SCIENCE

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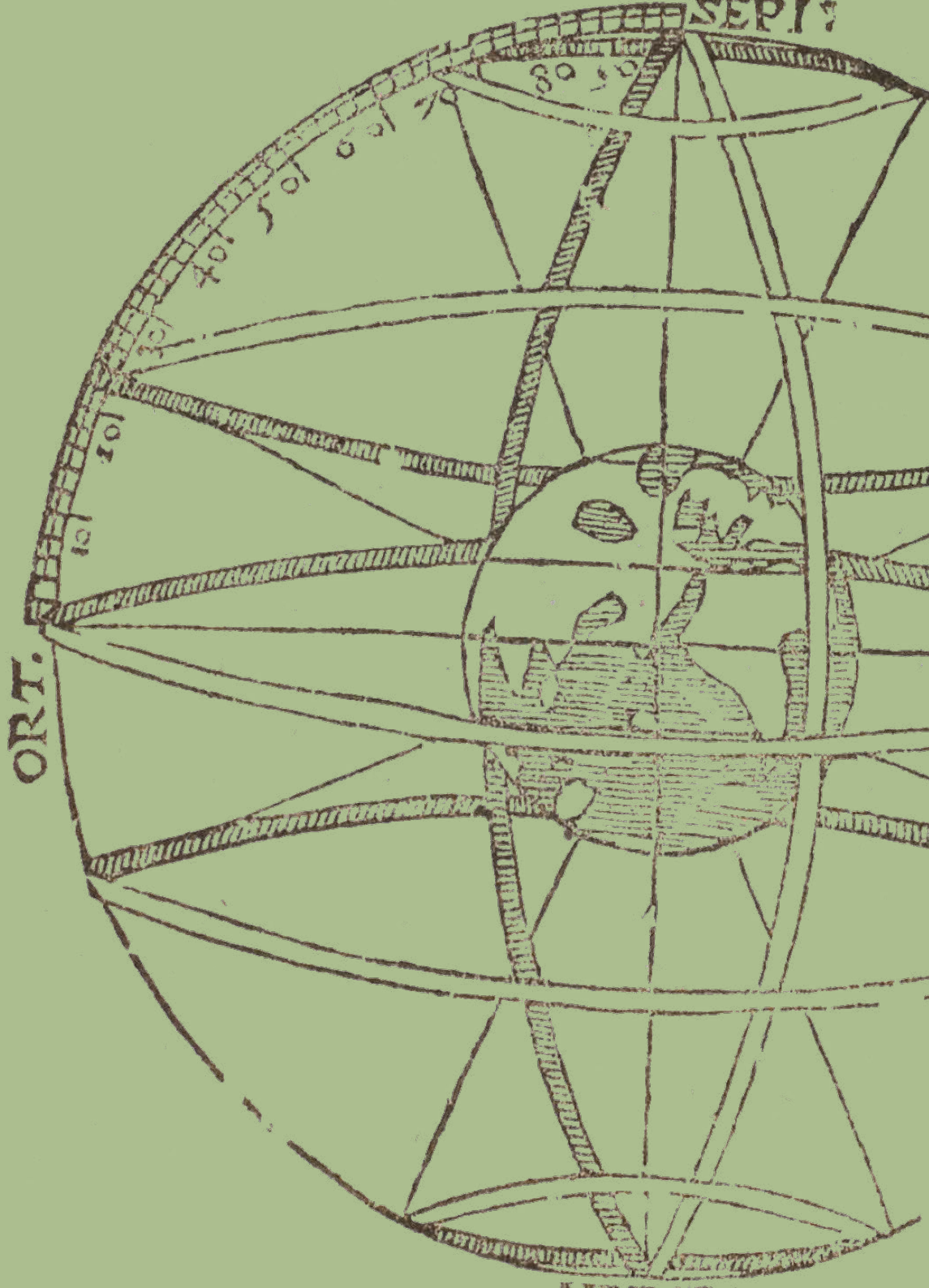
Cover: item 13; right: item 37



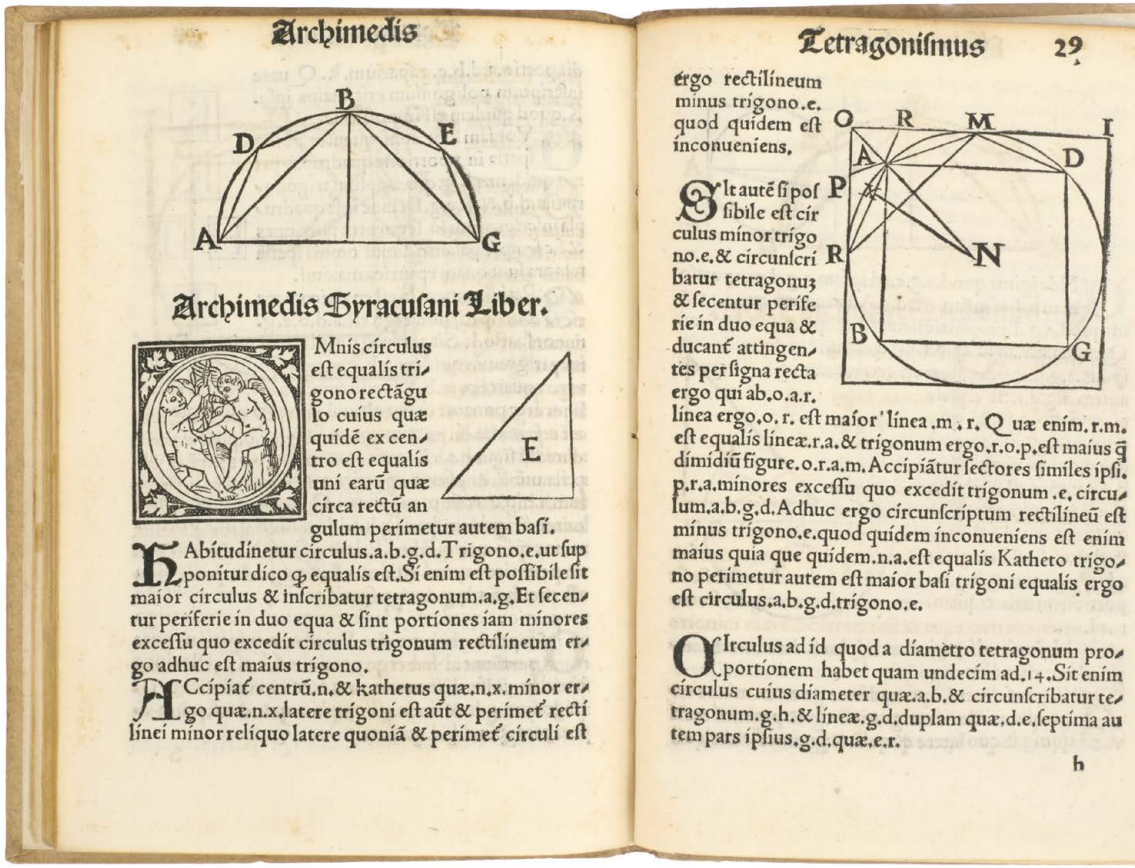
The First Archimedes

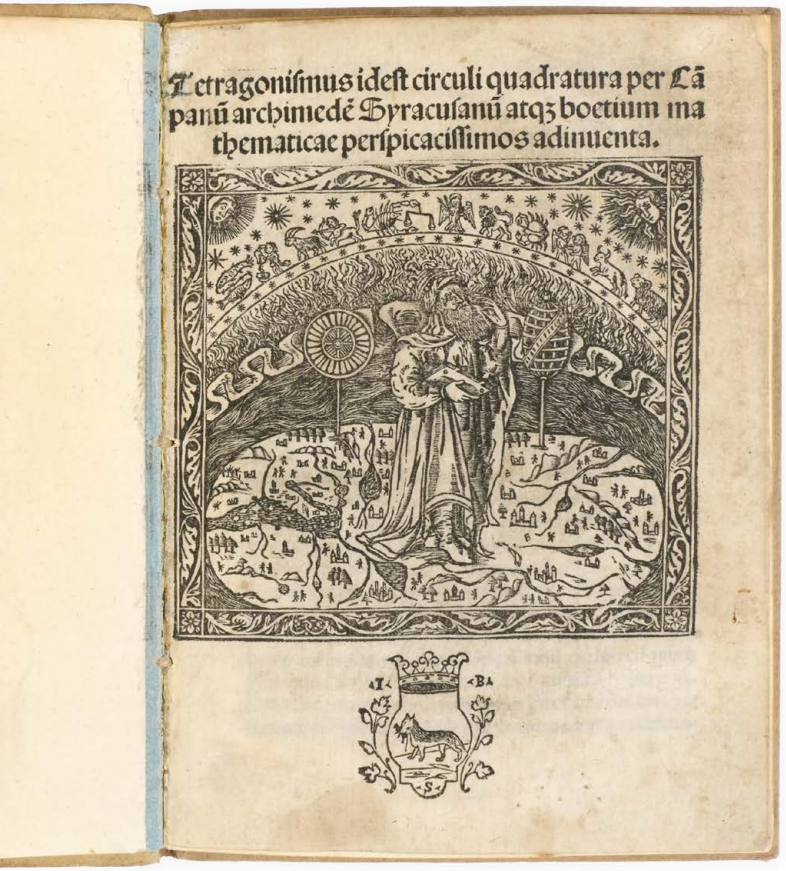
1. ARCHIMEDES, BOETHIUS, *and* CAMPANO da Novara; Luca GAURICO, *editor.* Tetragonismus id est circuli quadratura per Campanum Archimedem Syracusanum atque Boetium mathematicae perspicacissimos adinventa. *Venice,* [*Giacomo Penzio for*] *Giovanni Battista Sessa, 28 August 1503.*

4to, ff. 32; small woodcut Sessa device on title-page and different device below colophon, title with woodcut illustration of Archimedes standing on a map and looking up at the heavens, woodcut initials and diagrams; title-page slightly dust-soiled with small repair at foot, title tipped in and (conjoint) leaf a4 strengthened along gutter, a few headlines shaved, occasional light spotting, final verso with slight offsetting; a good copy in nineteenth-century boards, green morocco spine label, year of publication lettered to upper cover in manuscript, remains of index tabs; binding a little soiled; bookplate of 'Progel' (probably Joseph Bonaventura Progel, of Munich, d. 1851). **£18,000**

The first appearance in print of any complete work by Archimedes, 'generally regarded as one of the greatest mathematicians the world has ever known' (*PMM*), including one of the earliest approximations of the value of π.

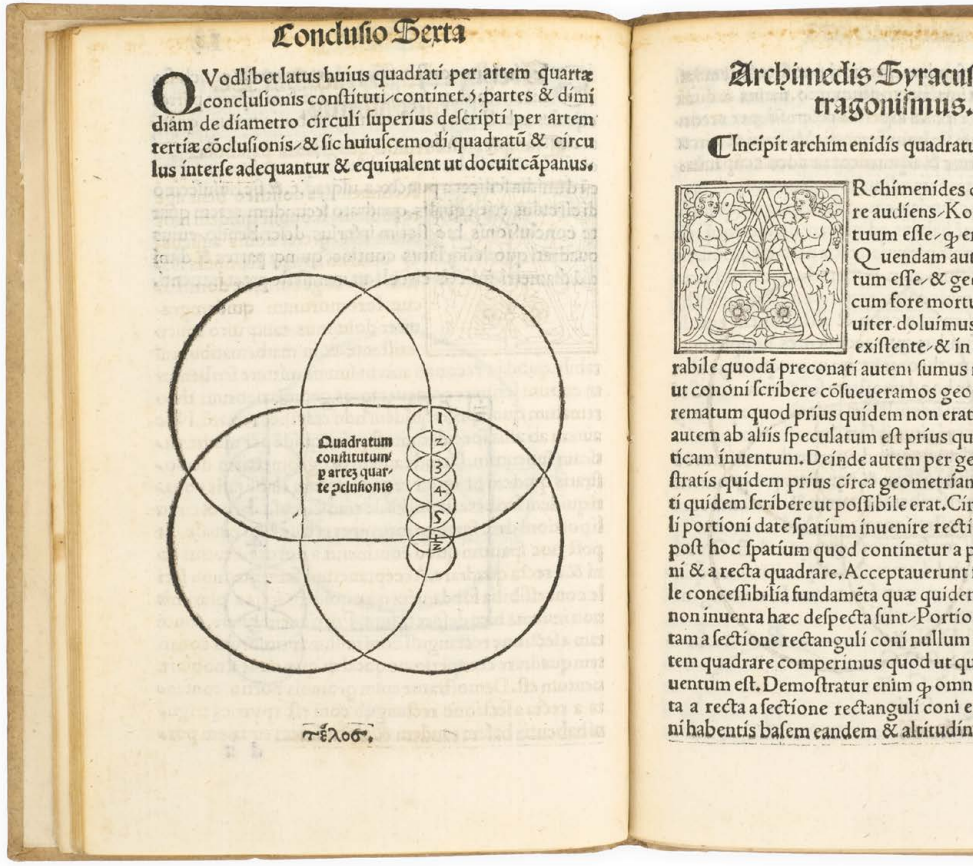
This work contains Archimedes' mathematical treatises *Quadratura circuli* and *Quadratura parabolae*, in the Latin translation of William of Moerbeke, which accompanied similar works on the quadrature of the circle by Campano da Novara and Boethius. In *Quadratura circuli,* Archimedes 'calculated the ratio of circumference to diameter (not called π until early modern times) as being less than 3-1/7 and greater than 3-10/71. In the course of this proof Archimedes showed that he had an accurate measurement of approximating the roots of large numbers' (*DSB* I, p. 222). *Quadratura parabola* proved that the area enclosed by a straight line and a parabola is equal to 4/3 the area of a triangle with equal height and base. 'Archimedes demonstrated the quadrature of the parabola by purely geometric methods. In the first part of the tract he demonstrated the same thing by means of a balancing method. By the use of the law of the lever and a knowledge of the centers of gravity of triangles and trapezia, coupled with a *reductio* procedure, the quadrature is demonstrated' (*ibid.*, p. 219).




Tetragoniſmus ideſt circuli quadratura per Cā
panū archimedē Syracuſanū atqz boetium ma
thematicae perſpicaciſſimos adinuenta.

Tetragonismus represents the earliest appearance of any work by Archimedes in Latin, predated only by excerpts in Valla's *De expetendis et fugiendis rebus opus* (Venice, 1501). The first printing of Archimedes in Greek was not until 1544, accompanied by Regiomontanus's version of the Latin text. These publications, along with Tartaglia's reprint of these two Archimedean texts in 1543, facilitated the use of Archimedes by Galileo, Torricelli, and Kepler.

BM STC Italian, p. 292; EDIT16 CNCE 8810; USTC 818222; Adams C 470; raesse VII, p. 151; Riccardi I, col. 40, no. 1*.


Conclusio Terta

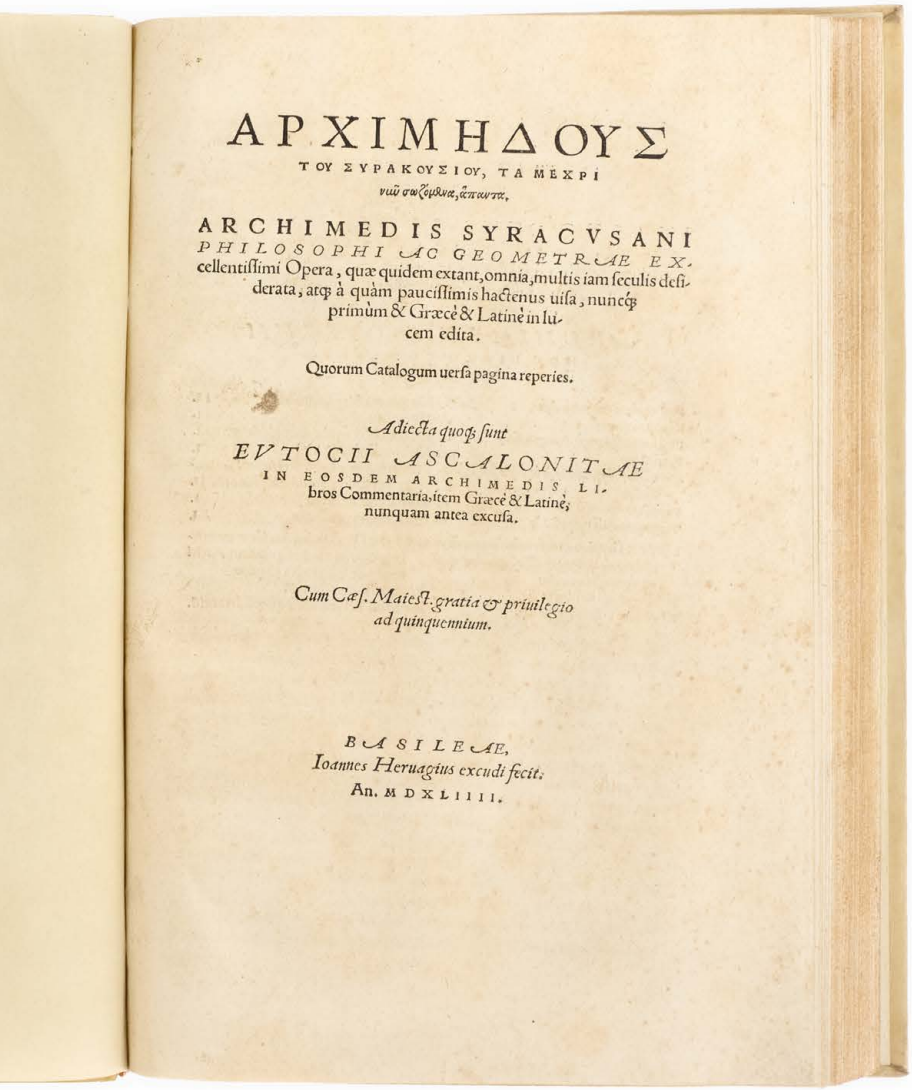
QVodlibet latus huius quadratí per artem quartæ conclusionis constituti/continet.3.partes & dimi diam de diametro circuli superius descripti per artem tertiæ cõclusionis/& sic huiuscemodi quadratũ & circu lus interse adequantur & equiualent ut docuit cãpanus.

Quadratum constitutum/ p artez quar- te pclusionis

Archimedis Syracuſ
tragoniſmus.

Incipit archimenidis quadratu

4



ΑΡΧΙΜΗΔΟΥΣ

ΤΟΥ ΣΥΡΑΚΟΥΣΙΟΥ, ΤΑ ΜΕΧΡΙ
νυῦ σωζόμενα, ἅπαντα.

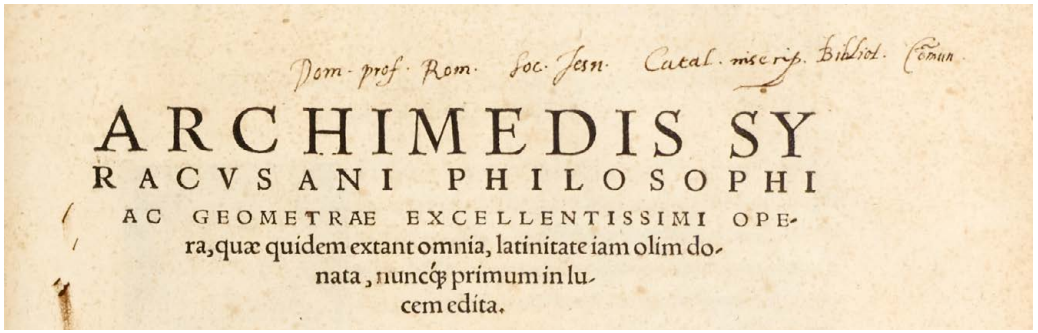
ARCHIMEDIS SYRACVSANI
PHILOSOPHI AC GEOMETRAE EX-
cellentissimi Opera, quæ quidem extant, omnia, multis iam seculis desi-
derata, atq; à quàm paucissimis hactenus uisa, nunćq;
primùm & Græcè & Latinè in lu-
cem edita.

Quorum Catalogum uersa pagina reperies.

Adiecta quoq; sunt
EVTOCII ASCALONITAE
IN EOSDEM ARCHIMEDIS LI-
bros Commentaria, item Græcè & Latinè,
nunquam antea excusa.

Cum Cæs. Maiest. gratia & priuilegio
ad quinquennium.

BASILEAE,
Ioannes Heruagius excudi fecit.
An. MDXLIIII.

