomical drawing with notes by Leonardo.

44. Munich, Pinacoteca, a drawing with notes on warfare.

45. The collection of drawings made by Valardi, a large volume in the Library of the Louvre contains a sheet with notes on arms and several drawings by Leonardo, but only two out of these bear on the subjects of this publication: Pl. LXXX and Pl. LXXX, No. 1.

46. Louvre, Collection of drawings, mounted on card (not exhibited) see Vol. I p. 297 and No. 594 Note.

47. Paris, Collection of drawings in the possession of M. Armand; a drawing with M.S. note similar to that at Munich and to that in the Collection of A. Morrison, Esq. London.


50. Collection of A. Morrison, Esq. (see No. 47).

51. Collection of the late Prince Henry of the Netherlands; one sheet containing notes and a diagram, referring to Perspective.

52. The five Manuscript sheets formerly in the possession of Libri (described in his catalogue of the reserved portion), were bought in 1862 by the Marquis of Breadalbane. After his death they came into the possession of the Hon. Mr. Baillie Hamilton, Langton, Berkshire. Here they seem to have mysteriously disappeared, and I have not been able to trace them any further.

53. In the Library of Christ Church Oxford; two mounted drawings preserved in portfolios. The first is marked 4 and has notes on machines, on weight and a sketch of a horseman fighting. The second is reproduced in parts in Vol. I Pl. LIX, Pl. LX, No. 1, Pl. LXI 676, 677.

54. Modena, Archivio Palatino: No. 1348.

55. Treatise of Francesco di Giorgio, MS. in possession of Lord Ashburton, with notes in Leonardo's handwriting written on the margin, on Fol. 13 b 767, on Fol. 25 a 952, on Fol. 27 b 44. Others on mechanics &c. on Fol. 15 b, 32 a, 41 a and 44 b.
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