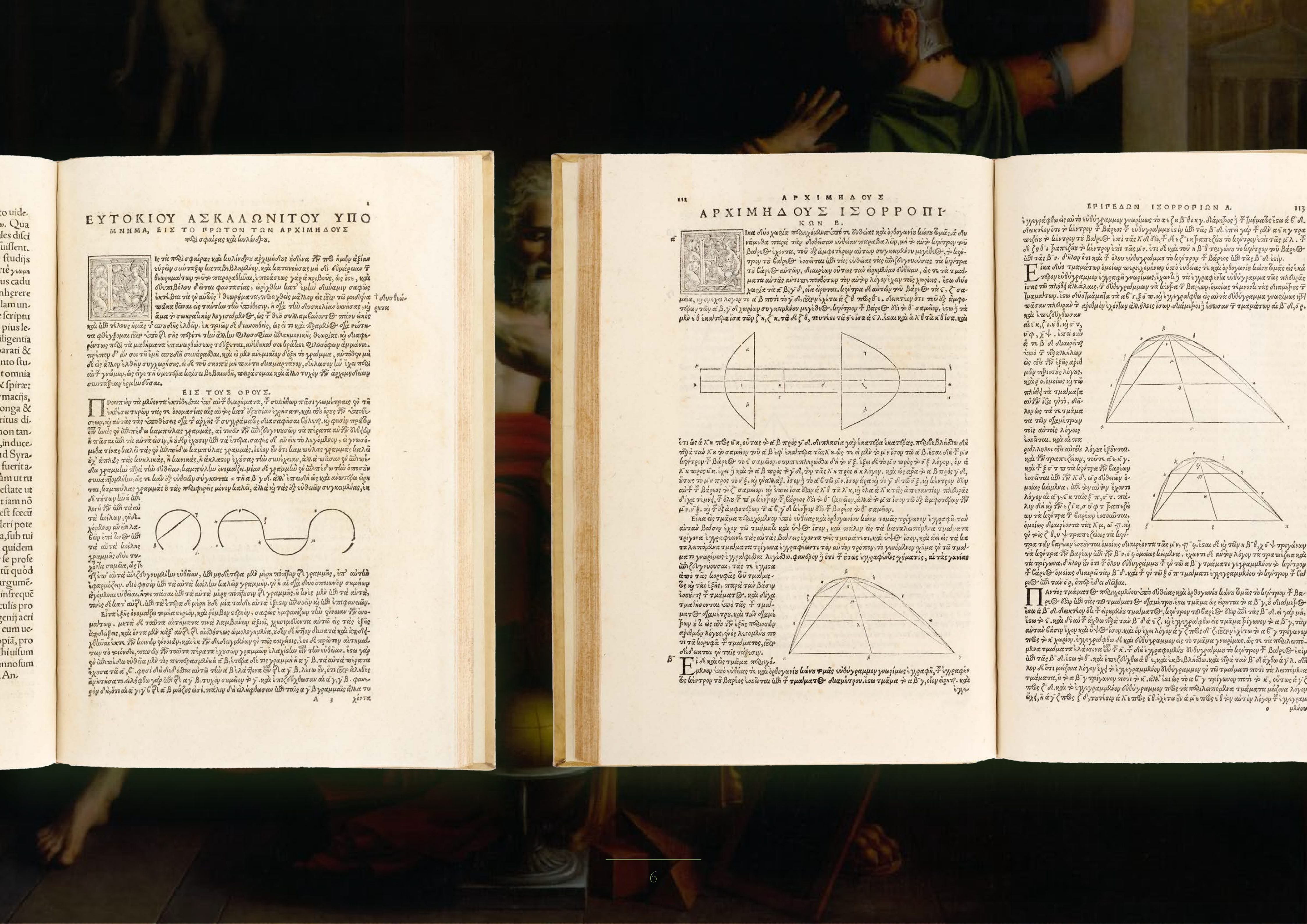


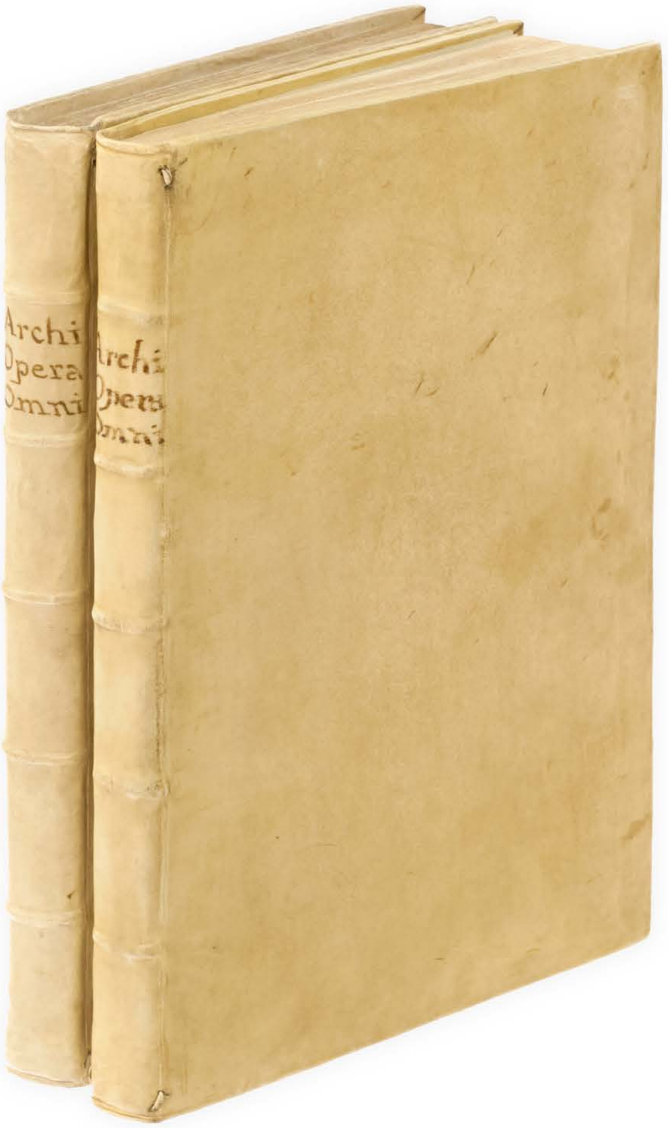
Eureka! Editio Princeps

2. ARCHIMEDES. Τα μεχρι νυν σωζομενα, απαντα ... Opera, quae quidem extant, omnia, multis iam seculis desiderata atque a quam paucissimis hactenus visa, nuncque primum & Graece & Latine in lucem edita ... Adiecta quoque sunt Eutocii Ascalonitae in eodem Archimedis libros commentaria, item Graece & Latine, nunquam antea excusa. *Basel, Johannes Herwagen,* [(*colophon*)*: March*] *1544.*

Four parts bound in two vols, folio, I: pp. [8], 139, [5], 65, [1]; II: pp. [8], 163, [1], 68, [4]; the Greek text all in vol. I and the Latin in vol. II, with Eutocius's commentary bound at the end of each relevant volume, with part titles to ††1 and A1, without blank I4, woodcut initials and diagrams, woodcut printer's device to final verso; small marginal stain to α1^{r}, marginal dampstain to lower outer corner of quire ††, a few quires slightly foxed, mostly in vol. II, small stain at foot of q2–r1; vol. II recased in eighteenth-century Italian vellum, vol. I very skilfully bound to match, manuscript titles to spine; ownership inscription 'Dom. Prof. Rom. Soc. Jesu. Catal. Inscrip. Bibliot. Cõmun.' to title of vol. II. **£45,000**

***Editio princeps* of the works of Archimedes, 'the greatest mathematician and engineer of antiquity'** (*PMM*). Prior to this edition only a small tract in Latin translation, published in 1503, and a partial translation by Tartaglia, published in 1543, had appeared.


ΕΥΤΟΚΙΟΥ ΑΣΚΑΛΩΝΙΤΟΥ ΥΠΟΜΝΗΜΑ, ΕΙΣ ΤΟ ΠΡΩΤΟΝ ΤΩΝ ΑΡΧΙΜΗΔΟΥΣ
ΕΙΣ ΤΟΥΣ ΟΡΟΥΣ.
ΑΡΧΙΜΗΔΟΥΣ
ΑΡΧΙΜΗΔΟΥΣ ΙΣΟΡΡΟΠΙΚΩΝ Β.
ΕΠΙΠΕΔΩΝ ΙΣΟΡΡΟΠΙΩΝ Α.

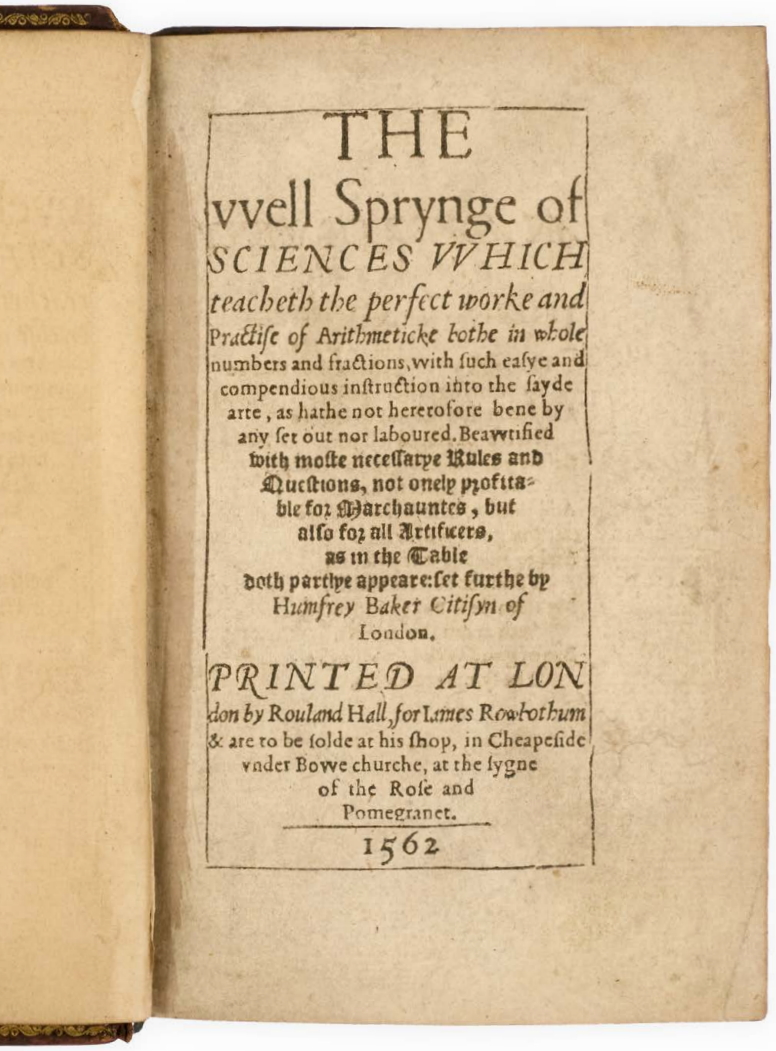


‘Archimedes – together with Newton and Gauss – is generally regarded as one of the greatest mathematicians the world has ever known, and if his influence had not been overshadowed at first by Aristotle, Euclid and Plato, the progress to modern mathematics might have been much faster. As it was, his influence began to take full effect only after the publication of this first printed edition which enabled Descartes, Galileo and Newton in particular to build on what he had begun’ (*PMM*).

The text was edited by Thomas Geschauf (or Venatorius, 1490–1551), a humanist scholar and preacher from Nuremberg and a close friend of Willibald Pirckheimer, with whom he had studied in Padua. Johann Regiomontanus had made a copy of the Jacobus Cremonensis translation of Archimedes when in Rome in the 1460s, making corrections and adding readings from other manuscripts, including a Greek manuscript owned by Cardinal Bessarion. His manuscript of the Latin Archimedes came into Pirckheimer’s possession and was then used by Geschauf for this edition.

The early sixth-century commentary by Eutocius, also provided in both Greek and Latin, gives both historical and mathematical context to the work of Archimedes.

USTC 612734; VD 16 A 3217; Adams A-1531; Dibner 137; Graesse I, p. 180; Horblit 5; *PMM* 72.



THE
vvell Sprynge of
SCIENCES VVHICH
teacheth the perfect worke and
Practiſe of Arithmeticke bothe in whole
numbers and fractions, with ſuch eaſye and
compendious inſtruction into the ſayde
arte, as hathe not heretofore bene by
any ſet out nor laboured. Beawtified
with moſte neceſſarye Rules and
Queſtions, not onely profita-
ble for Marchauntes, but
alſo for all Artificers,
as in the Table
doth partlye appeare: ſet furthe by
Humfrey Baker Citiſyn of
London.
PRINTED AT LON
don by Rouland Hall, for Lames Rowlothum
& are to be ſolde at his ſhop, in Cheapeſide
vnder Bowe churche, at the ſygne
of the Roſe and
Pomegranet.
1562

Mercantile Arithmetic and Mathematical Games

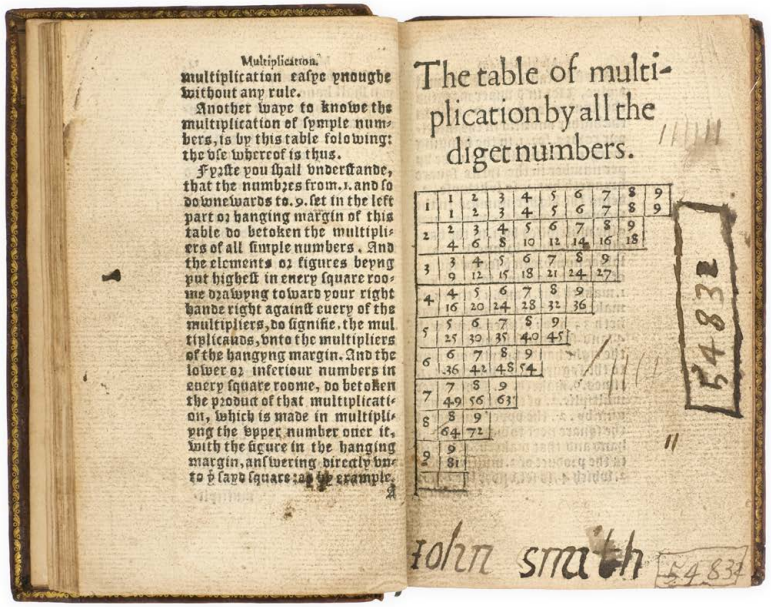
3. BAKER, Humfrey. The Well Sprynge of Sciences which teacheth the perfect Worke and Practise of Arithmeticke bothe in whole Numbers and Fractions, with such easye and compendious Instruction into the sayde Arte, as hathe not heretofore been by any set out nor laboured. Beawtified with most necessarye Rules and Questions, not onely profitable for Marchaunts, but also for all Artificers, as in the Table doth partlye appeare … *London, Roland Hall for James Rowbotham, 1562.*

Small 8vo, ff. [4], 160; somewhat dusty throughout, a few stains, withal a very good copy, bound in early nineteenth-century panelled calf; joints rubbed, spine chipped at head, light wear to corners; faded annotation to f. a3^{r}, sums in an early hand to *c.* 5 pp., early inscription 'John Smith' on f. 15; armorial bookplate of the Duke of Sussex, inscription to front endpaper 'Presented by E. Ryley Esqr'.

£35,000

The extremely rare first edition (one of two copies in ESTC) of a very popular guide to arithmetic by the London schoolteacher and almanack-maker Humfrey Baker (*fl.* 1557–87).

The work went through at least nine further editions in the sixteenth century (some revised), and remained in print throughout the seventeenth, the later editions known simply as *Baker's Arithmetic*. 'For a long time Baker's arithmetic was the only English rival to Recorde's *Ground of Artes*, and it was in many respects better than that popular work' (Smith). Its success was largely due to its practical appeal to merchants.



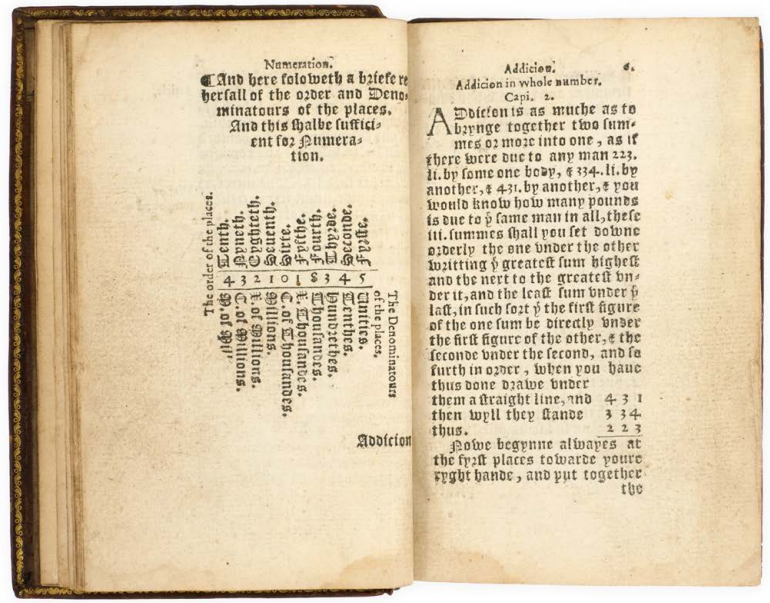
Multiplication.

multiplication eaſye ynoughe without any rule.

Another waye to knowe the multiplication of ſymple numbers, is by this table folowing: the vſe wherof is thus.

Fyrſte you ſhall vnderſtande, that the numbres from .1. and ſo downewards to .9. ſet in the left part or hanging margin of this table do betoken the multipliers of all ſimple numbers. And the elements or figures beyng put higheſt in euery ſquare roome drawyng toward your right hande right againſt euery of the multipliers, do ſignifie the multiplicands, vnto the multipliers of the hangyng margin. And the lower or inferiour numbers in euery ſquare roome, do betoken the product of that multiplication, which is made in multiplying the vpper number ouer it, with the figure in the hanging margin, anſwering directly vnto ꝑ ſayd ſquare: as by exemple.

The table of multiplication by all the diget numbers.



Numeration.

And here foloweth a briefe rehearſall of the order and Denominatours of the places. And this ſhalbe ſuffycient for Numeration.

The order of the places.

4	3	2	1	0	1	2	3	4
Tenth.	Vnyth.	Hundreth.	Thouſande.	Tenthouſande.	Hundrethouſande.	Millions.	Tenmillions.	Hundremillions.
Seuenth.	Sixte.	Fyfthe.	Fourth.	Thyrde.	Seconde.	Fyrſte.		

The Denominatours of the places.

4	3	2	1	0	1	2	3	4
Hundremillions of millions.	Tenmillions of millions.	Millions of millions.	Hundrethouſandes of millions.	Tenthouſandes of millions.	Thouſandes of millions.	Hundreths of millions.	Tenths of millions.	Vnities.

Addicion

Addicion. 6.

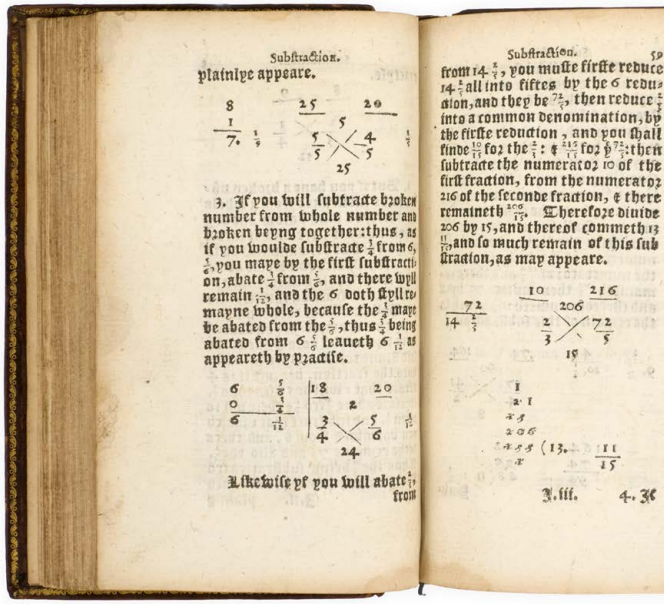
Addicion in whole number.

Capi. 2.

Addicion is as muche as to bryngе together two ſummes or more into one, as if there were due to any man 223. li. by ſome one body, & 334. li. by another, & 431. by another, & you would know how many pounds is due to ꝑ ſame man in all, theſe iii. ſummes ſhall you ſet downe orderly the one vnder the other writting ꝑ greateſt ſum higheſt and the nert to the greateſt vnder it, and the leaſt ſum vnder ꝑ laſt, in ſuch ſoꝛt ꝑ the firſt figure of the one ſum be directly vnder the firſt figure of the other, & the ſeconde vnder the ſeconde, and ſo furth in ordꝛ, when you haue thus done drawe vnder them a ſtraight line, and then wyll they ſtande thus.

4 3 1	
3 3 4	
2 2 3	

Nowe begynne alwayes at the fyrſt places towarde youre ryght hande, and put together the



Subſtraction.

plaineye appeare.

3. If you will ſubtracte broken number from whole number and broken beyng together: thus, as if you woulde ſubtracte ½ from 6, ⅓, you maye by the firſt ſubſtraction, abate ½ from ⅚, and there wyll remain 1/12, and the 6 doth ſtyll remayne whole, because the ½ maye be abated from the ⅚, thus ½ being abated from 6 ⅚ leaueth 6 1/12 as appeareth by practiſe.

Likewiſe yf you will abate ⅔ from

Subſtraction. 59

from 14 ⅔, you muſte firſte reduce 14 ⅔ all into fiftes by the 6 reduction, and they be 72/5, then reduce ⅔ into a common denomination, by the firſte reduction, and you ſhall finde 10/15 for the ⅔: & 215 for ꝑ 72/5: then ſubtracte the numerator 10 of the firſt fraction, from the numerator 216 of the ſeconde fraction, & there remaineth 206/15. Therefore diuide 206 by 15, and thereof commeth 13 11/15, and ſo much remain of this ſubſtraction, as may appeare.

J. iii. 4. 3€

In his dedication to the Merchant Adventurers, Baker refers to his subject – in an obvious nod to Robert Recorde's 1557 *Whetstone of Witte* (*see item 59*) – as 'the best whetstone, or sharpening of the wit of every man that was ever invented, and … most necessarye to bee taught to unto children'. After dealing with basic arithmetic of integers and fractions, and providing lists of questions, Baker turns in Part Three to 'rules of practise … profitable for Marchaunts', with problems devoted in particular to 'lengths and breadthes of tapistrie', barter, fellowship, alligation, and 'false position'.

Chapter 15 in the Third Part 'treateth of sportes, and pastime, done by number', with 'some of the first pieces of recreational mathematics to be printed in England' (Wardhaugh, *A Wealth of Numbers* (2012), p. 2). They include games that allow you to correctly identify a number that 'any man may thinke of or imagine in his minde, as though you coulde devine', and the numbers rolled on three hidden dice.

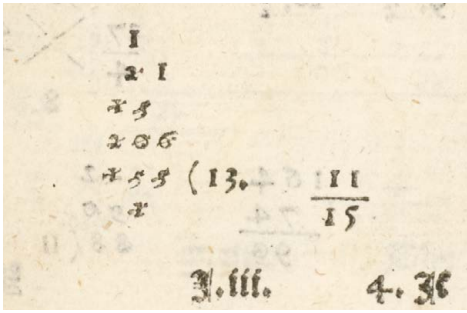
All early editions of Baker's arithmetic are very rare: none of the first eight editions are known in more than three copies, and the edition of 1591 is the only one to appear in auctions records; of this first edition there is only one other recorded copy, at UCL.

Provenance:

1. Augustus Frederick, Duke of Sussex (1773–1843), son of George III, whose celebrated library of fifty thousand books and manuscripts was sold by Messrs Evans in six parts in 1844–5 (this sold as part of Part VI, lot 28).

2. Presentation inscription of Edward Ryley (d. 1896), 'one of the ablest and most zealous of Cardinal Wiseman's lay coadjutors in obtaining equal rights for Catholics' (obituary in *The Tablet*).

ESTC S90366; STC 1209.5; Smith, *Rara Arithmetica,* p. 327.

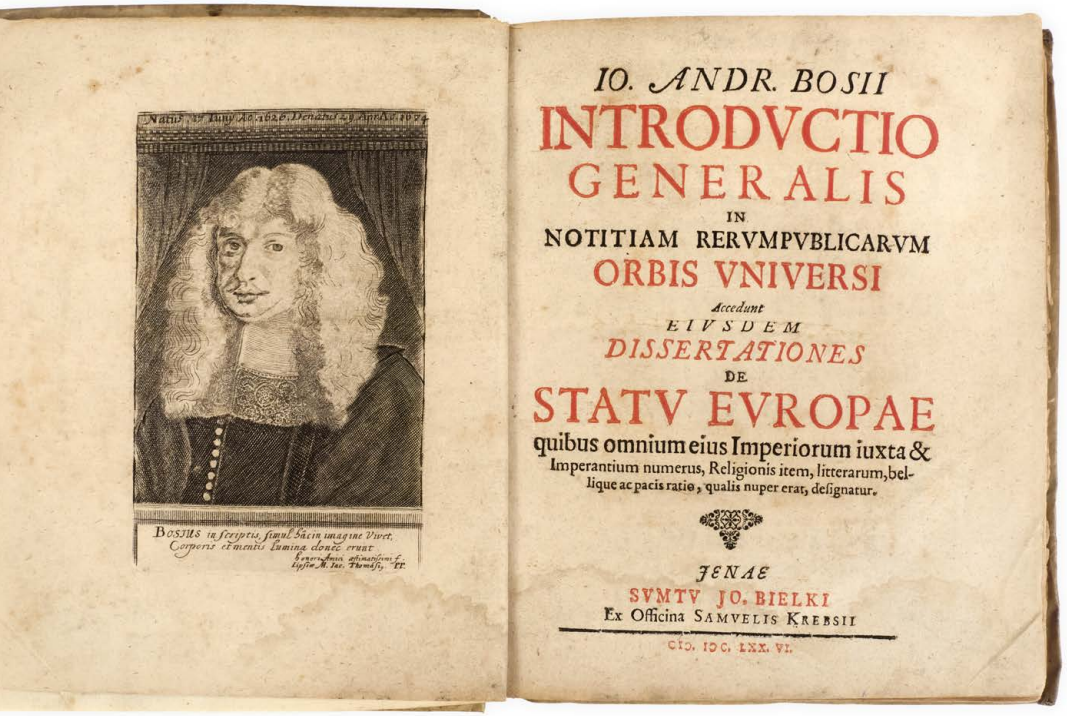


4. BOSE, Johann Andreas. Io. Andr. Bosii introductio generalis in notitiam rerumpublicarum orbis universi. Accedunt eiusdem dissertationes de statu Europae quibus omnium eius imperiorum iuxta et imperantium numerus, religionis item, litterarum, bellique ac pacis ratio, qualis nuper erat, designatur. *Jenae, Johann Bielke, 1676.*

4to, pp. [xvi], 370, [22]; title in red and black, engraved frontispiece portrait of the author; some browning due to paper stock, a few light water stains, but a very good copy in contemporary vellum; upper joint partly split, boards slightly bowed; 'Gunnar Fabritius Norregaard 1903' inscribed to front free endpaper.

£1500

First edition of a pioneering work of statistics and rare Americanum, by the philosopher and historian Johann Andreas Bose (1624–1674).

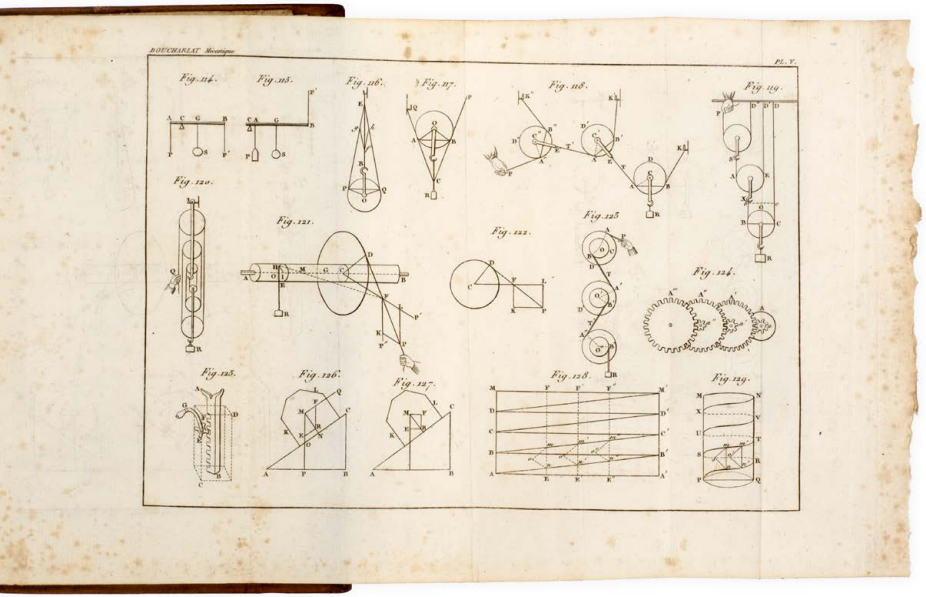

IO. ANDR. BOSII
INTRODVCTIO
GENERALIS
IN
NOTITIAM RERVMPVBLICARVM
ORBIS VNIVERSI
Accedunt
EIVSDEM
DISSERTATIONES
DE
STATV EVROPAE
quibus omnium eius Imperiorum iuxta &
Imperantium numerus, Religionis item, litterarum, bel-
lique ac pacis ratio, qualis nuper erat, designatur.
IENAE
SVMTV IO. BIELKI
Ex Officina SAMVELIS KREBSII
CIↃ. IↃC. LXX. VI.

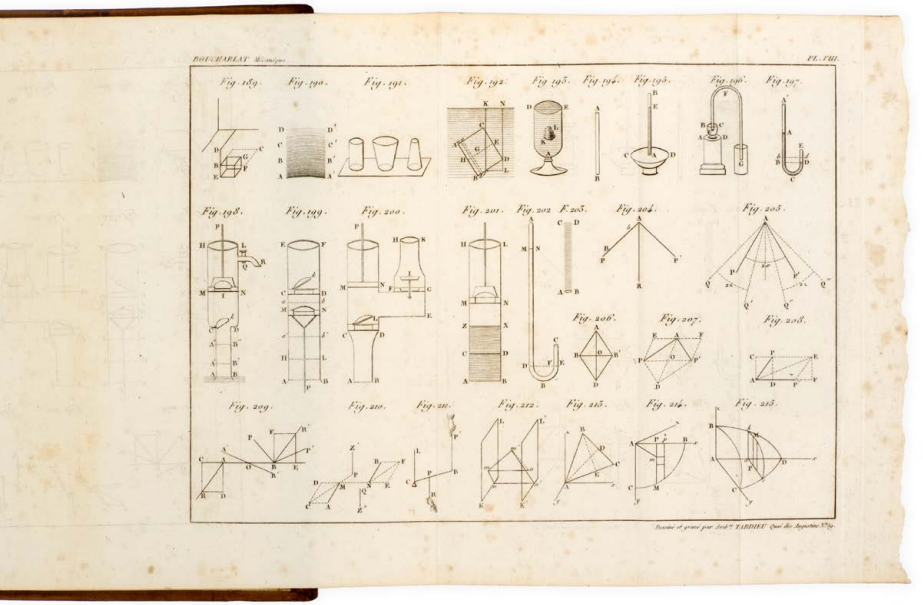
Bose's crucial intuition as a student of human societies lies in his advocacy of interdisciplinary investigations. His work 'on all the states in the world' marshalls data and outlooks ranging from geography to economics and trade, politics, history, sciences, and religion, and includes several remarks about the age of discoveries, particularly noting the impact of the Europeans' encounter with America.

The book is of considerable theoretical importance, as it sets out a specific status for the discipline of statistics within the realm of the human sciences. Bose 'analyzes the differences between the universality of politics (constitutional doctrine) and the singularities of history. Statistics, Bose reasons, is therefore not part of political philosophy, since it does not manifest itself in the discussion of constitutional law as applied to a given state. Nor can statistics be classed as a genus of history writing, which 'represents individual state actions with the details of time, space, social condition, character and other circumstances [...] Instead, statistics bestows a "more general treatment" [...] on the details of history. [It] represents the concerns of individual states "principally from a universal point of view and not tied to this or that point in time or these or those specific persons". In accordance with the famous formula from Aristotle's Poetics, which claims that poetry, in the medium of probability, brings the singularities of history closer to the universality of philosophy, statistics is poetical. Statistics is the poetry of the state' (R. Campe, *The Game of probability. Literature and calculation from Pascal to Kleist*, Stanford University Press, 2013, p. 244).

Not all of Bose's works passed muster with censorship. Yet his career at Jena was a success: after holding of the chair of history for seven years, counting Leibniz and Pufendorf among his most illustrious pupils, he became rector in the same University.

Not in Sabin, not in Brunet. See Robert Horvath, 'La France en 1618 vue par un statisticien hongrois, Márton Szepsi Csombor', in: 'Population', 40e année, n°2, (1985) pp. 335–346.





Mastering Mechanics

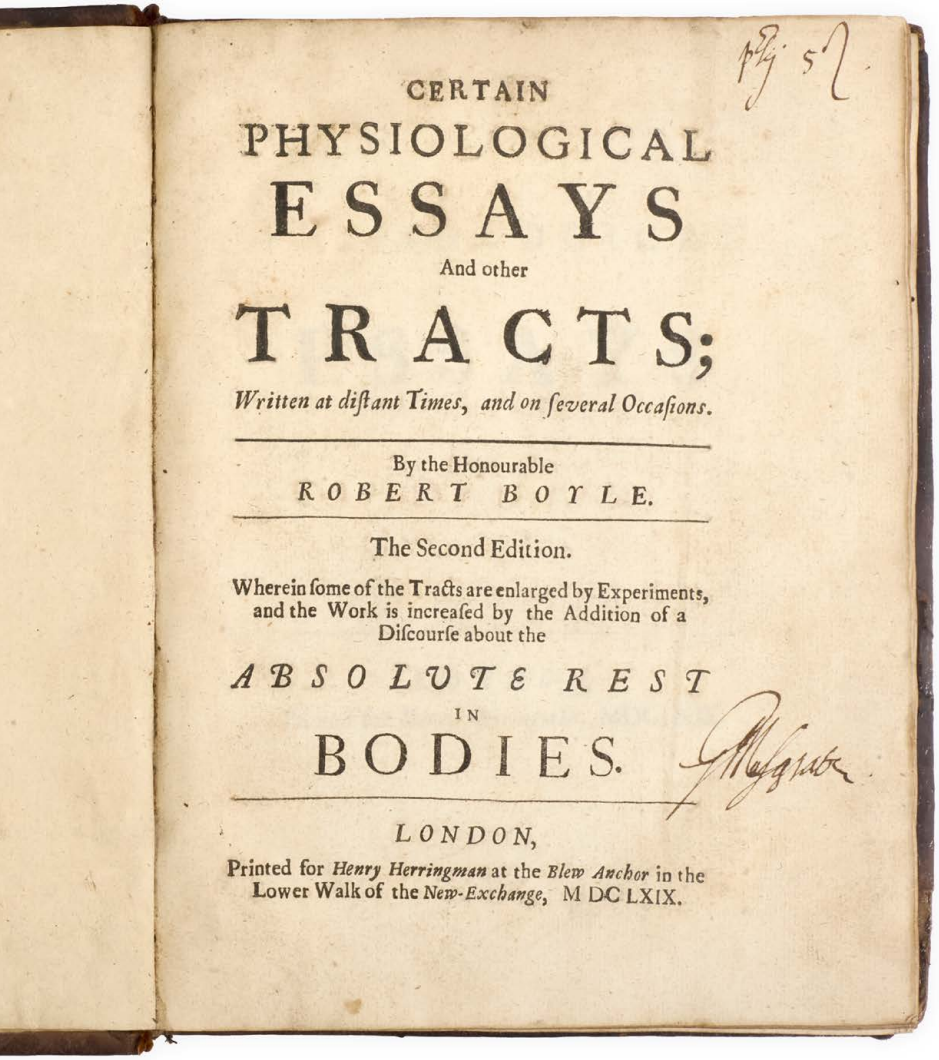
5. BOUCHARLAT, Jean-Louis. Élémens de mécanique ... *Paris, 'chez Mme Ve Courcier', 1815.*

8vo, pp. xv, [1], 328, with 8 folding engraved plates at the end; occasional light spotting; a very good copy in contemporary calf, flat spine decorated in gilt with lettering-piece, marbled endpapers; some wear to joints and corners; prize inscription to front flyleaf 'Collège de Nivelles Mécanique Prix de supériorité, Glibert [*sic*], Auguste, de Nivelles 1835' with ink stamp. **£450**

First edition of an introduction to mechanics, illustrated with over two hundred diagrams, by Jean-Louis Boucharlat (1773–1848), printed by Victoire-Félicité Courcier.

Boucharlat, a native of Lyon, taught mathematics at the royal military school of La Flèche, his expertise in mathematics, physics, and astronomy earning him a doctorate and membership of the Académie des Sciences; he turned his hand to poetry too. His *Éleméns* is divided into three parts, tackling statics, dynamics, and fluid mechanics. The plates at the end of the volume – showing geometrical diagrams, pulleys, gears, and pumps – are the work of the engraver and cartographer Ambroise Tardieu (1788–1841). This copy was awarded as a prize for 'superiority' in mechanics at the college of Nivelles in Belgium.

Victoire-Félicité Courcier (*née* Lemaire, d. 1821) was the wife of the Parisian printer Louis Courcier (who began his career selling rabbit skins) and took over the business upon being widowed in 1811. The imprint here describes her as 'imprimeur-libraire pour les mathématiques', and she specialised in printing educational works on geography, algebra, geometry, astronomy, and, as here, mechanics. Her output was impressive: Arbour records that she printed eight to ten works per month in 1815–16. She was clearly ambitious too, acquiring equipment from several other printing businesses. In 1820 she sold her printing house to her son-in-law Démophile Huzard, but retained control of her bookshop, which in 1821, due to ill health, she was obliged to sell to another son-in-law, Victor Bachelier.



CERTAIN
PHYSIOLOGICAL
ESSAYS
And other
TRACTS;
Written at distant Times, and on several Occasions.

By the Honourable
ROBERT BOYLE.

The Second Edition.

Wherein some of the Tracts are enlarged by Experiments, and the Work is increased by the Addition of a Discourse about the
ABSOLUTE REST
IN
BODIES.

LONDON,
Printed for *Henry Herringman* at the *Blew Anchor* in the Lower Walk of the *New-Exchange*, M DC LXIX.

A Prologue to the Sceptical Chymist

6. BOYLE, Robert. Certain physiological Essays and other Tracts; written at distant Times, and on several Occasions. The second Edition. Wherein some of the Tracts are enlarged by Experiments, and the Work is increased by the Addition of a Discourse about the absolute Rest in Bodies. *London, Henry Herringman, 1669.*

4to, [viii], 292, [4], 30, [2, blank]; title-page and a few upper margins dust-soiled, otherwise a very good copy; in contemporary mottled, panelled sheep, corners bumped, small patches of insect damage to covers; ownership inscription and purchase note to title 'G Musgrave' (*see below*). **£1500**

Second edition in English, enlarged. 'The importance of the *Essays* [first 1661] lies in the fact that in a very real sense it was a "prologue" to the more widely known *Sceptical Chymist* since it continued the attack on the alchemists begun in *New Experiments*, and actually it was as much of **a landmark in the history of chemistry**. In the *Essays* Boyle gives **the first clear outline of his corpuscular hypothesis concerning the nature of matter**' (Fulton). The new additions to this edition were to have been indicated by parenthesis, but these being 'by an oversight of the Press, omitted', Boyle provides a list of the main changes in a new Advertisement.

Provenance:
George Musgrave (1648–1721), of Nettlecombe, Somerset, who may have known Boyle through his brother, the physician and antiquary William Musgrave (1655–1721, Fellow of the Royal Society, for which he acted as secretary and editor of the *Philosophical Transactions* in 1685). George Musgrave, who studied at Exeter College, Oxford, and then qualified as a barrister, was a friend of Edward and Mary Clarke, the friends and correspondents of John Locke – his son later married their daughter. Like his brother William (who had a large collection of works by Boyle in his library, sold in Exeter in 1725), he seems to have combined legal and medical training.

ESTC R17579; Wing B3930; Fulton 26.

7. BOYLE, Robert. Tractatus ... Ubi 1. Mira aëris ... rarefactio detecta. 2. Observata nova circa durationem virtutis elasticae aeris expansi. 3. Experimenta nova de condensatione aeris, solo frigore facta; ejusque compressione sine machinis. 4. Ejusdem quantitatis aeris rarefacti & compressi mire discrepans extensio. *London, Henry Herringman, 1671* [*but printed abroad?*].

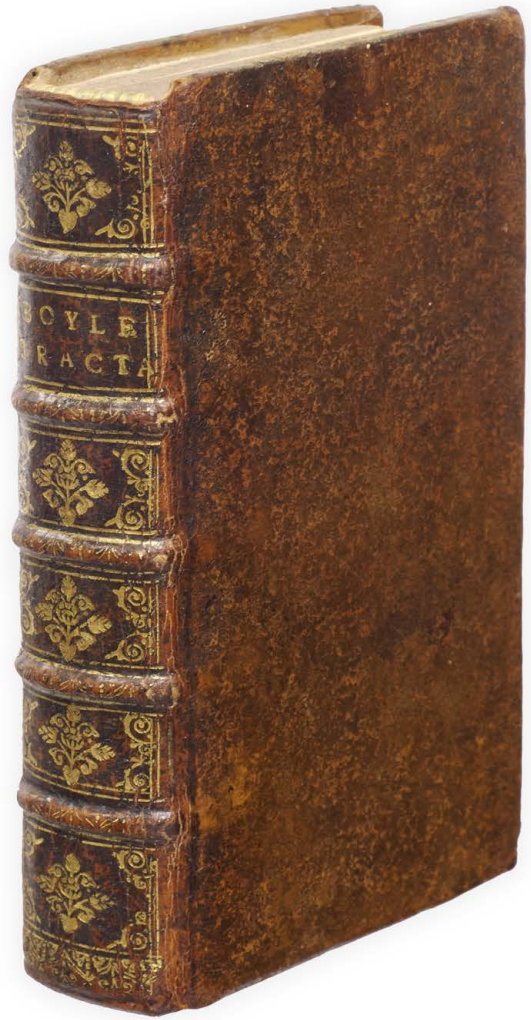
[*bound with*:]

BOYLE, Robert. Tractatus de cosmicis rerum qualitatibus; De cosmicis suspicionibus; De temperie subterranearum regionum; De temperie submarinarum regionum; De fundo maris. Quibis praemittitur introductio ad historiam qualitatum particularium. Accedit denique Tractatus de absoluta quiete in corporibus. Omnia ex anglica in latinam linguam conversi. *Amsterdam, Joannes Janssonius van Waesberghe, and Hamburg, Gotffried Schultze, 1671.*

Two works bound in one volume, 12mo, *Tractatus ubi mira aëris*: pp. 71, with a woodcut ornament on the title and woodcut head- and tailpieces; *Tractatus de cosmicis rerum qualitatibus*: pp. [xii], 60, 40, 42, 64, 30, 24, [3], [1, blank], '57' [*recte* 58], general title printed in red and black, with one woodcut initial; good copies in contemporary calf, spine gilt; extremities rubbed, head of spine slightly chipped, two short splits in upper joint. **£1750**

I. **Second edition, very scarce.** The first edition, published the year before, is known in less than half a dozen copies. An English translation also appeared in 1671.

'This, the briefest of Boyle's separately published works, contains a series of observations upon the influence of temperature and pressure on the size of air bubbles in water. After arriving at the law of pressures Boyle was quick to appreciate that temperature influenced the state of expansion of a gas. The observations recorded in the present tract were carried out in the year 1662. His deductions are ingenious, and they represent an important step toward the further elucidation of the gas laws' (Fulton).

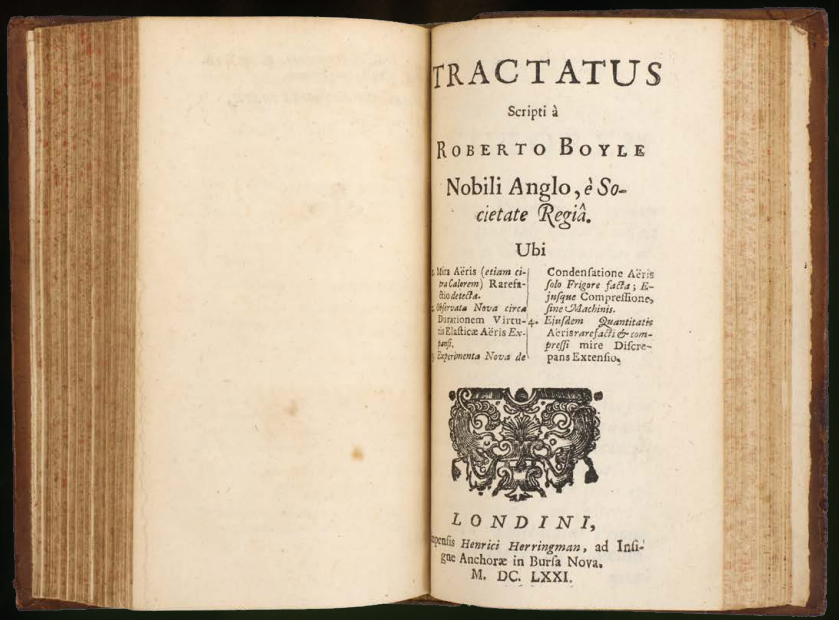


II. **First Latin edition**; first published in English earlier the same year. This is the issue with the added essay 'De absoluta quiete in corporibus', first published in English ('Absolute rest in bodies') in the second edition of *Certain Physiological Essays* (1669).

'In the first tract of the present collection – a sequel to '*Formes and Qualities*' – Boyle deals with possible objections to his doctrine concerning the nature of matter … . The view set forth in this essay is … considerably in advance of that elucidated in the *Sceptical Chymist* or in '*Formes and Qualities*' and it may well be looked upon as one of the important milestones in the history of the theories of chemical combination. The tract incidentally contains further observations on the change of colour of vegetable extracts when their reaction is changed from acid to alkali' (Fulton).

I. Fulton 91A (the variant without the line 'Juxta Exemplar impressum' in the title); USTC 3089576; Wing B4052. The Cambridge University Library online catalogue plausibly postulates 'Imprint false? Probably printed abroad'. Krivatsy 1691 records the first edition.

II. Fulton 87, noting a copy belonging to Geoffrey Keynes (now in Cambridge University Library) which had the *Tractatus ubi mira aëris* bound in before N1 as in our copy; USTC 1807752; VD17 3:622726G. This edition not in Krivatsy.



TRACTATUS

Scripti à

ROBERTO BOYLE

Nobili Anglo, è Societate Regiâ.

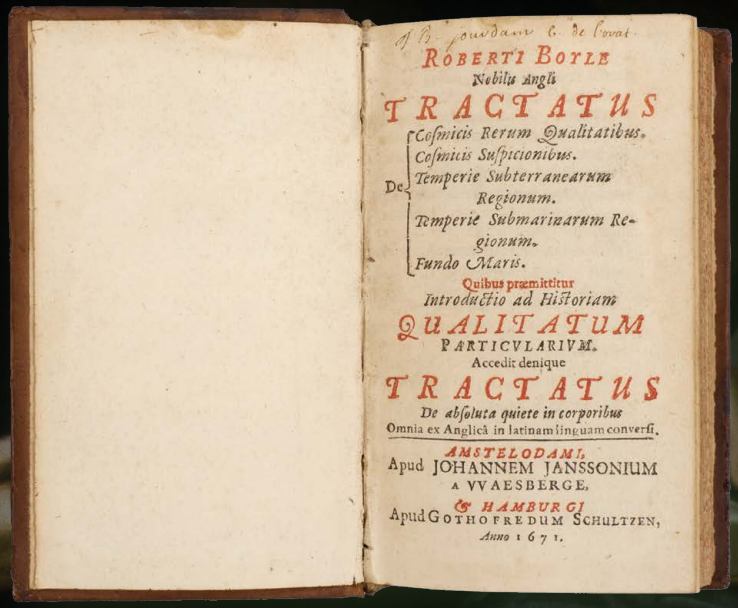
Ubi

Mira Aëris (etiam ciṫra Calorem) Rarefactio detecta.
Observata Nova circa Dilatationem Virtutis Elasticæ Aëris Extensi.
Experimenta Nova de Condensatione Aëris solo Frigore facta; Ejusque Compressione, sine Machinis.
Eiusdem Quantitatis Aëris rarefacti & compressi mire Discrepans Extensio.

LONDINI,

Impensis Henrici Herringman, ad Insigne Anchoræ in Burſa Nova.

M. DC. LXXI.



ROBERTI BOYLE

Nobilis Anglí

TRACTATUS

De
Cosmicis Rerum Qualitatibus.
Cosmicis Suspicionibus.
Temperie Subterranearum Regionum.
Temperie Submarinarum Regionum.
Fundo Maris.

Quibus præmittitur

Introductio ad Historiam

QUALITATUM

PARTICULARIUM.

Accedit denique

TRACTATUS

De absoluta quiete in corporibus

Omnia ex Anglicâ in latinam linguam conversi.

AMSTELODAMI,

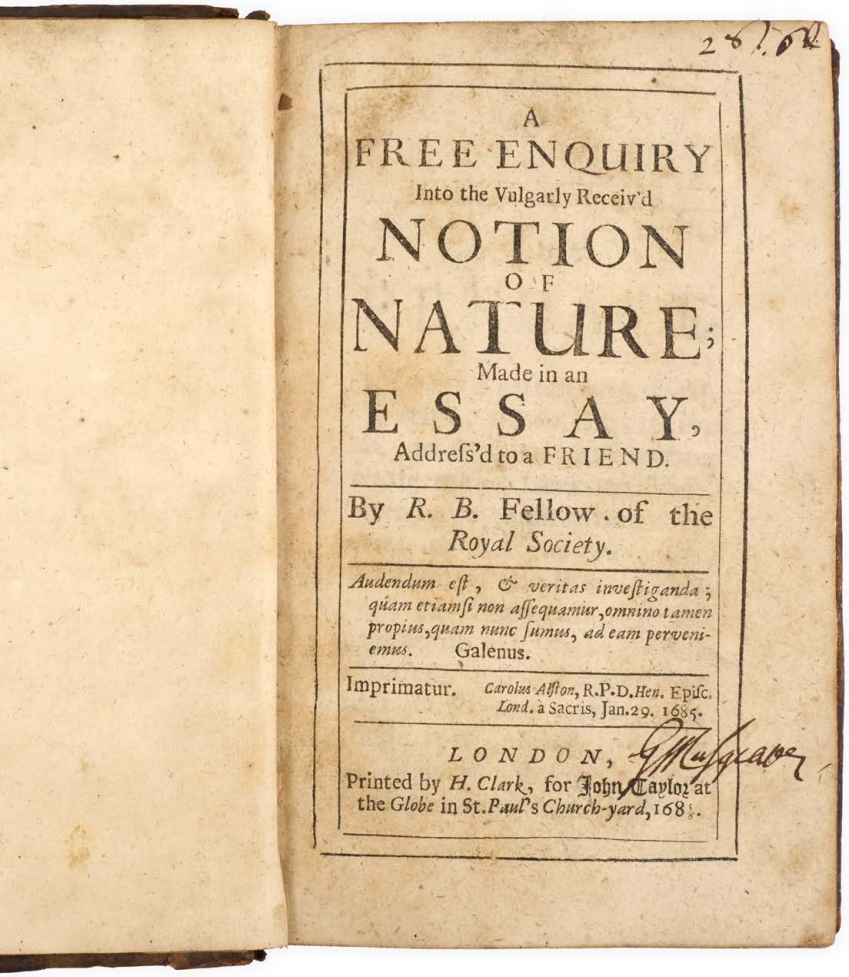
Apud JOHANNEM JANSSONIUM

A VVAESBERGE,

& HAMBURGI

Apud GOTHOFREDUM SCHULTZEN,

Anno 1671.



A
FREE ENQUIRY
Into the Vulgarly Receiv'd
NOTION
OF
NATURE;
Made in an
ESSAY,
Addreſs'd to a FRIEND.

By *R. B.* Fellow of the *Royal Society.*

Audendum eſt, & veritas inveſtiganda; quam etiamſi non aſſequamur, omnino tamen propius, quam nunc ſumus, ad eam perveniemus. Galenus.

Imprimatur. *Carolus Alſton*, R.P.D. *Hen.* Epiſc. *Lond.* à Sacris, Jan. 29. 1685.

LONDON,
Printed by *H. Clark*, for John Taylor at the *Globe* in St. *Paul's Church-yard*, 168⅝.

The Laws of Motion

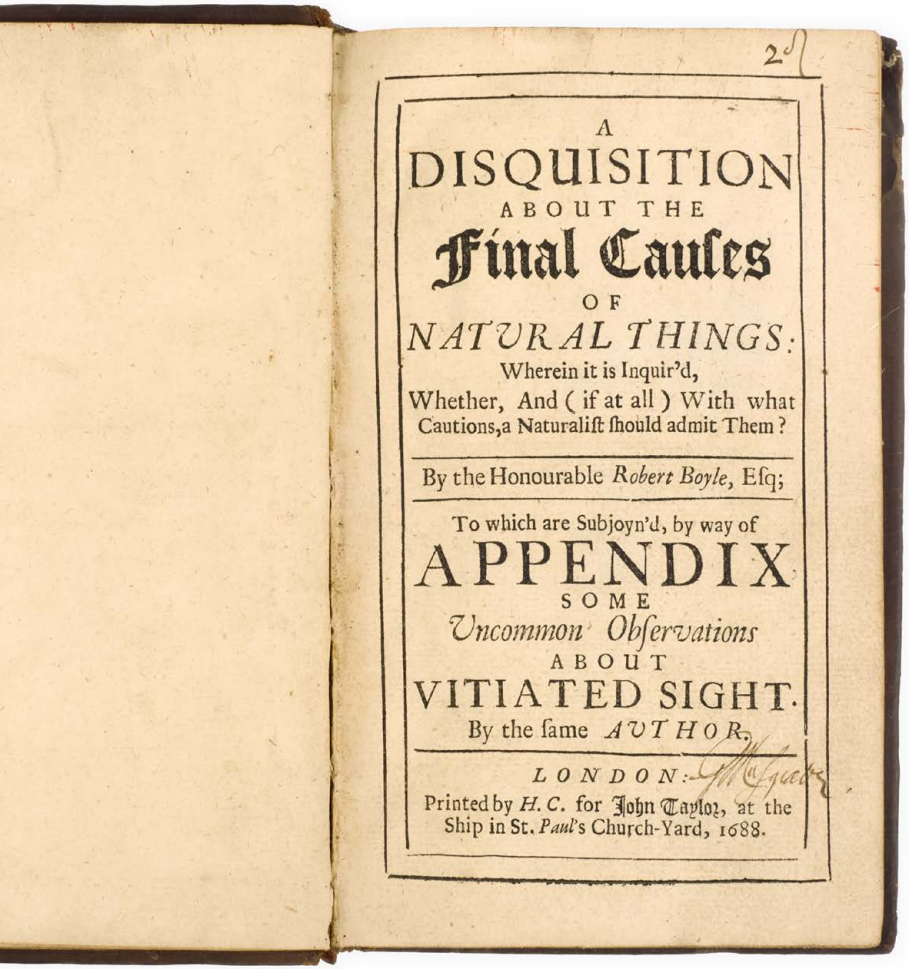
8. BOYLE, Robert. A Free Enquiry into the vulgarly receiv'd Notion of Nature; made in an Essay, address'd to a Friend … *London, H. Clark for John Taylor, 1685/6.*

8vo, pp. [26], 412, [2, advertisements and errata], [2, blank]; with the scarce 'Advertisement' leaf inserted after a4; slightly foxed and dusty at the front, else a good copy; in contemporary sheep, rubbed; head- and tailcaps chipped, edges rubbed; ownership inscription and purchase note to title 'G Musgrave'. **£1250**

First edition. 'After thirty years of experimentation and observation of natural phenomena Boyle appears in this thoughtful treatise to have reached his maturity as a philosopher … The book deals with the laws of motion … He tells us that the current views of Nature were incompatible both with religion and philosophy' (Fulton).

Provenance:
George Musgrave (1648–1721), of Nettlecombe, Somerset, who may have known Boyle through his brother, the physician and antiquary William Musgrave (1655–1721, Fellow of the Royal Society, for which he acted as secretary and editor of the *Philosophical Transactions* in 1685). George Musgrave, who studied at Exeter College, Oxford, and then qualified as a barrister, was a friend of Edward and Mary Clarke, the friends and correspondents of John Locke – his son later married their daughter. Like his brother William (who had a large collection of works by Boyle in his library, sold in Exeter in 1725), he seems to have combined legal and medical training.

ESTC R11778; Wing B3979; Fulton 170.



A
DISQUISITION
ABOUT THE
Final Causes
OF
NATURAL THINGS:
Wherein it is Inquir'd,
Whether, And (if at all) With what
Cautions, a Naturalist should admit Them?

By the Honourable *Robert Boyle*, Esq;

To which are Subjoyn'd, by way of
APPENDIX
SOME
Uncommon Observations
ABOUT
VITIATED SIGHT.
By the same *AUTHOR*.

LONDON:
Printed by *H. C.* for John Taylor, at the
Ship in St. *Paul*'s Church-Yard, 1688.

9. BOYLE, Robert. A Disquisition about the final Causes of natural Things: wherein it is inquir'd, whether, and (if at all), with what Cautions, a Naturalist should admit them? ... To which are subjoyn'd, by Way of Appendix some uncommon Observations about vitiated Sight ... *London, H. C. for John Taylor, 1688.*

8vo, pp. [xvi], 96, 81–112, 129–274, [2, errata], [4, advertisements]; a fine copy; in contemporary speckled calf, edges slightly rubbed, small chip at foot of spine; ownership inscription to title-page 'GMusgrave'. **£750**

First edition, second issue, with Boyle's name in full on the title-page. 'Boyle is just revered as an enthusiastic early protagonist of the experimental method ... [but] he recognized the limitations of experiment and wrote widely upon the philosophical implications of scientific investigation ... In the "*Final Causes of Natural Things*" Boyle takes us into his confidence and gives us briefly his *confession fidei* as a biologist'. The treatise 'is essentially a plea for a teleological interpretation of natural phenomena ... and there are many references to physiology; perhaps the most interesting is the record of a conversation with William Harvey on how he discovered the circulation of blood' (Fulton).

The Appendix is on disturbances of vision including cataracts, with fourteen case histories.

ESTC R11832; Wing B3946; Fulton 186A.

A System of Axioms for Probability

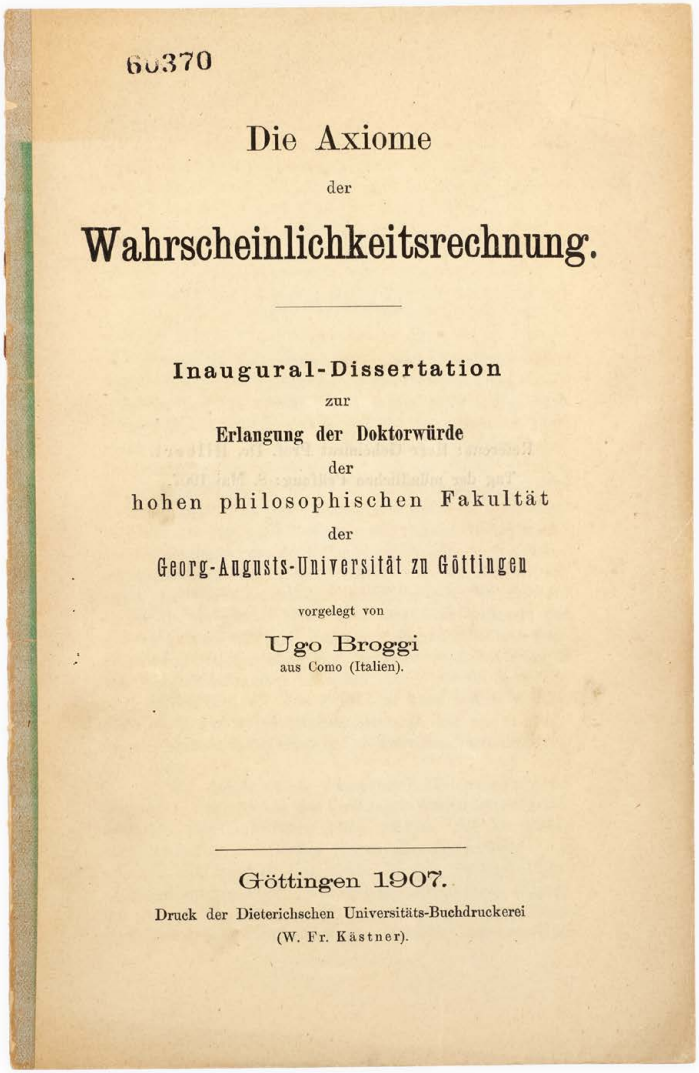
10. BROGGI, Ugo. Die Axiome der Wahrscheinlichkeitsrechnung. *Göttingen, Dieterischen Universitäts-Buchdruckerei, 1907.*

8vo, pp. 32, [2]; a very good copy, sewn as issued, paper back strip mostly split, number stamp to the head of the title page. **£200**

Rare first edition of this doctoral dissertation on the solution of Hilbert's sixth problem, written under the supervision of David Hilbert. The problem posed tried to axiomatize those branches of science in which mathematics is prevalent. Broggi here aims to establish a system with which to prove the consistency, completeness and the mutual independence of the axioms, following the model of Hilbert's geometry.

Broggi (1880–1865) is one of the neglected figures in modern mathematical economics, an eminent academician, he held office in various seats at different institutions, producing numerous works.

Schneider, *Entwicklung der Wahrscheinlichkeitstheorie, 367 ff*.


60370

Die Axiome

der

Wahrscheinlichkeitsrechnung.

Inaugural-Dissertation

zur

Erlangung der Doktorwürde

der

hohen philosophischen Fakultät

der

Georg-Augusts-Universität zu Göttingen

vorgelegt von

Ugo Broggi

aus Como (Italien).

Göttingen 1907.

Druck der Dieterichschen Universitäts-Buchdruckerei

(W. Fr. Kästner).

Accomplished Amateur Astronomer

11. BULLA, Paolo. Notizie intorno all'osservatorio privato di Paolo Bulla. *Rome, Tipografia della R. Accademia dei Lincei, 1885.*

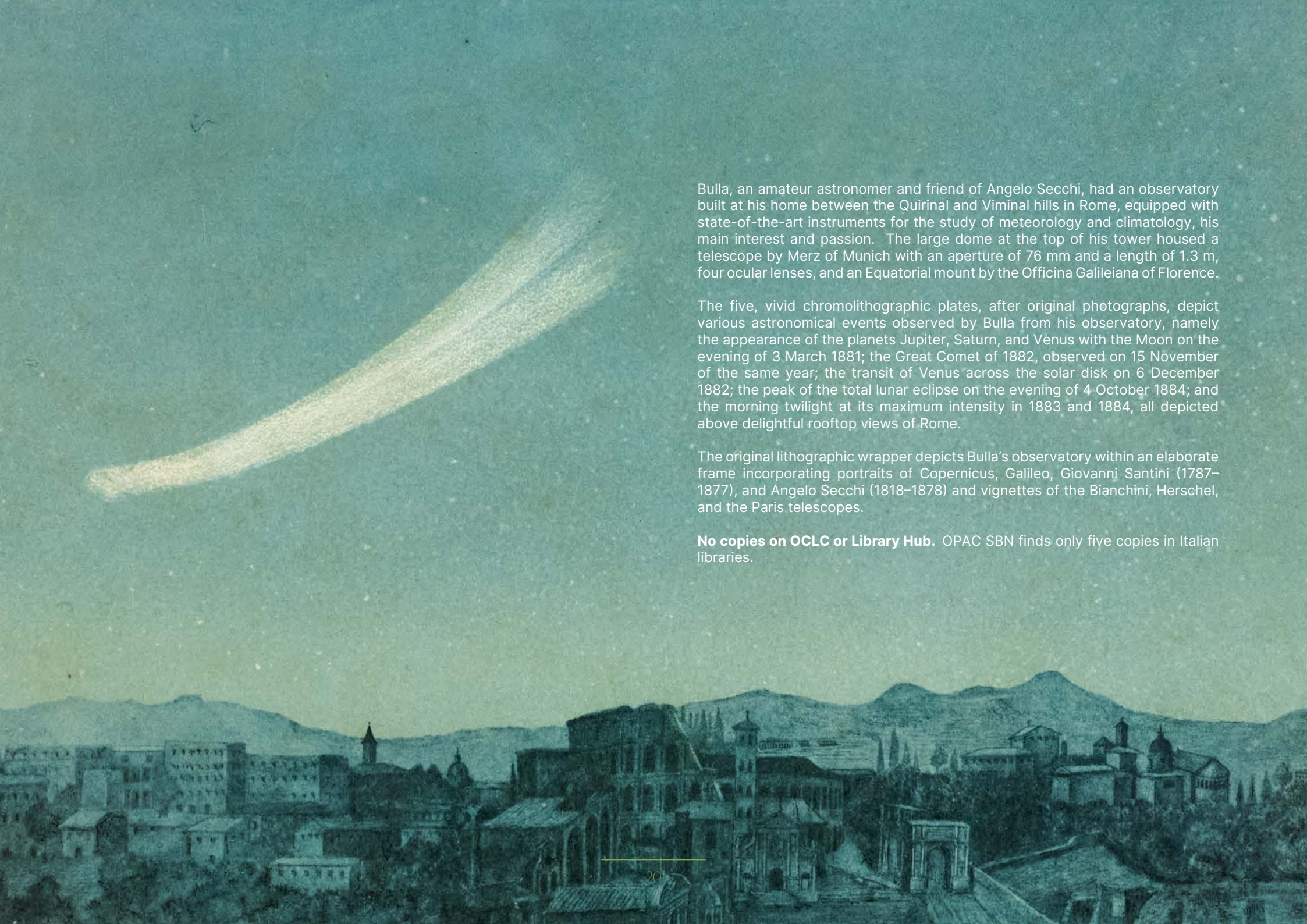
Large 4to, pp. 7, [1, blank], with 5 chromolithographic plates; slight marginal dampstaining to plates and title; else a very good copy; bound in the original lithographic wrappers, (*see below*); slight marginal dampstaining and fraying, spine chipped and worn. **£1250**

First and only edition, very rare, of this description of Paolo Bulla's private observatory, illustrated with five striking chromolithographic plates depicting astronomical events observed by Bulla in the sky above Rome, printed by the Accademia dei Lincei.

OSSERVATORIO PRIVATO DEL SIG.r PAOLO BULLA AL VIMINALE

APPARENZE CREPUSCOLARI MATTUTINE NELLA MASSIMA INTENSITÁ

negl'anni 1883 e 1884 osservate dal Sig.r PAOLO BULLA



Bulla, an amateur astronomer and friend of Angelo Secchi, had an observatory built at his home between the Quirinal and Viminal hills in Rome, equipped with state-of-the-art instruments for the study of meteorology and climatology, his main interest and passion. The large dome at the top of his tower housed a telescope by Merz of Munich with an aperture of 76 mm and a length of 1.3 m, four ocular lenses, and an Equatorial mount by the Officina Galileiana of Florence.

The five, vivid chromolithographic plates, after original photographs, depict various astronomical events observed by Bulla from his observatory, namely the appearance of the planets Jupiter, Saturn, and Venus with the Moon on the evening of 3 March 1881; the Great Comet of 1882, observed on 15 November of the same year; the transit of Venus across the solar disk on 6 December 1882; the peak of the total lunar eclipse on the evening of 4 October 1884; and the morning twilight at its maximum intensity in 1883 and 1884, all depicted above delightful rooftop views of Rome.

The original lithographic wrapper depicts Bulla's observatory within an elaborate frame incorporating portraits of Copernicus, Galileo, Giovanni Santini (1787–1877), and Angelo Secchi (1818–1878) and vignettes of the Bianchini, Herschel, and the Paris telescopes.

No copies on OCLC or Library Hub. OPAC SBN finds only five copies in Italian libraries.


GEOMETRIA
FAMIGLIARE,
ET INSTRVTTIONE PRATICA
D'ALESSANDRO CAPRA
ARCHITETTO CREMONESE.
Per gl'Edificij nuoui, e vecchij,
Opera molto curiosa, e di giouamento vniuersale.
DIVISA IN TRE PARTI,
Con l'Indice de Capi, e loro Argomenti.
DEDICATA AGL'ILLVSTRISSIMI
SIGNORI DECVRIONI
DELLA CITTA' DI CREMONA.
IN CREMONA.
Per Gio. Pietro Zanni. 1671.
Con licenza de' Superiori.


ILLVSTRISSIMI, E NOBILISSIMI
SIG.RI DECVRIONI
DELL'ALMA, ET INCLITA
CITTA' DI CREMONA.
Vendo io dare alla luce al-
cune mie fatiche Geometri-
che, quali risguardano il pu-
blico seruiggio; diuisando in
me stesso, à chi meglio potessi appog-

Geometry for Real Estate Agents

12. CAPRA, Alessandro. Geometria famigliare, et instruttione pratica d'Alessandro Capra architetto cremonese. Per gl'edificii nuovi, e vecchii, opera molto curiosa, e di giovamento universale. *Cremona, Gio*[*vanni*] *Pietro Zanni, 1671.*

4to, pp. [12], 145–187, [1, blank]; title within architectural woodcut border incorporating perspectival view of a street and a compass, woodcut initials, head-, and tailpieces, engraved arms of Cremona to p. [3], several woodcut illustrations, including large woodcut allegorical personification of Cremona to p. 150; sporadic light foxing and dampstaining, corners slightly thumb-soiled; but overall a good copy; sewn longstitch in contemporary *carta rustica*; a few small marks, upper cover chipped and creased at fore-edge, some wear to corners, short split to spine at foot, juvenile doodling to covers and inside of rear cover; printed collection slip to p. 159; ownership inscription 'Premoli' to front cover, and 'Di Gio. Ant. Premoli' to title. **£575**

An exceedingly rare extract from the first edition of the treatise of practical geometry by the architect and inventor Alessandro Capra (*c*. 1605–*c*. 1685), seemingly prepared and sold as a manual for surveyors and early estate agents.

Following an apprenticeship in his hometown of Cremona, Capra went to Milan, where he was employed as a military architect by the Spanish governors Gonzalo Fernández de Cordoba (1585–1635) and Ambrogio Spinola (1569–1630). There, he designed fortifications and siege engines, and also supervised the renovation of churches and the construction of the cathedral of Pontremoli. His final years were dedicated to a project aimed at preventing the floods of the Po River through the construction of embankments. Invited to the court of Madrid, he was unable to go due to his declining health.

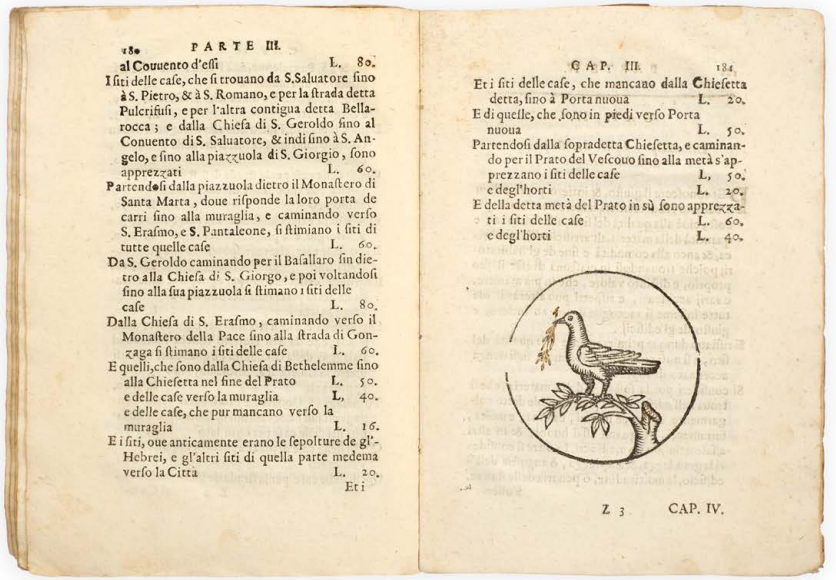

Premoli
B

Capra's *Geometria famigliare* was published in Cremona by Giovanni Pietro Zanni in 1671, with a dedication letter to the *decurioni* of Cremona, the members of the city council. Another edition, seemingly identical and with the same *imprimatur*, but with a different dedication and preface, was published the same year in Lodi by Gioseffo Piti . In 1673, Zanni published a third, improved edition, with the new title *Le due prime parti della geometria famigliare*, a new engraved title, and new woodcut illustrations. The present extract from the *Geometria famigliare* comprises the first quire and quires T–Z of Zanni's 1671 edition, in which the arms of Cremona at the head of the dedication are engraved rather than woodcut.

As a manual for surveyors or estate agents, its contents include the front matter and index, the final three sections of the second part on measuring volume using a rod, and the complete third part on estimating the value of real estate properties in Cremona based on location, building materials used, and state of repair. Capra's estimates are based on the city map of Cremona by the painter Antonio Campi (1523–1587), and he here meticulously details the location of shops and houses within the city, appraising, for instance, shops located between the church of San Faccio and either 'the city gate or the parlour of the nuns at Sant'Anna' (*trans.*) at 500 *lire*. On p. 159, a printed correction slip changes the name of a church referenced in another estimate from 'San Matteo' to 'San Marco'.

Capra's other publications, reflecting interests in both military fortification and hydraulics, include *Nuova architettura dell'agrimensura di terre, ed acque…* (1672), *Della architettura famigliare…* (1678), and *La nuova architettura militare…* (1683). See Olivato, 'Capra, Alessandro', *Dizionario Biografico degli Italiani* 19 (1976).

We find only one other copy of this extract, at the Biblioteca Statale di Cremona, though lacking the printed correction slip.



180 PARTE III.

al Conuento d'essi L. 80.
I siti delle case, che si trouano da S. Saluatore fino à S. Pietro, & à S. Romano, e per la strada detta Pulcrifiusi, e per l'altra contigua detta Bellarocca; e dalla Chiesa di S. Geroldo fino al Conuento di S. Saluatore, & indi fino à S. Angelo, e fino alla piazzuola di S. Giorgio, sono apprezzati L. 60.
Partendosi dalla piazzuola dietro il Monastero di Santa Marta, doue risponde la loro porta de carri fino alla muraglia, e caminando verso S. Erasmo, e S. Pantaleone, si stimiano i siti di tutte quelle case L. 60.
Da S. Geroldo caminando per il Basallaro fin dietro alla Chiesa di S. Giorgo, e poi voltandosi fino alla sua piazzuola si stimano i siti delle case L. 80.
Dalla Chiesa di S. Erasmo, caminando verso il Monastero della Pace fino alla strada di Gonzaga si stimano i siti delle case L. 60.
E quelli, che sono dalla Chiesa di Bethelemme fino alla Chiesetta nel fine del Prato L. 50.
e delle case verso la muraglia L. 40.
e delle case, che pur mancano verso la muraglia L. 16.
E i siti, oue anticamente erano le sepolture de gl'Hebrei, e gl'altri siti di quella parte medema verso la Città L. 20.
Et i

CAP. III. 184

Et i siti delle case, che mancano dalla Chiesetta detta, fino à Porta nuoua L. 20.
E di quelle, che sono in piedi verso Porta nuoua L. 50.
Partendosi dalla sopradetta Chiesetta, e caminando per il Prato del Vescouo fino alla metà s'apprezzano i siti delle case L. 50.
e degl'horti L. 20.
E della detta metà del Prato in sù sono apprezzati i siti delle case L. 60.
e degl'horti L. 40.

Z 3 CAP. IV.

151

PARTE TERZA

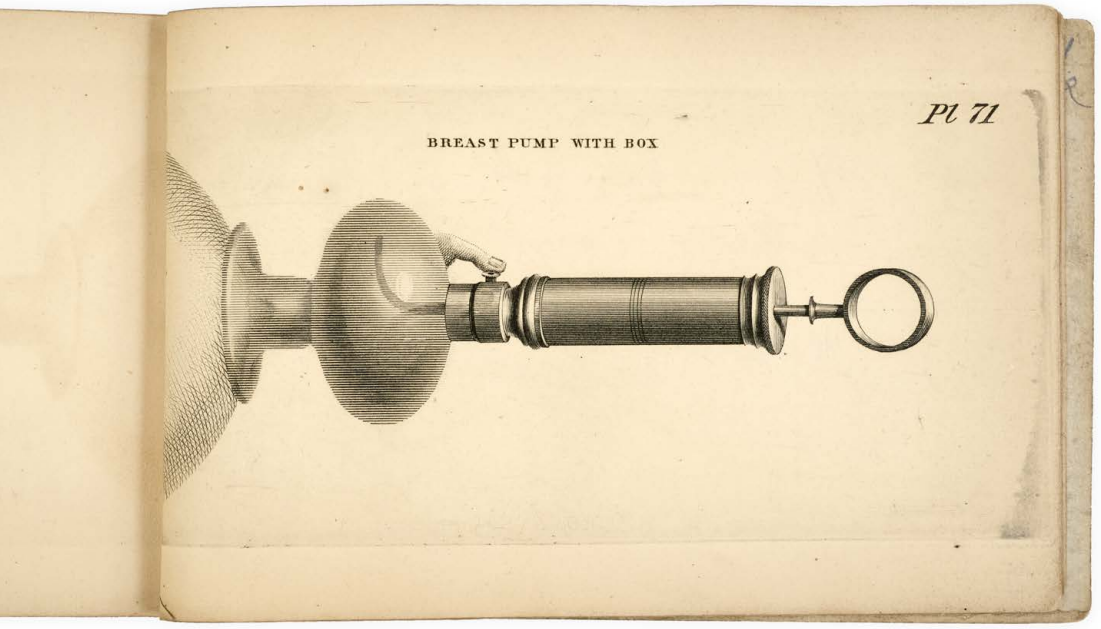
DELLE STIMATIONI.

CAP. I.

Della regola per il prezzo de Siti, Case, Boteghe, & Horti in Cremona.

LA valuta de siti, mentre corrisponda, & habbi la debita proportione, si al affitto delle Case, rendità delle Boteghe, frutto de gl'Horti, corso delle Merci, vtile de traffichi, guadagno de negotij; Si anche al valore della materia, che necessariamente si ricerca alla fabbrica, come sono pietre, coppi, calcina, legnami ferramenti, e cose simili, ben può seruire di regola, e certa, e generale per il prezzo delle case, botteghe, & horti della Città; In fatti già cent'anni, cioè del 1561. fù riconosciuta per tale, e questa appunto è quella, che da me quì à basso si esporrà à prò di tutti.

Mi resta solo d'auuertire, che cauandosi il valsente de siti, come da propria, & adequata cagione da



Quaker Makers in Northern England

13. [CHADBURN *Brothers.*] Wholesale Catalogue with Prices, of the principal Articles manufactured by Chadburn Brothers, Opticians, &c. to H. R. H. Prince Albert. Albion Works, Nursery Street, and Nursery Steam Wheel, Sheffield. Branch Establishment 71, Lord Street, Liverpool. *Sheffield, Charles Walker,* [*1853*].

Oblong 12mo, pp. 19, [1], with large folding engraved advertisement for the Chadburn Brothers Exhibition Room (*c*. 412 × 308 mm) and 45 ff. of engraved diagrams of scientific instruments numbered 22–37, 39–45, 47–57, 60–2, 64, 67–8, 70–1, 74, 79–80; lightly browned with the odd minor stain; else a very good copy in contemporary brown cloth over card; front board neatly rejointed, a few minor scuffs to covers; nineteenth-century ownership inscription 'R. Walmsley / Bolton' to front pastedown. **£850**

Extremely rare trade catalogue of this Sheffield- and Liverpool-based Quaker firm of scientific instrument makers, with some forty illustrations of their wares including a very early breast pump.

Taking over from their father William, maker of barometers and optical devices in Sheffield since the 1810s, the Chadburn Brothers (Alfred, Francis, and Charles) oversaw the firm's expansion into a wide range scientific instruments as well as the establishment of a Liverpool branch. In 1847 they were appointed opticians to Prince Albert, and gained further recognition at the Great Exhibition of 1851, where they were awarded an honourable mention (a printed certificate of which is included in the present trade catalogue). Among their patents was the engine order telegraph (later known simply as the Chadburn) for transmitting orders from a ship's bridge to its engine room, a device quickly adopted across the British shipping industry; Chadburn telegraphs and steam whistles were among the equipment aboard RMS *Titanic*.

R. Walmsley

Bolton

The Public are respectfully invited

CHADBURN

OPTICAL MATHEMATICAL AND

ALBION WORKS,

PATENT PHOTOGRAPHIC PORTRAIT GALLERY

TO H.R.H. PRINCE ALBERT.

to inspect the Exhibition Room of

BROTHERS,

PHILOSOPHICAL INSTRUMENT MAKERS

NURSERY STREET

Spectacles.
TELESCOPES.
Microscopes.

Opera & Reading Glasses.
CAMERAS.

Lanterns for
DISSOLVING VIEWS &c.

Optical Lenses &c.

Stereoscopes.
BAROMETERS.
Thermometers.

SYRINGES.
Galvanic Electrical
and
MAGNETIC APPARATUS.
Theodolites.
LEVELS &
Surveyors Instruments.
MODELS, &c.

EXHIBITED
IN CLASS 10, CASE 259,
OF THE
GREAT EXHIBITION
OF 1851.

JURY AWARD,
HONOURABLE MENTION
FOR
GOOD AND CHEAP
INSTRUMENTS

DESIGNED BY ALFD. CHADBURN, SHEFFIELD. ENGRAVED BY BRADSHAW & BLACKLOCK, MANCHESTER.

SHEFFIELD.

Persons requiring Spectacles may depend on having those that are best adapted to their Vision *and* Occupation, *mounted in Horn or Steel, from 1/. In Elastic Blue Steel, from 2/6 In Tortoise Shell, from 4/6 In Silver, from 7/6 In Gold, from 21/ to 70/ pr Pair. Brazilian Pebble 4/6 per Pair extra. Eye Preservers. Hand Spectacles & Eye Glasses in great variety. Articles Purchased of C. B.s if not approved of may be exchanged.*

BRANCH ESTABLISHMENT
71 LORD STREET, LIVERPOOL.

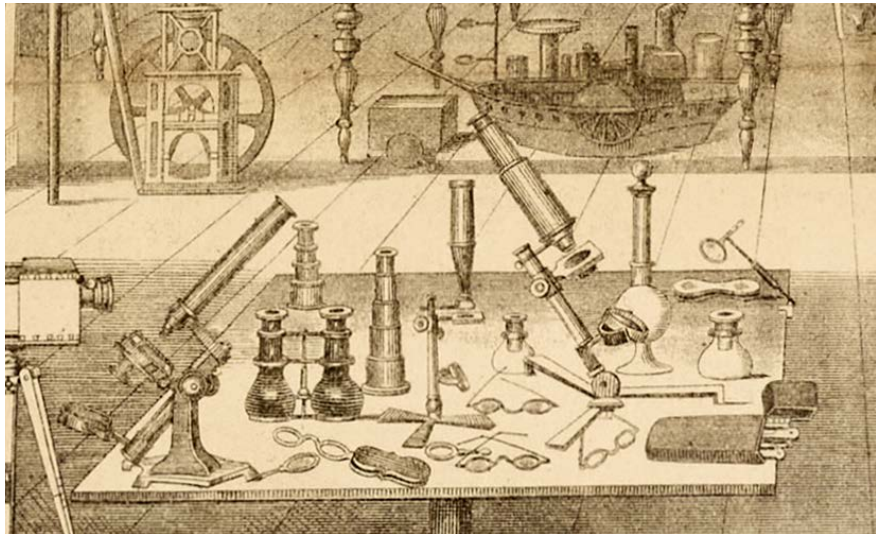
Instruments by Celebrated London and Continental Makers.

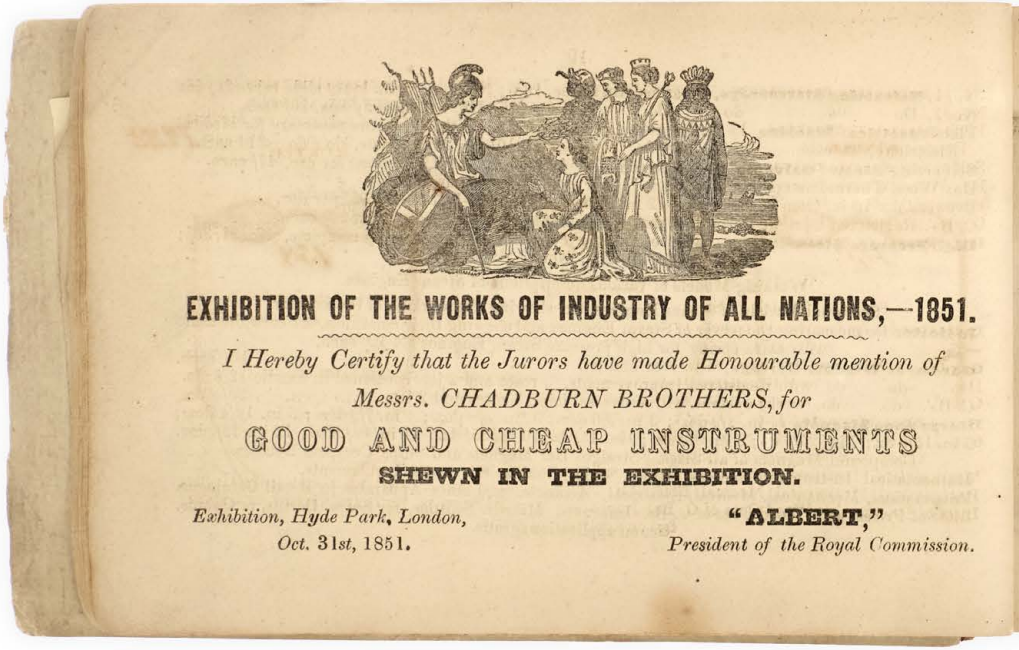
Wholesale & Retail Lists of Prices may be had on application Gratis. with Copperplate Engravings 1 Shilling each.

OPTICAL GLASS GRINDING ROOM.
NURSERY STEAM WHEEL.
Admission by Ticket from C.B.s

The present catalogue consists of a detailed seventeen-page price list of their products, including spectacles, magnifiers, opera glasses, telescopes, microscopes, ‘muslin, linen, and woollen provers’, magic lanterns, cameras, an ‘Electro Galvanic Machine’, stereoscopes, magnets, and steam engines. Forty-five plates of diagrams follow, illustrating most of these products together with a ship deck illuminator, an air valve for preventing dry rot on ships, an enema syringe, a videoscope , and **a very early example of a mechanical breast pump – the first patent for which would only be issued the following year**. Also bound in is a large illustrated advertisement for the Brothers’ splendid exhibition room in Nursery Street, Sheffield.

We have traced only one other copy of this catalogue, at the University of York, which appears to lack two of the plates present in ours (23 and 80).



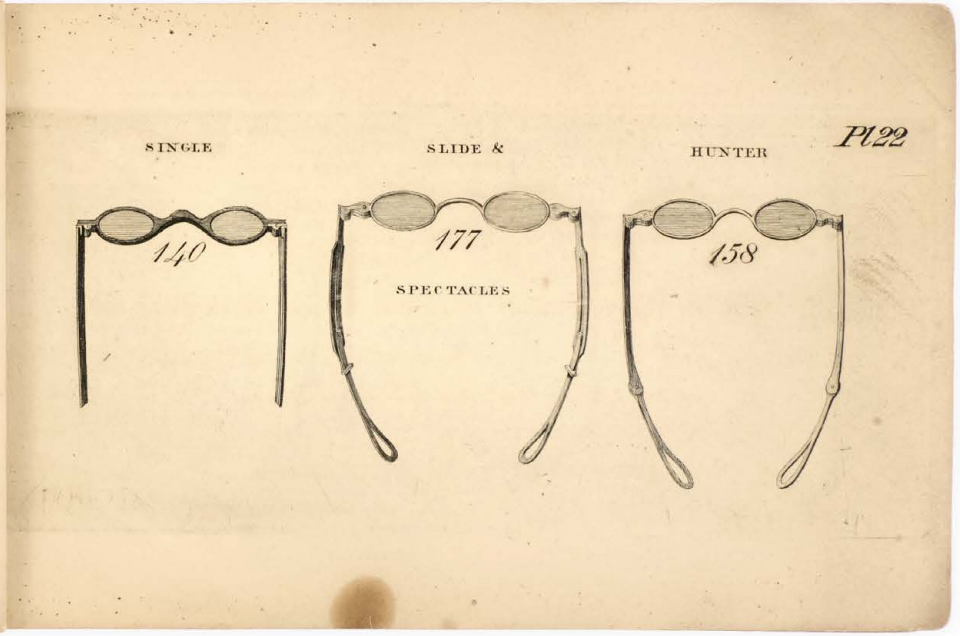


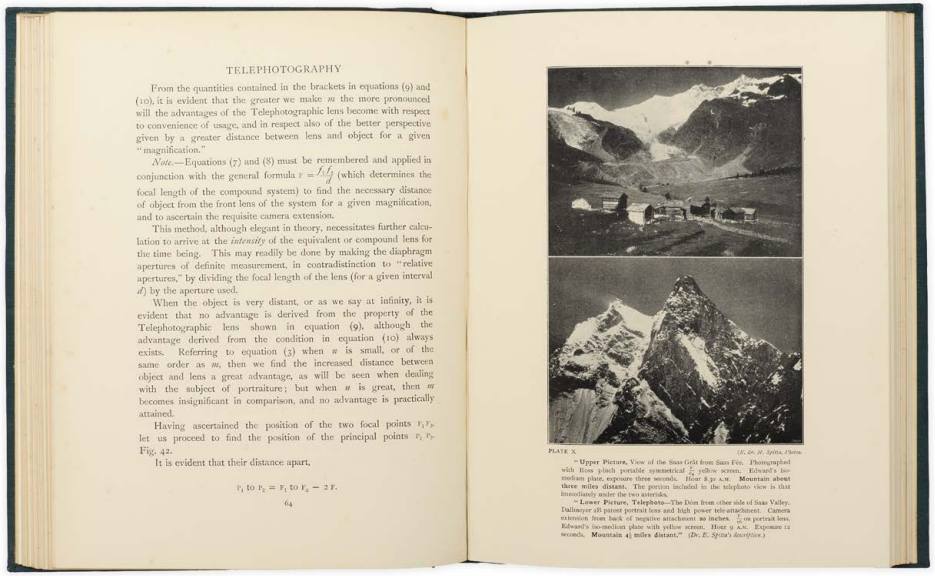
EXHIBITION OF THE WORKS OF INDUSTRY OF ALL NATIONS,—1851.

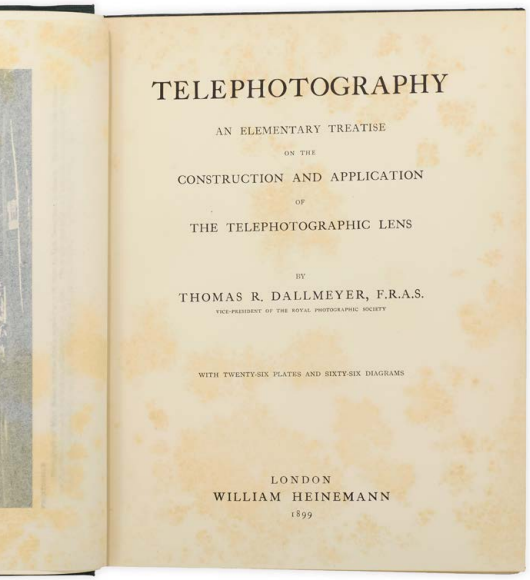
I Hereby Certify that the Jurors have made Honourable mention of
Messrs. CHADBURN BROTHERS, for
GOOD AND CHEAP INSTRUMENTS
SHEWN IN THE EXHIBITION.

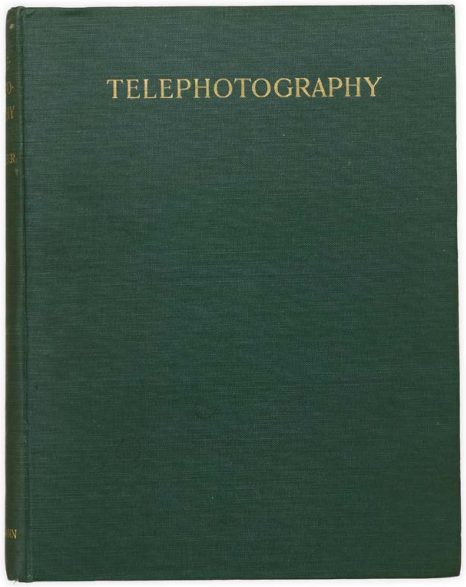
Exhibition, Hyde Park, London,
Oct. 31st, 1851.

“ALBERT,”
President of the Royal Commission.









Trailblazing Telephotography

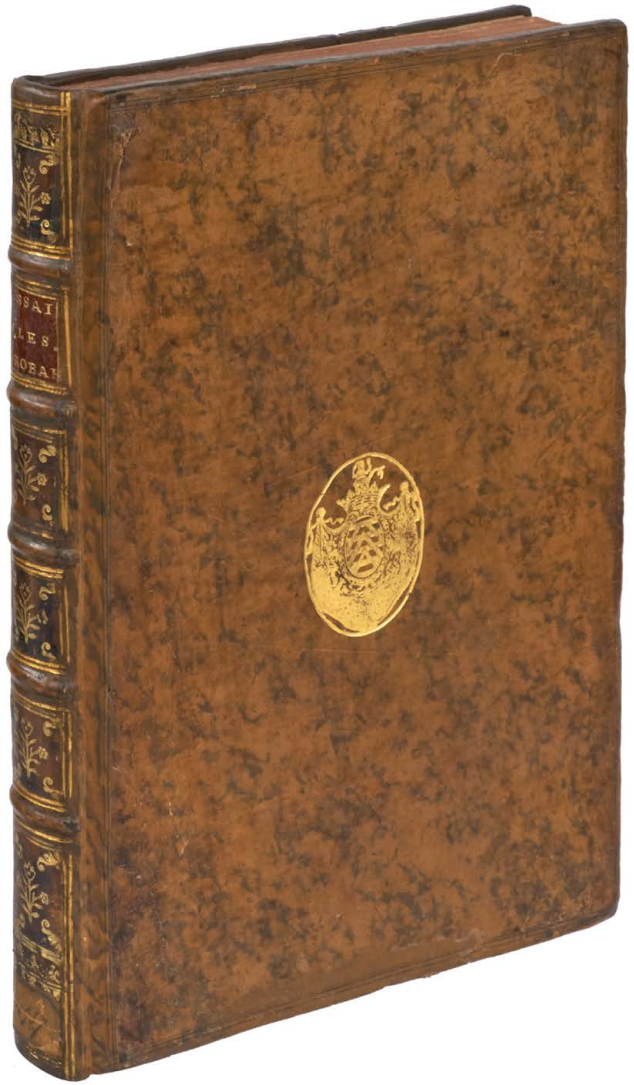
14. DALLMEYER, Thomas. Telephotography: An elementary Treatise on the Construction and Application of the telephotographic Lens ... with twenty-six plates and sixty-six diagrams. *London, William Heinemann, 1899.*

8vo, pp. xv, [1, blank], 147, [1], with halftone frontispiece and 25 plates; numerous diagrams printed in-text; scattered spotting, most heavily on the title, but a good copy; bound in publisher's dark green cloth, lettered in gilt; a few small marks, corners and endcaps a little bumped, but a good copy; bookplate of Lionel Nathan de Rothschild to front pastedown. **£200**

First edition of the authoritative treatise on telephotography by the inventor of the first practical telephotographic lens.

Thomas Rudolphus Dallmeyer (1859–1906) was the son of John Henry Dallmeyer (1830–1883), to whose memory the book is dedicated, a noted optician and lensmaker who made advances in the designs of both tele- and microscopic and photographic lenses. The younger Dallmeyer developed the first practical telephotographic lens, patented in 1891, for which he won the Royal Photographic Society Medal in 1896, and was elected President of the Society in 1900. Dallmeyer here outlines the scientific underpinnings of telephotographic lenses and compares their performance and structure with both astronomical telescopes and with the ordinary lenses of the era. He proposes that telephotography is not only invaluable for its ability to capture objects far away, but also for its use in magnifying objects in medical, geological, and naval contexts, *inter alia*.

Provenance: with the bookplate of Lionel Nathan de Rothschild (1882–1942), Partner at New Court Rothschild Bank, Conservative Member of Parliament, and an avid photographer who experimented with the autochrome from its first release in Britain in 1907.



A Classic of Statistical Science

15. DEPARCIEUX, Antoine. Essai sur les probabilités de la durée de la vie humaine; d'où l'on déduit la manière de déterminer les rentes viagères, tant simples qu'en tontines: précédé d'une courte explication sur les rentes à terme, ou annuités; et accompagné d'un grand nombre de tables. *Paris, chez les frères Guerin, 1746.*

4to, pp. vi, [2], 132, xxii (ix–xvi double-page), [1, *privilège du Roi*], [1, blank]; a very few marks; a fine copy in contemporary mottled calf, spine gilt in compartments and with gilt morocco lettering-piece, red edges, marbled endpapers; neatly rebacked preserving spine, corners repaired; from the library of Francois-Alexandre-Frédéric de La Rochefoucauld (1747–1827), with gilt arms (Olivier 710, fer 2) on covers and Bibliothèque de Liancourt bookplate on front pastedown; booklabel of Erwin Tomash. **£3000**

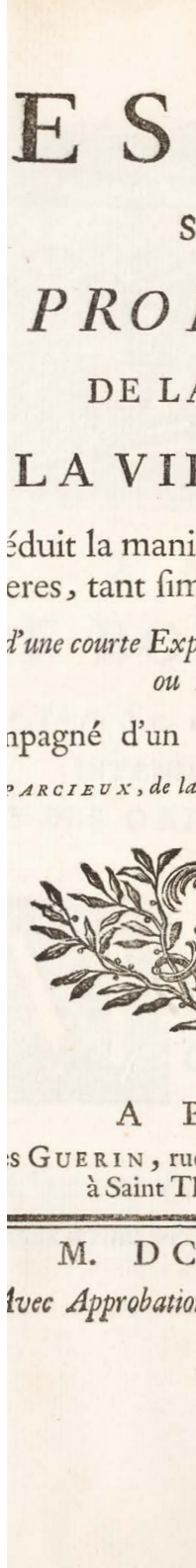
A large, crisp, and illustrious copy of the first edition of a classic of statistical science: it is the first to define expectation of life – which Deparcieux calls 'la vie moyenne' – and the first to contain life tables for men and women.

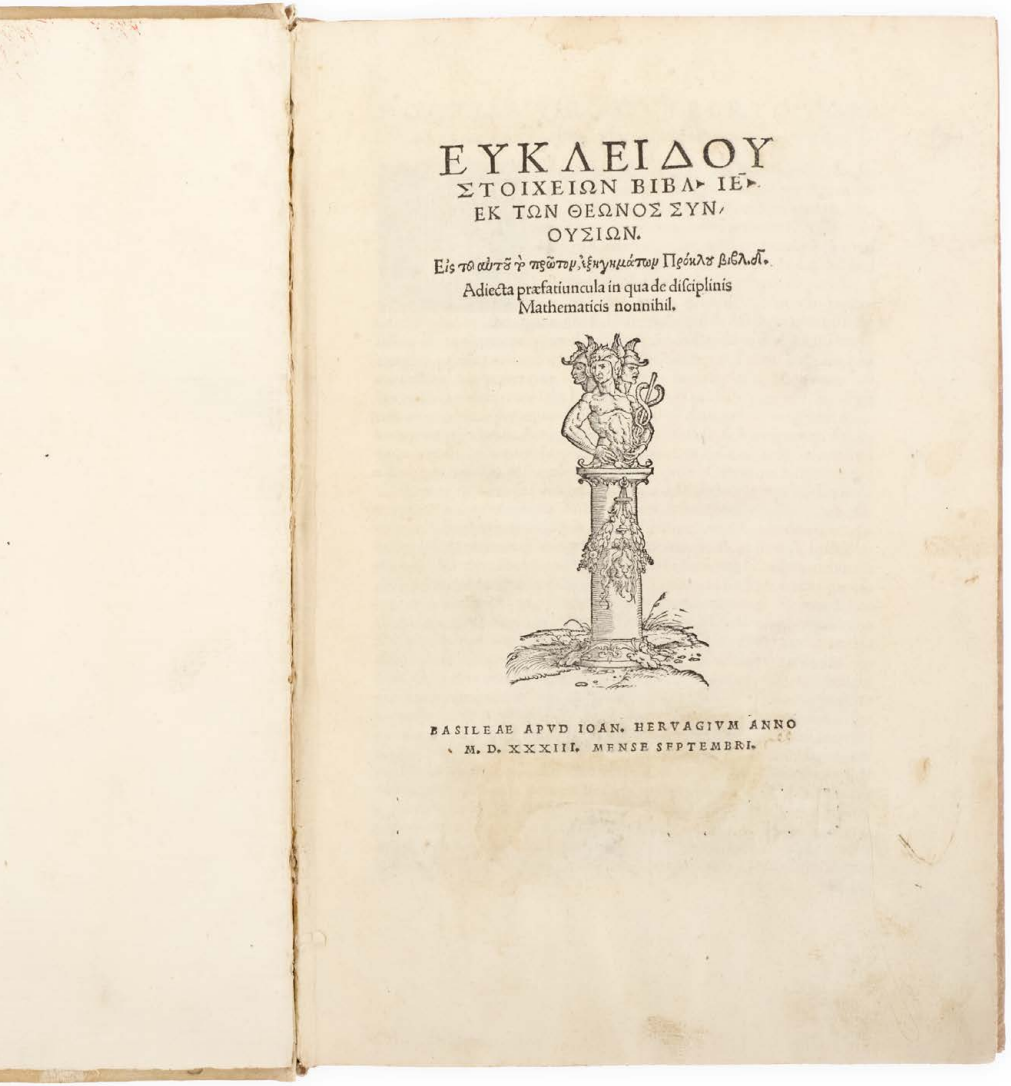
'The first French work in the actuarial field … After publication of this *Essai*, expectation of life came into general use as a descriptive statistic. Deparcieux scaled his mortality data to a radix of 1000 at age 3, calculated the survivors at every five years and interpolated the intermediate values … [His table] was espoused by the French life insurance companies and used almost until the end of the nineteenth century for premium calculations where payments were made on survival' (*History of Actuarial Science*, ed. Haberman and Sibbett (1995), p. 243).

The distinguished scientist and mathematician Deparcieux (1703–1768) was represented by Voltaire as one of the speakers in *l'Homme aux quarante écus*.

Provenance: **From the library of the social reformer Francois-Alexandre-Frédéric de La Rochefoucauld (1747–1827),** who established a model farm at Liancourt and a school of arts and crafts for the sons of soldiers (the École des Enfants de la Patrie), and who became one of the first promoters of vaccination in France. 'On the 12th of July [1789], two days before the fall of the Bastille, he warned Louis XVI of the state of affairs in Paris, and met his exclamation that there was a revolt with the answer, "Non, sire, c'est une révolution"' (*Encyclopaedia Britannica*).

Goldsmiths' 9586; Institute of Actuaries, p. 41; Kress 4801; Tomash & Williams D41. Not in Einaudi or 'Utrecht'.




ΕΥΚΛΕΙΔΟΥ
ΣΤΟΙΧΕΙΩΝ ΒΙΒΛ. ΙΕ.
ΕΚ ΤΩΝ ΘΕΩΝΟΣ ΣΥΝ-
ΟΥΣΙΩΝ.
Εἰς τὸ αὐτὸ τὸ πρῶτον, ἐξηγημάτων Πρόκλου βιβλ. δ.
Adiecta præfatiuncula in qua de diſciplinis
Mathematicis nonnihil.
BASILEAE APVD IOAN. HERVAGIVM ANNO
M. D. XXXIII. MENSE SEPTEMBRI.

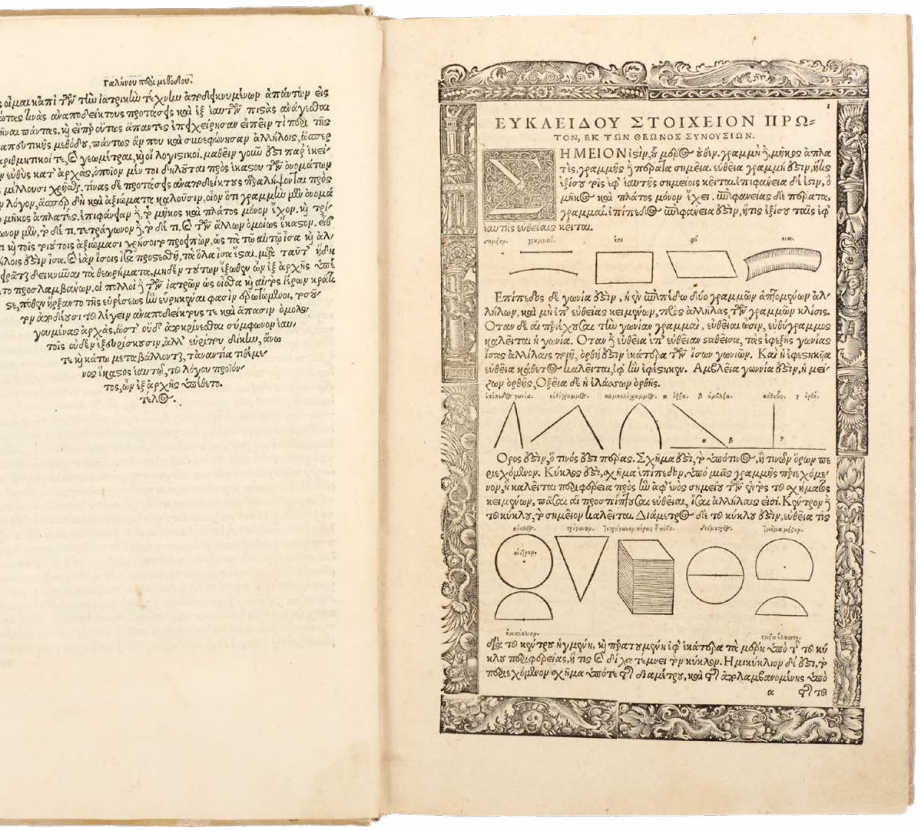
Editio Princeps
The Oldest Mathematical Textbook Still in Use

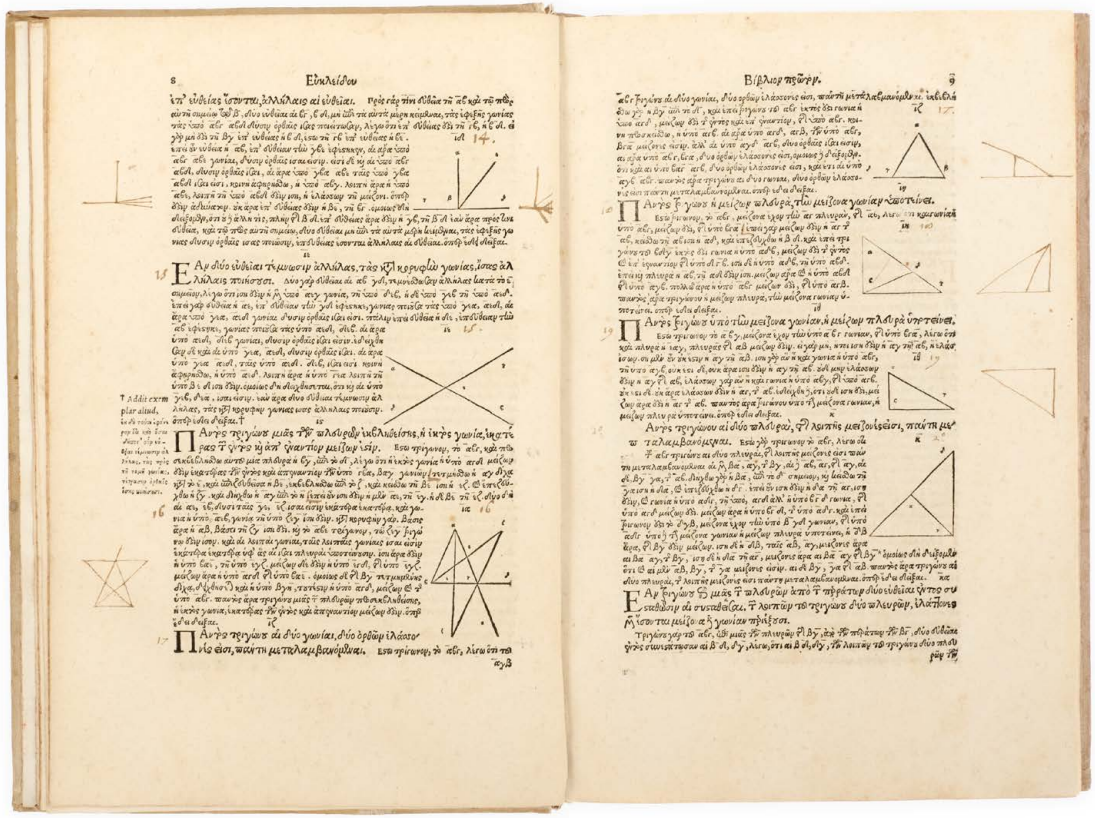
16. EUCLID. Στοιχειων βιβλ. ιε εκ των θεωνος συνουσιων. Εις του αυτου του πρωτον, εξηγηματων Προκλου βιβλ. δ. Adiecta praefatiuncula in qua de disciplinis Mathematicis nonnihil. *Basel, Johannes Herwagen, September 1533.*

Folio, pp. [xii], 268, 115, [1]; text in Greek, woodcut printer's device to title-page and final verso, woodcut initials, α1r within woodcut border, woodcut diagrams, woodcut headpieces, skilful repair to title-page where an old inscription removed, old ink stains to lower margins of κ4–6 and ξ4–5, very slight dampstain to outer margin of final leaves, nonetheless a very good copy; bound in eighteenth-century Italian vellum, gilt red morocco lettering-piece to spine, edges speckled red; manuscript diagrams in brown ink to the margins of a few leaves and a few notes and corrections in Greek (*e.g.* on π2–3 and σ5), eighteenth-century Italian shelfmark to front pastedown 'Pluteus octavus capsula prima' below erased inscription, later note in German, modern collector's bookplate. **£18,000**

***Editio princeps* of Euclid, the 'oldest mathematical textbook still in common use today'** (*PMM*), **a work which 'has exercised an influence upon the human mind greater than that of any other work except the Bible'** (*DSB*).

The 'decisive influence of Euclid's geometrical conception of mathematics is reflected in two of the supreme works in the history of thought, Newton's *Principia* and Kant's *Kritik der reinen Vernunft*' (*DSB*).

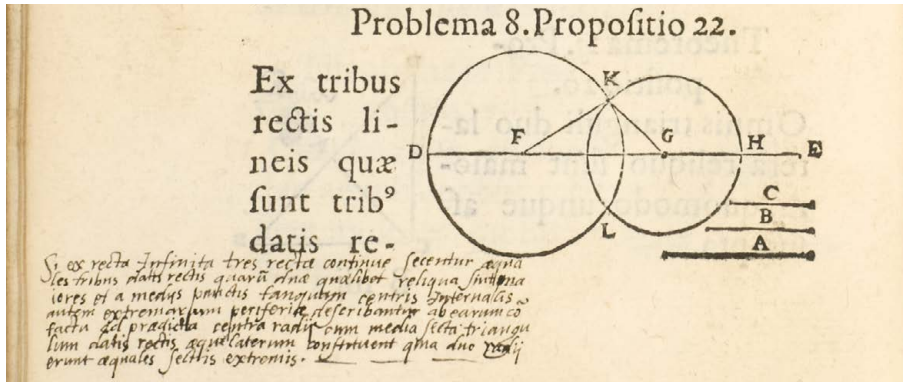


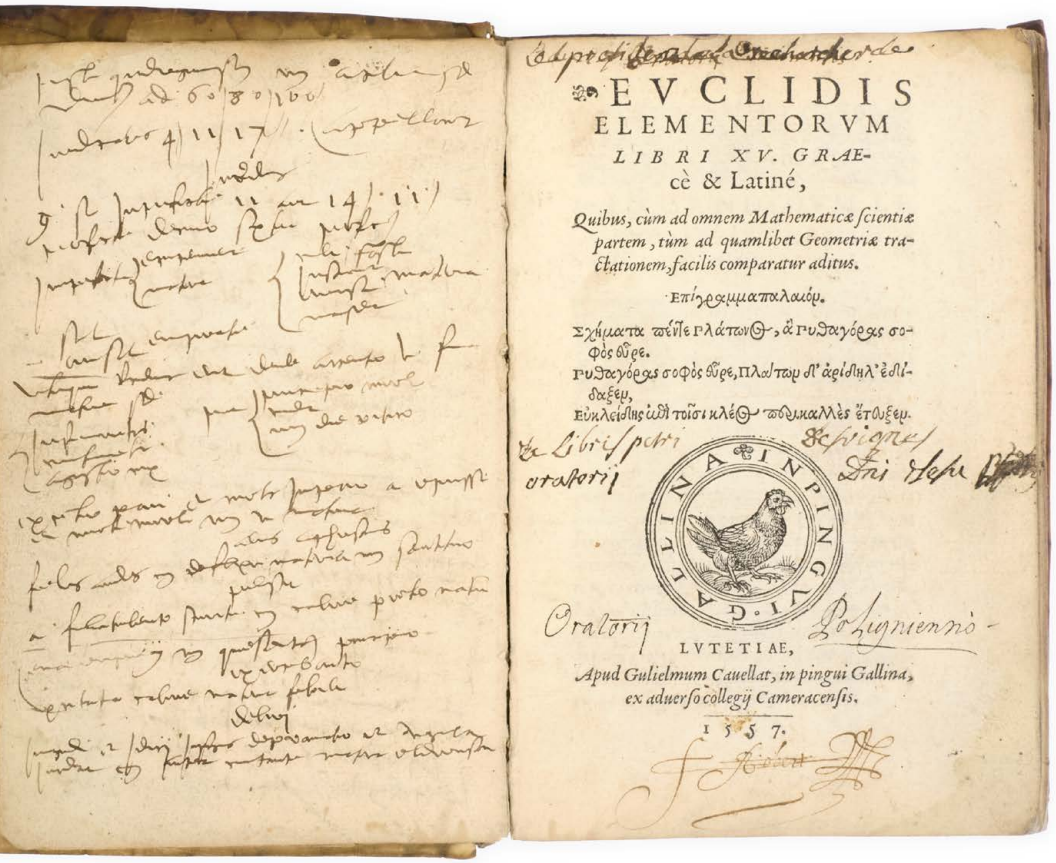


The text was edited by Simon Grynaeus, professor of Greek at the University of Basel, who dedicated the work to Cuthbert Tunstall, bishop of Durham. During a visit to Oxford in 1531, Grynaeus found the manuscript of Proclus' commentary which he appended to his edition of Euclid. 'Because of his interest in the principles underlying mathematical thought and their relation to ultimate mathematical principles, Proclus' commentary is a notable – and also the earliest – contribution to the history of mathematics. Its numerous references to the views of Euclid's predecessors and successors, many of them otherwise unknown to us, render it an invaluable source for the history of science' (*DSB*).

This is a wide-margined copy, with additional manuscript diagrams and annotations in Greek. On pages 8–9 the Greek numeral for each diagram has been translated into an Arabic number, with five ink manuscript diagrams added in the margins. In the second half of the volume there are occasional additions and amendments to the text in Greek, mostly correcting typographical errors.

VD 16 E 4142; Steck III.29. See *PMM* 25 for the first Latin edition of 1482.



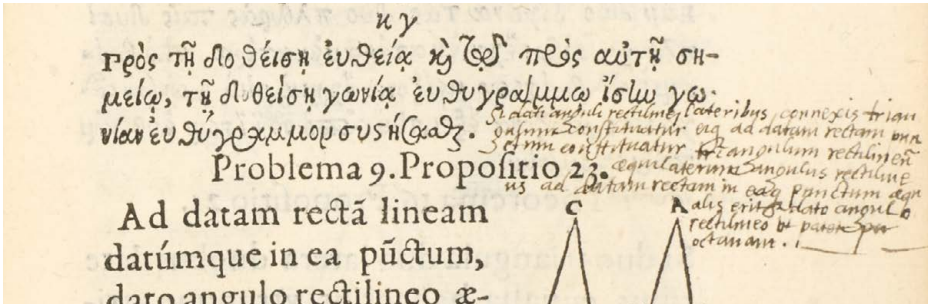


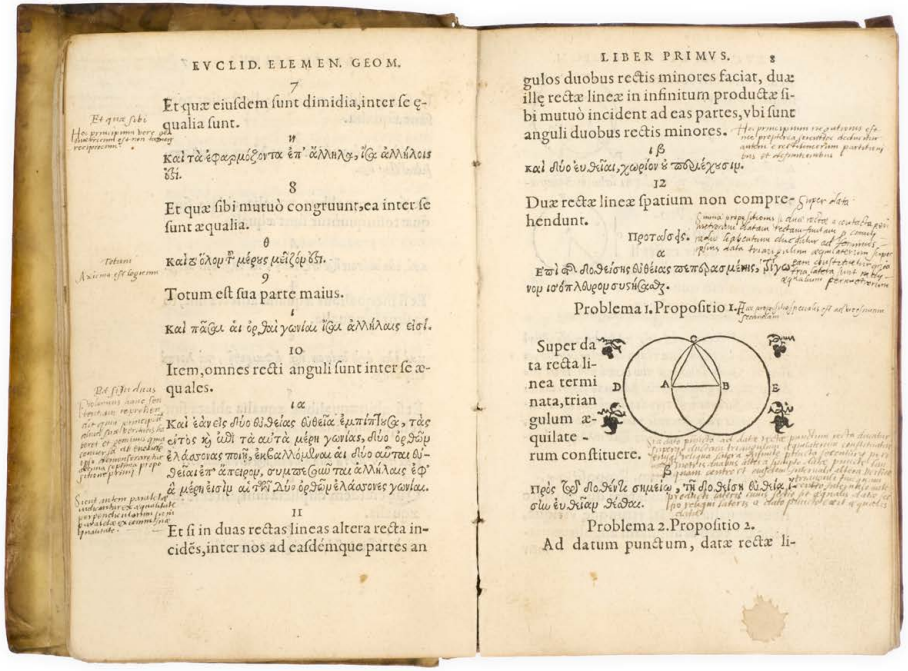
Annotated Euclid

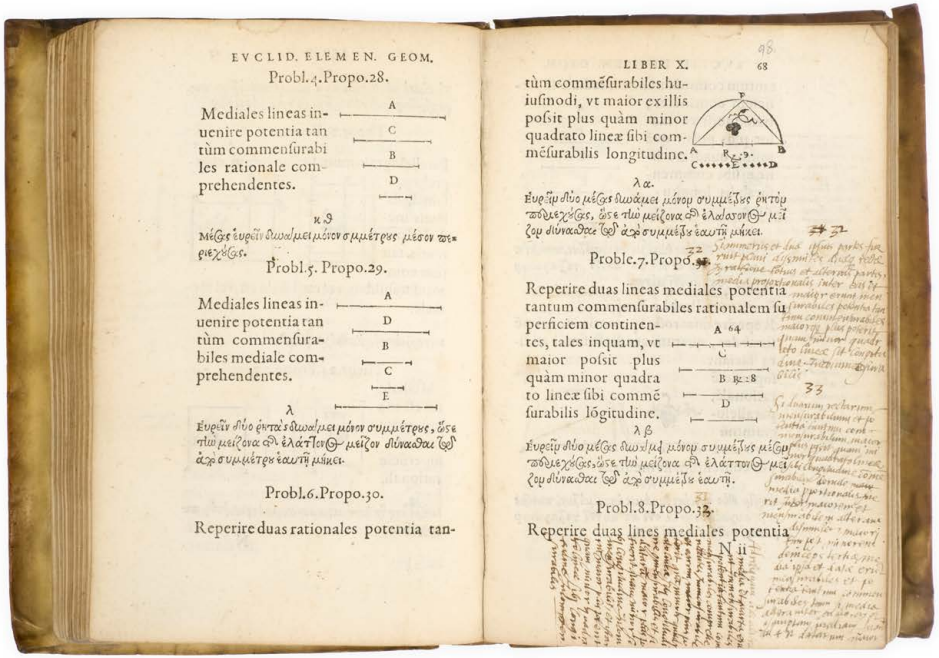
17. EUCLID; Jean MAGNIEN *and* Stephanus GRACILIS, *editors*. Euclidis elementorum libri XV Graece et Latine, quibus, cum ad omnem mathematicae scientiae partem, tum ad quamlibet geometriae tractationem, facilis comparatur aditus ... *Paris, Guillaume Cavellat, 1557.*

8vo, ff. [xvi], 88, '59–130' (*i.e.* 89–160); text in Greek and Latin, woodcut printer's devices to title-page and last page, woodcut diagrams throughout, woodcut initials and headpieces; very slight marginal dampstaining and toning, a few marks, last page dusty, but overall a very good copy; bound in contemporary vellum, yapp fore-edges, geometric patterns drawn with dividers on covers, '[...] Commissaire du Roy [?] [...]' in manuscript to front cover, later paper spine label, vestigial ties to fore-edge, sewn on 4 split tawed thongs laced in, endguards of manuscript waste on vellum, spine lined with printed waste on paper; somewhat worn and stained, upper hinge split, rear endpapers removed; early ownership inscriptions 'Chabaud', 'ex libris Petri Desvignes oratorii Dni Jesu', 'Oratorii Polignensis' (Poligny), **annotations in a handsome contemporary italic hand to 56 pp., and 3 pp. of notes in a contemporary cursive hand to front endpapers** (*see below*); nineteenth-century printed booklabel of A. M. Faivre to inner front cover. **£5500**

First edition of Euclid's *Elements* as edited by Jean Magnien and Stephanus Gracilis, with woodcut diagrams throughout, this copy extensively annotated by a contemporary student.







The French mathematician and professor at the Collège royal, Jean Magnien (d. 1556), had projected an edition of Euclid's *Elements* with the Parisian publisher Guillaume Cavellat, but the enterprise was stalled by Magnien's premature death, prompting Cavellat to seek the assistance of Gracilis to bring the work to completion. The resulting edition contains Euclid's propositions in Greek and Latin, but not the proofs.

The contemporary annotations, in an elegant italic hand, elaborate, occasionally at great length, upon the text. The content suggests that they were taken down by a student from a teacher. They begin with definitions of mathematics and its parts and show a particular interest in points, lines, triangles, rectangles, parallelograms, circles, proportions, and commensurability. Our annotator provides summaries at the opening of books VI and X and makes references to Aristotle, Ptolemy, and Philoponus. Further mathematical notes in a contemporary cursive hand appear on the front endpapers.

USTC 152265; Pettegree & Walsby, *French Books* 70021; Smith, *Rara Arithmetica*, p. 240; Steck III.56.

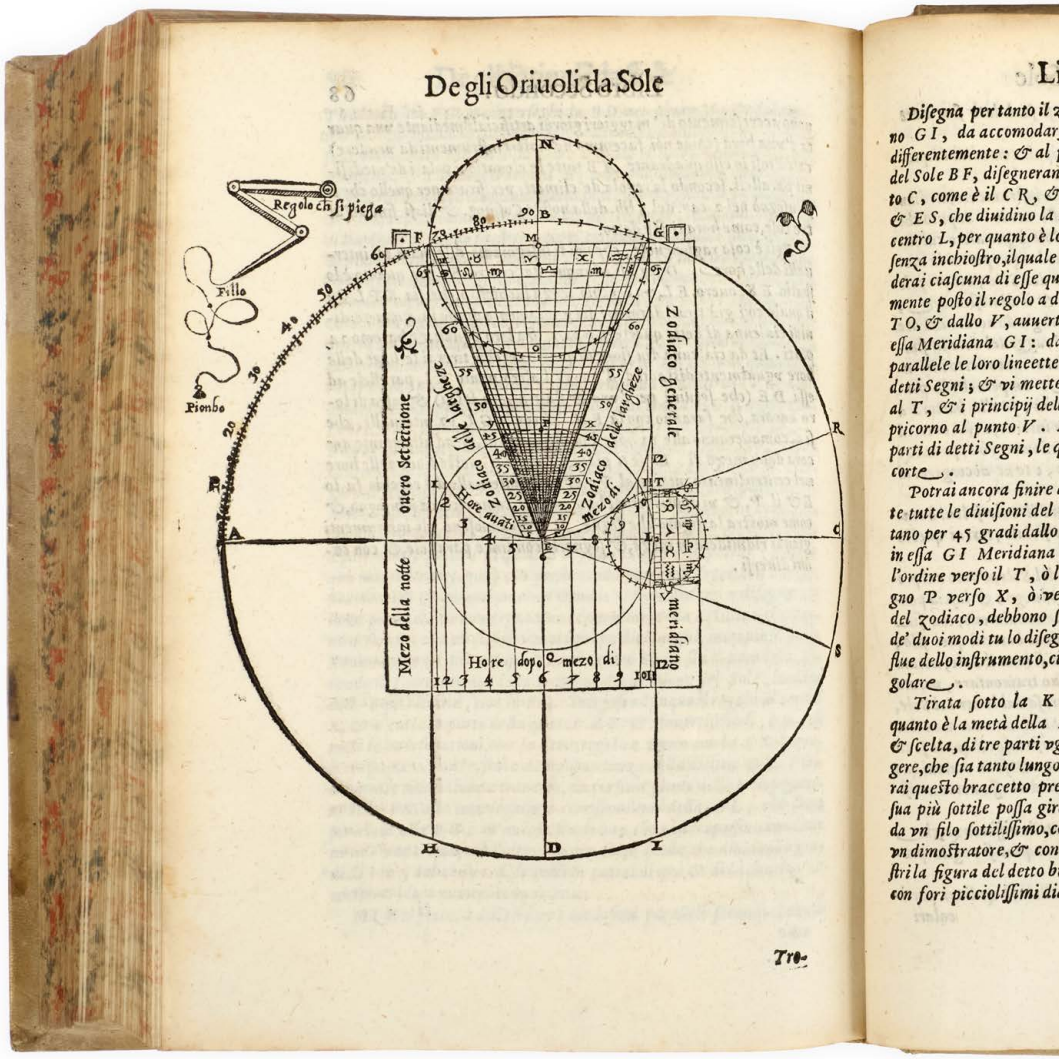
18. FINÉ, Oronce. Opere di Orontio Fineo ... divise in cinque parti, arimetica, geometria, cosmografia, e orivoli, tradotte da Cosimo Bartoli ... et gli specchi, tradotti dal cavalier Ercole Bottrigaro ... nuovamente poste in luce. *Venice, Francesco Franceschi, 1587.*

4to, ff. [8], 81, [1, blank], 84, 126, 88, 18, [2]; woodcut printer's device to title, woodcut initials and numerous woodcut diagrams and illustrations in text, letterpress tables (of which many folding), several errors in foliation; occasional light foxing, aaa and aaa2 browned, one single small wormhole to blank outer margin of first few leaves, old repair to outer margin of *6, *8, and A2; nevertheless a very good copy in eighteenth-century Italian vellum over boards, spine lettered directly in gilt; lower board a little soiled. **£2750**

First edition in Italian of the works of Oronce Finé, including the translations of his *Protomathesis* (1532) on arithmetic, geometry, cosmography, and sundials, and *De speculo ustorio* (1551) on burning mirrors, the only time all five texts appear together in any vernacular language.

Among the most influential scientific scholars of the sixteenth century, in over three decades at the Collège Royale Oronce Finé (1494–1555) made considerable contributions to various branches of mathematics, from geometry and arithmetic to astronomy and geography, including cartography. The woodcuts here are copied from those designed by Finé himself for his *Protomathesis* and continued to be used until 1670: 'his work as a designer is closely related to his major fields of mathematics, astronomy, and geography, and his contribution to book production is particularly interesting in extending beyond the illustration to the ornamentation of scientific texts' (Mortimer).

EDIT16 19063; USTC 829603; Adams F459; Mortimer 187.



Tre-

& scelta, di tre parti vguali, impernato in altrettali, che si possi volgere, che sia tanto lungo a punto, quanto è la linea EM: & fermerai questo braccetto presso al punto M; talmente che la estremità sua più sottile possa girarsi per ogni verso, dallaquale estremità penda vn filo sottilissimo, con vna perla che scorra in sù & in giù, ouero vn dimostratore, & con il solito piombinetto, come pare che ti dimostri la figura del detto braccetto. Restati a fare due mire, forate con fori picciolissimi diametralmente, le quali metterai a dirittura, per

OPERE
DI
ORONTIO FINEO
DEL DELFINATO:

Diuise in cinque Parti;

Arimetica, Geometria, Cosmografia, & Oriuoli,

TRADOTTE

Da Cosimo Bartoli, Gentilhuomo, & Academico Fiorentino:

Et gli Specchi,

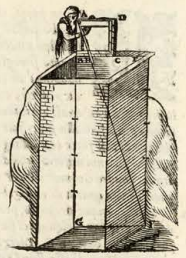
Tradotti dal Caualier Ercole Bottrigaro, Gentilhuomo Bolognese.

Nuouamente poste in luce:

CON PRIVILEGIO.

In Venetia, Presso Francesco Franceschi Senese, 1587

Moltiplica adunque 6 per 60, & haurai 360; ilquale partendolo per 20, harai il numero quante volte il 18. e tanti cubiti adunque sarà la AG, dalla quale se tu leuerai la AB, cioè tre cubiti, ti rimarrà la BG, che tu andaui cercando, cioè la profondità del pozzo, che sarà 15 cubiti.



3 Il medesimo ti uerrà fatto, se tu misurerai la HE, la quale per modo di esempio sia 5 cubiti. Moltiplica 5 per 60, & harai 300, ilquale partilo per 20, e te ne verrà 15, come prima. Imperoche li duoi triangoli ABH, & HEF, sono di nuouo di angoli vguali, perche l'angolo AHB, per la 15. del primo d'Euclide è vgual all'angolo EHF, posto da capo. Et l'angolo retto B è parimente vguale all'angolo retto E; l'altro adunque BAH per la 32 pur del primo è vguale all'altro HFE. Onde per la di sopra allegata 4 propositione del sesto, come HB corrisponde alla BA, così fa la HE alla EF vguale per la ragion detta alla medesima BG.

Ma quando occorresse, che il pozzo fosse di figura tonda, bisognerà hauer riguardo al diametro della bocca del pozzo, & far tutte l'altre cose nel modo detto di sopra.

4 Restaci a dimostrarti, come si misurino le medesime profondità, mediante il quadrante ordinario. Et sia il pozzo tondo EFGH, del quale il diametro sia EF, ò lo vguale a lui GH. Accomoda adunque il quadrante alla bocca del pozzo, in questo modo, che la fine del lato AD venga al punto E. Alza poi, ò abbassa il quadrante, (lasciando sempre cadere liberamente il filo con il suo piombo) fino a tanto, che passando il raggio della veduta per amenduoi i fori delle mire, arriui al termine da basso H, postoti allo incontro. Fatto questo, & non mouendo il quadrante, auuertisci doue batta il filo nel lato CD, & dicasi, che ei batta al punto

I, quella proportione, che haurà la parte compresa dal filo DI, al lato DA, la harà ancora il diametro GH, ò il suo vguale EF, alla propostati

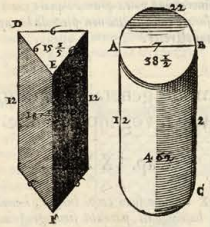
lunghezza della profondità EG. Imperoche li duoi triangoli ADI, & EGH, sono di angoli vguali; percioche l'angolo GEH è vguale a quello di dentro, & dalla medesima banda DAI, per la 29 del primo de gli Elementi di esso Euclide. Imperoche la diritta AH taglia, ò interfega la AI, & la EG paralelle. Et medesimamente l'angolo retto D è vguale all'angolo retto G, secondo la quarta dimanda. Et l'altro angolo ancora AID è vguale per la trentesimaseconda pur del primo de gli Elementi di Euclide all'altro EHG. Quella proportione adunque, che ha il lato ID al lato DA, la ha ancora il lato HG, per la quarta del sesto, alla GE: percioche elle sono sotto ad angoli vguali. Misura adunque EF vguale ad essa GH, & sia per modo di dire 9 cubiti, & sia ancora la DI sei di quelle parti, delle quali tutto il quadrante è 12; perche il 12 corrisponde al 6 di proportione del doppio. La EG ancora sarà per due volte la EF, ouero per la DH vguale (come poco fà dicemmo) ad essa EF. Moltiplica adunque 9 per 12, & harai 108, il quale partito per 6, ti darà per il quante volte il 18. E tanti cubiti è la propostati profondità EG. In tutte le altre osseruerai corrispondentemente il modo simile.

*

Come

Disegna per tanto il zodiaco generale per il lungo del Meridiano GI, da accomodarsi a tutte le sopradette regioni, ò paralleli indifferentemente: & al propostoti arco della maggior declinatione del Sole BF, disegneranne duoi a lui vguali di quà & di là dal punto C, come è il CR, & il CS. Tirinsi oltra di questo le diritte ER, & ES, che dividino la Meridiana GI, ne' punti T & V. Et dal centro L, per quanto è lo spacio LT, ouero LV, disegnisi vn cerchio senza inchiostro, ilquale poi che sarà diuiso in quattro quarte, ridiuiderai ciascuna di esse quarte in 3 parti vguali, & saranno 12: finalmente posto il regolo a duoi punti per volta, vgualmente lontani dal TO, & dallo V, auuertirai tutte le interfegationi, che egli farà con

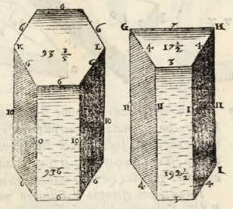
harai 164; alqual numero aggiugni due volte 38 & ½, cioè 77, e te ne risulterà 241: e tanti piedi quadrati è la superficie vniuersale di detto Cilindro. Et se tu moltiplicherai 38 & ½ per il medesimo 12, te ne verrà la grossezza del detto Cilindro ABC, che sarà 462 piedi sodi.



3 Diasi di nuouo vno esempio di vna colonna a faccie, che sia DEF, terminata da duoi triangoli vguali, & di lati, & di angoli, & da tre linee diritte lunghe, & che medesimamente sieno fra loro vguali, che da' Greci fu chiamata Prisma; ilche noi forse potremmo dire colonna ristretta a canti triangolari: & sia ciascuno de' lati delli triangoli piedi 6, & l'altezza di detta colonna sia piedi 12. Lo spazzo adunque di detto triangolo di lati vguali, sarà, per quello, che si disse al diciannouesimo capitolo, 15 & ½, & il suo ambito sarà 18. Moltiplica adunque la prima cosa 18 per 12, & harai 216; al qual numero aggiugni due volte 15 & ½, cioè 31 & ½, & harai 247 ½, e tanti piedi quadrati è lo vniuersale ambito della detta colonna. Et se tu moltiplicherai 15 & ½ per esso 12, te ne verrà 187 ½, e tanta è la grossezza di essa colonna a tre faccie DEF.

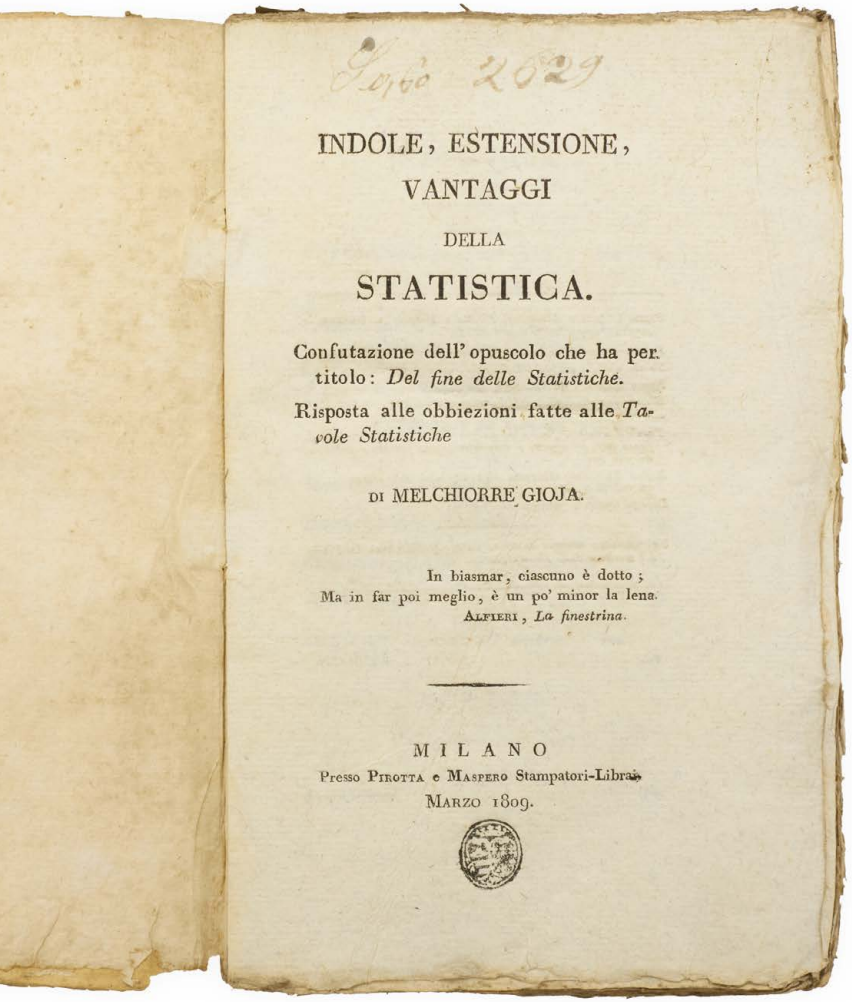
4 Et vna colonna quadrangolare, se ella sarà da per tutto ad angoli retti, non si misurerà in altra maniera, che come vn sodo più lungo per vn verso, che per l'altro, come si insegnò nel capitolo passato.

Ma se le base di dette colonne saranno irregolari, come sono i corpi di quattro lati diuersi, trouato lo spazzo della basa, secondo che ti si disse al cap. 23. bisogna fare le altre cose, nel modo che hora ti si è dato. Come che ci sia proposto vna colonna a quattro faccie disuguali, che sia GHI, le base della quale sono di quattro lati, ma dua vguali, & dua disuguali: i lati vguali della quale sieno 4 piedi, il lato minore 3 piedi, & il maggiore sia 7 piedi, & l'altezza piedi 11. Sarà adunq; lo spazzo di queste quattro faccie, per il medesimo cap. 23. piedi 17 & ½, & il suo girare sarà piedi 18. Moltiplica adunque 18 per 11, e te ne verrà 198; alqual 198 aggiugni due volte 17 & ½, e te ne risulterà la vniuersale superficie della detta colonna a quattro faccie, che sarà piedi 233. Et se tu moltiplicherai 17 ½, per il medesimo 11, te ne verrà 192 ½. e tanti piedi è la grossezza GHI della detta colonna.



5 Piacemi finalmente, per maggior chiarezza del misurare le altre colonne di più diuersi angoli, di esaminare la colonna di 6 faccie KLM; la altezza della quale sia piedi 10, & ciascun lato delle 6 faccie sia piedi 6. Sarà adunque la circonferenza 36 piedi, & lo spazzo 93 & ½, secondo quello che ti si insegnò al cap. 24. passato. Moltiplica adunque la prima cosa 36 per 10, & harai 360: al qual numero aggiugni due volte 93 & ½, cioè 187 ½, & harai 547 ½, che sarà l'vniuersale quantità della superficie. Moltiplica di nuouo 93 ½, per esso 10 dell'altezza, & harai 936; e tanti piedi sodi è la sua grossezza. Il medesimo corrispondentemente farai di tutte le altre simili, qualunque elle si sieno. Nè bisogna che tu ti marauigli, se alcuna volta il numero de' piedi della superficie sarà maggiore del numero de' piedi di essa grossezza: imperoche in ogni piede cubico si truouano esser 6 piedi quadrati.

6 Da queste cose primieramente si caua la misura di diuersi corpi solidi, che par che sieno parti delle sopradette, & simili colonne, si co-



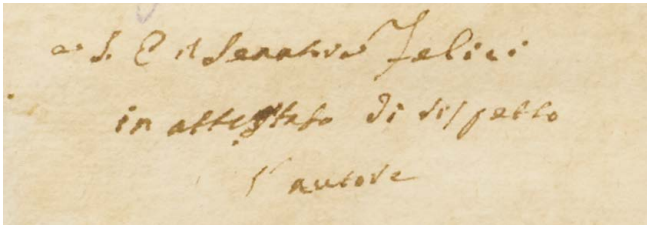
INDOLE, ESTENSIONE,
VANTAGGI
DELLA
STATISTICA.

Confutazione dell' opuscolo che ha per titolo: *Del fine delle Statistiche.*
Risposta alle obbiezioni fatte alle *Tavole Statistiche*

DI MELCHIORRE GIOJA.

In biasmar, ciascuno è dotto;
Ma in far poi meglio, è un po' minor la lena.
ALFIERI, *La finestrina.*

MILANO
Presso PIROTTA e MASPERO Stampatori-Librai.
MARZO 1809.



Statistics for Happiness: Advocating Data-Informed Decision-Making

19. GIOIA [*or* GIOJA], Melchiorre. Indole, estensione, vantaggi della statistica. Confutazione dell' opuscolo che ha per titolo: *Del fine delle statistiche.* Risposta alle obbiezioni fatte alle *Tavole statistiche. Milan, Pirotta and Maspero, March 1809.*

8vo, pp. viii, 195, [1, blank]; a remarkably clean, unsophisticated copy, uncut in original yellow wrappers; light dust-staining to wrappers with a few minor creases and chips; **ink presentation inscription 'a S. E. il Senatore Felici / in attestato di rispetto / l'autore'** to front pastedown, contemporary ink shelfmark to upper margin of title and ink ownership stamp to lower margin, pencil mark to front pastedown, remains of an old paper label to rear pastedown. **£1250**

First and only edition of this rare work on the nature and necessity of statistics by Melchiorre Gioia, presented by the author to the former Minister for the Interior, Daniele Felici.

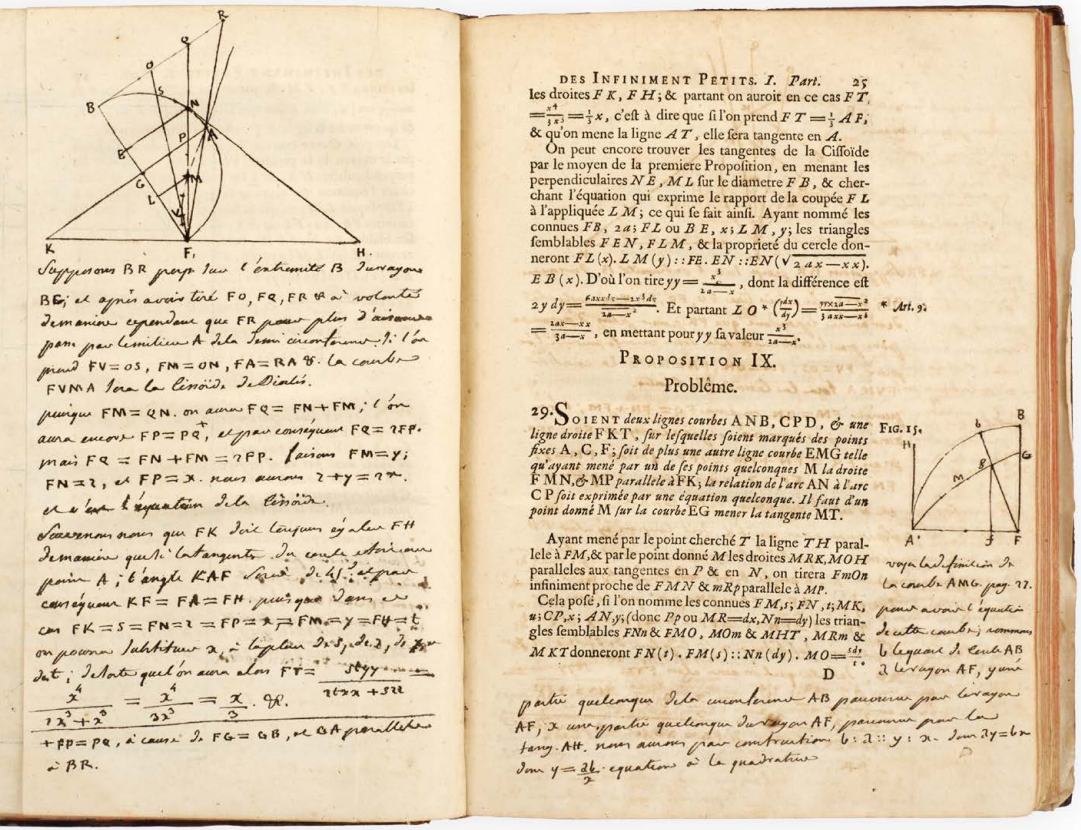
The publication of the *Indole, estensione, vantaggi della statistica* was a momentous event in the controversy that led to the exile of its author, the statistician and econonomist Melchiorre Gioia (1767–1829). It was conceived as a defence of his work of the previous year, the *Tavole statisiche*, in which he had presented 'algebraic formulas for an optimal solution for balancing the happiness of each and every person' (DBI, *trans.*) with the use of statistics on seven topics: topography, population, agriculture, arts and crafts, trade, public administration, and the character of the people. Met by immediate and public rebuke from contemporary administrators, Gioia wrote this riposte exploring the central role of statistics in the pursuit of public welfare; it, too, was dismissed, and in May he resorted to publishing a satirical novel to highlight his predicament, *La scienza del povero diavolo*, for which he was exiled in July and not allowed to return to Milan until the following November.

His subsequent highly praised contributions to economics continued to be underpinned by his belief in the fundamental importance of data as drivers of policies for the happiness of nations.

Provenance:
The present copy was inscribed by Gioia to the Senator and erstwhile Minister for the Interior, Daniele Felici (1769–1836), under whom he had been appointed to lead the Office for Statistics in 1803.

OCLC finds one copy in the UK (Senate House) and only two in the US (Harvard, Washington); no copies traced at auction.

Not in Sraffa.



DES INFINIMENT PETITS. I. Part. 25

les droites FK, FH; & partant on auroit en ce cas $FT = \frac{x^4}{3x^3} = \frac{1}{3}x$, c'eſt à dire que ſi l'on prend $FT = \frac{1}{3}AF$, & qu'on mene la ligne AT, elle ſera tangente en A.

On peut encore trouver les tangentes de la Ciſſoïde par le moyen de la premiere Propoſition, en menant les perpendiculaires NE, ML ſur le diametre FB, & cherchant l'équation qui exprime le rapport de la coupée FL à l'appliquée LM; ce qui ſe fait ainſi. Ayant nommé les connues FB, $2a$; FL ou BE, x; LM, y; les triangles ſemblables FEN, FLM, & la proprieté du cercle donneront $FL(x).LM(y)::FE.EN::EN(\sqrt{2ax-xx})$. $EB(x)$. D'où l'on tire $yy = \frac{x^3}{2a-x}$, dont la différence eſt $2y\,dy = \frac{6axdx-3xxdx}{2a-x} - \frac{2x^3dx}{2a-x^2}$. Et partant LO * $(\frac{dx}{dy}) = \frac{yy \times 2a-xx}{3axx-x^3}$ * Art. 9. $= \frac{2ax-xx}{3a-x}$, en mettant pour yy ſa valeur $\frac{x^3}{2a-x}$.

PROPOSITION IX.

Problême.

29. SOIENT *deux lignes courbes* ANB, CPD, *& une ligne droite* FKT, *ſur leſquelles ſoient marqués des points fixes* A, C, F; *ſoit de plus une autre ligne courbe* EMG *telle qu'ayant mené par un de ſes points quelconques* M *la droite* FMN, *&* MP *parallele à* FK; *la relation de l'arc* AN *à l'arc* CP *ſoit exprimée par une équation quelconque. Il faut d'un point donné* M *ſur la courbe* EG *mener la tangente* MT.

FIG. 15.

Ayant mené par le point cherché T la ligne TH parallele à FM, & par le point donné M les droites MRK, MOH paralleles aux tangentes en P & en N, on tirera $FmOn$ infiniment proche de FMN & mRp parallele à MP.

Cela poſé, ſi l'on nomme les connues FM, s; FN, t; MK, u; CP, x; AN, y; (donc Pp ou $MR = dx$, $Nn = dy$) les triangles ſemblables FNn & FMO, MOm & MHT, MRm & MKT donneront $FN(t).FM(s)::Nn(dy).MO = \frac{sdy}{t}$.

D

Mathematical Marginalia

20. L'HÔPITAL, Guillaume François Antoine, *marquis de.* Analyse des infiniment petits, pour l'intelligence des lignes courbes ... Seconde edition. *Paris, François Montalant, 1715.*

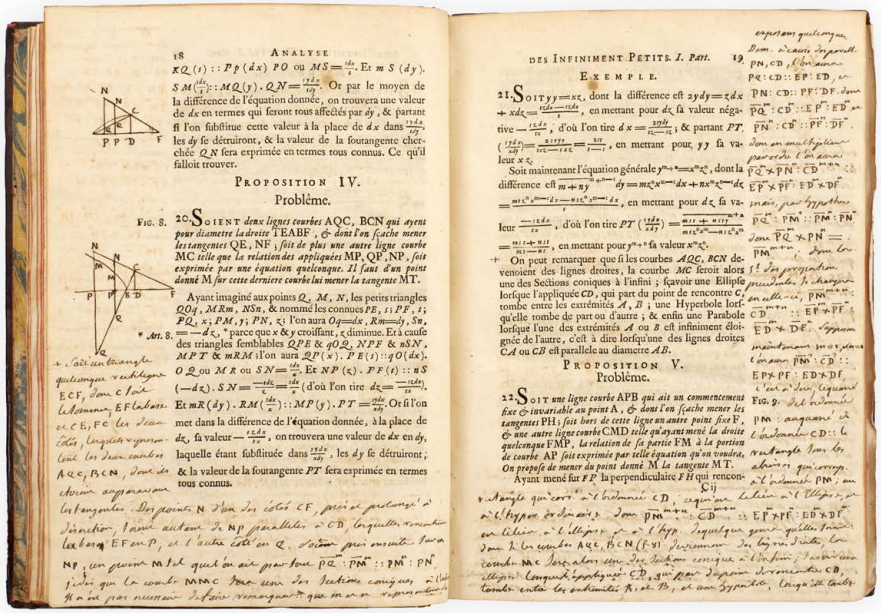
4to, pp. xv, [1], 162, 165–181, [1] (*i.e.* wanting leaf X2, pp. 163–164); with 11 folding engraved plates illustrating 156 diagrams, engraved vignette to title, initials, head- and tailpieces; two marginal tears to title (not touching text), final plate detached, small marginal hole to last leaf and plate, occasional light marginal dampstaining and other small marks, some toning; overall good in contemporary mottled calf, spine gilt in compartments, gilt lettering-piece, edges stained red, marbled pastedowns, small fragments from a medieval musical manuscript visible to joints; upper joint partly split, spine with small losses and partly detached, some wear to boards, corners, and edges, free endpapers wanting; with marginal annotations in a later eighteenth-century hand to 137 pp. of text and to 4 plates, with occasional marginal diagrams.

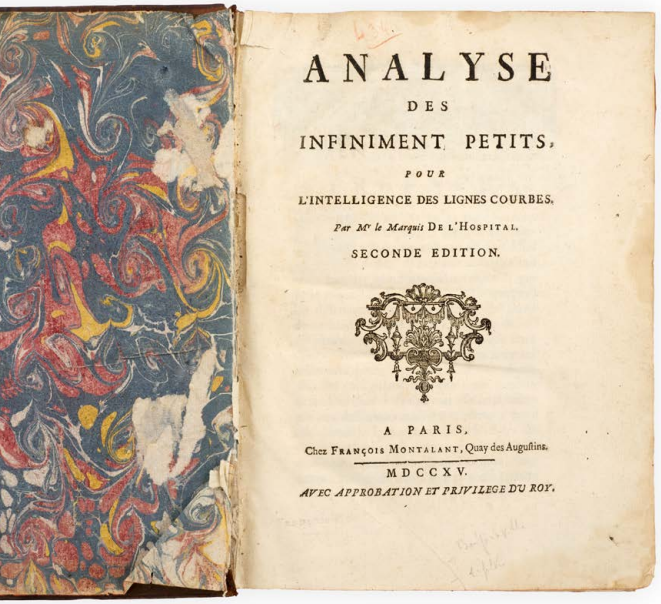
£2750

Second edition (first 1696) of l'Hôpital's famous *Analyse*, the first textbook on differential calculus, inspired by the work of Leibniz and the Bernoulli brothers, this copy profusely annotated by an anonymous but proficient eighteenth-century mathematician.

'Following the classical custom, the book starts with a set of definitions and axioms ... Following the axioms, the basic rules of the differential calculus are given and exemplified. The second chapter applies these rules to the determination of the tangent to a curve in a given point ... The third chapter deals with maximum-minimum problems and includes examples drawn from mechanics and from geography. Next comes a treatment of points of inflection and of cusps. This involves the introduction of higher-order differentials, each supposed infinitely small compared to its predecessor. Later chapters deal with evolutes and with caustics' (*DSB*). The rule named after L'Hôpital (for finding the limiting value of a fraction whose numerator and denominator tend to zero) is given in chapter nine.

The extraordinary marginal annotations in this copy by a later eighteenth-century reader display a remarkable engagement with l'Hôpital's work, comprising critical and explanatory text, detailed mathematical formulae, and occasional diagrams. The popularity of the *Analyse* prompted several commentaries, such as Jean-Pierre de Crousaz's *Commentaire* (1721) and Pierre Varignon's *Eclaircissemens* (1725), and the marginalia here are very much in the same spirit, although evidently not copied from either of these works. The annotator sometimes employs the first person, as if drafting their own commentary or recording that of a teacher *e.g.* 'we will see what to think of these general rules' (p. 63); 'it seems to me that the rule should be presented in this way …' (p. 66). He is certainly not uncritical: 'the author, for greater clarity, should have said for example …' (p. 105); 'this equation of the BCD curve proves as well as that of our author that this curve is of the 3rd kind' (p. 137). The final page contains a rant regarding faults in the printing, our annotator expressing his opinion that the editor was 'the worst kind of scamp' ('le pire polison'). There are references to Descartes ('ce grand homme' pp. 21–22), to Varignon (p. 103), and to the astronomer Nicolas-Louis de Lacaille (1713–1762) (p. 138).





ANALYSE

DES

INFINIMENT PETITS,

POUR

L'INTELLIGENCE DES LIGNES COURBES.

Par M^r le Marquis DE L'HOSPITAL.

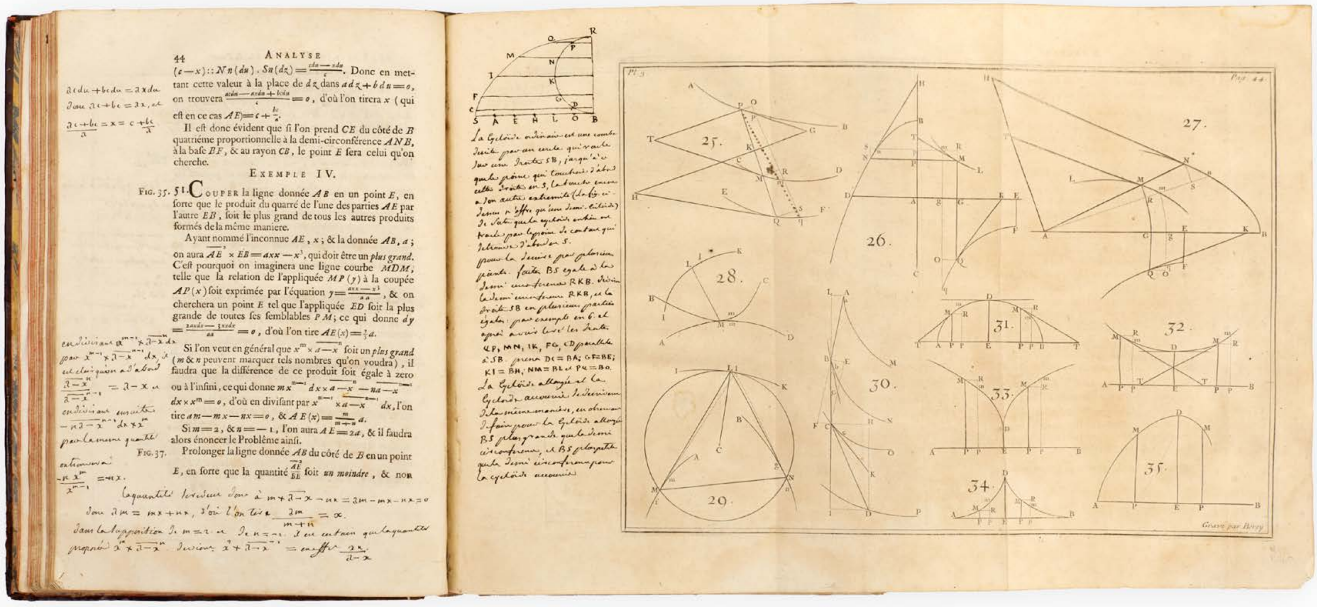
SECONDE EDITION.

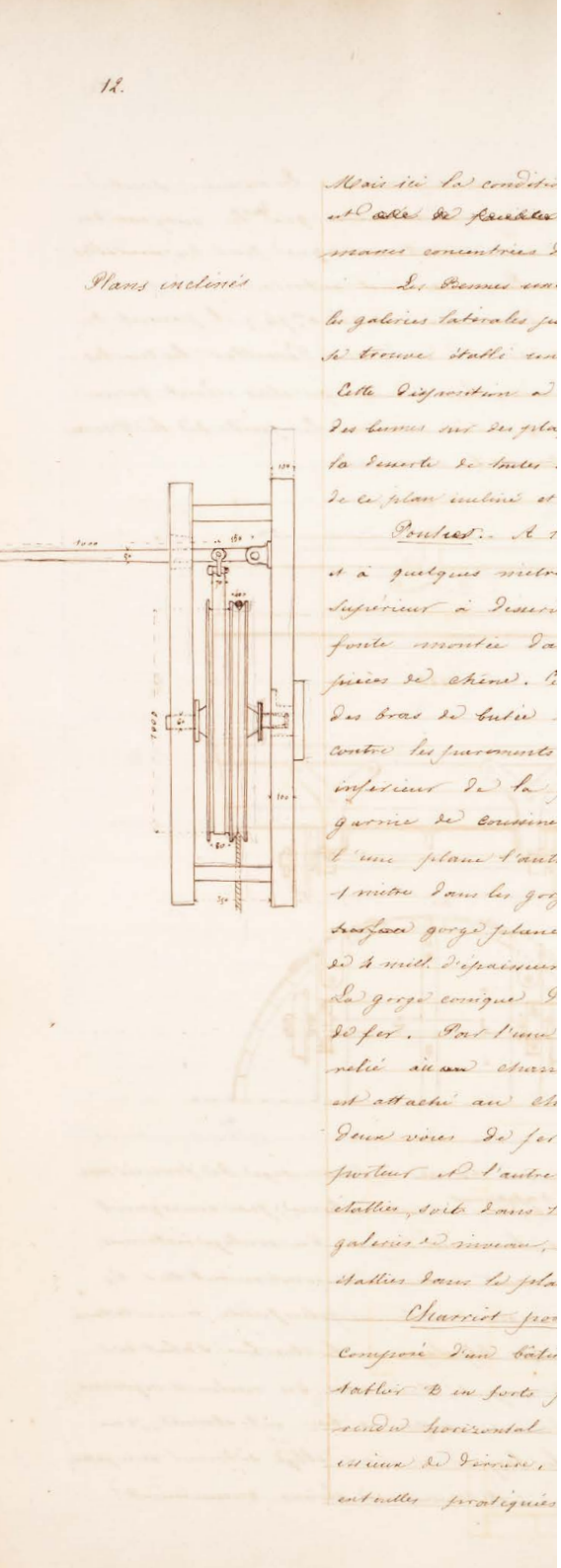
A PARIS,

Chez François Montalant, Quay des Augustins.

MDCCXV.

AVEC APPROBATION ET PRIVILEGE DU ROY.





Mining in France Elaborately Illustrated

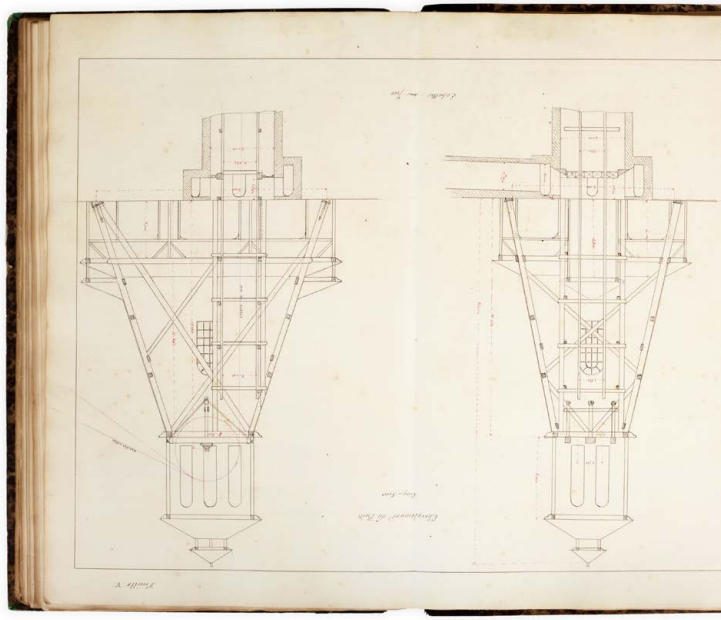
21. HUMBLOT, F. Journal de voyage ... *France, June–September 1866.*

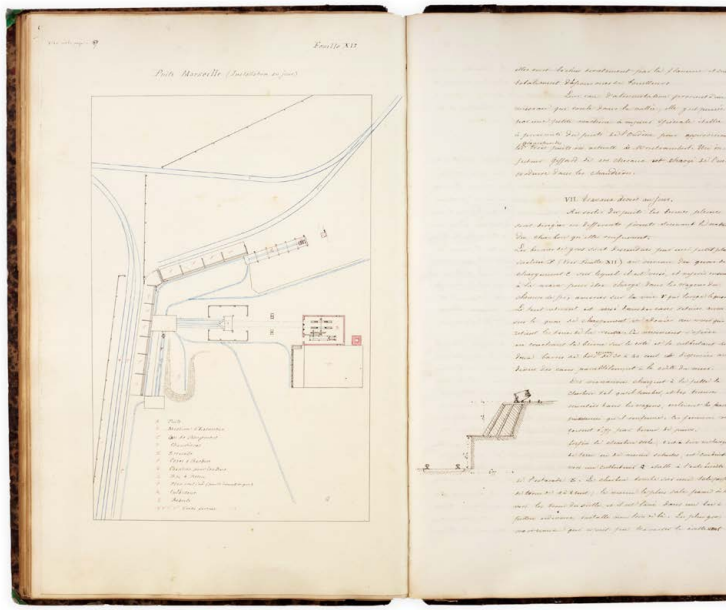
Manuscript on paper, in French, folio (372 × 242 mm), pp. [ii], 157, with 13 coloured drawings bound in (some folding), 2 drawings on tracing paper loosely inserted, and over 100 marginal and in-text drawings; neatly written in brown and occasionally red ink, 38 lines per page; loosely inserted a folder titled 'Croquis' with 9 further drawings on squared paper; a little occasional light foxing; very good in contemporary quarter black cloth with marbled sides; spine detached (remaining portion loosely inserted), some rubbing to corners and edges. **£3500**

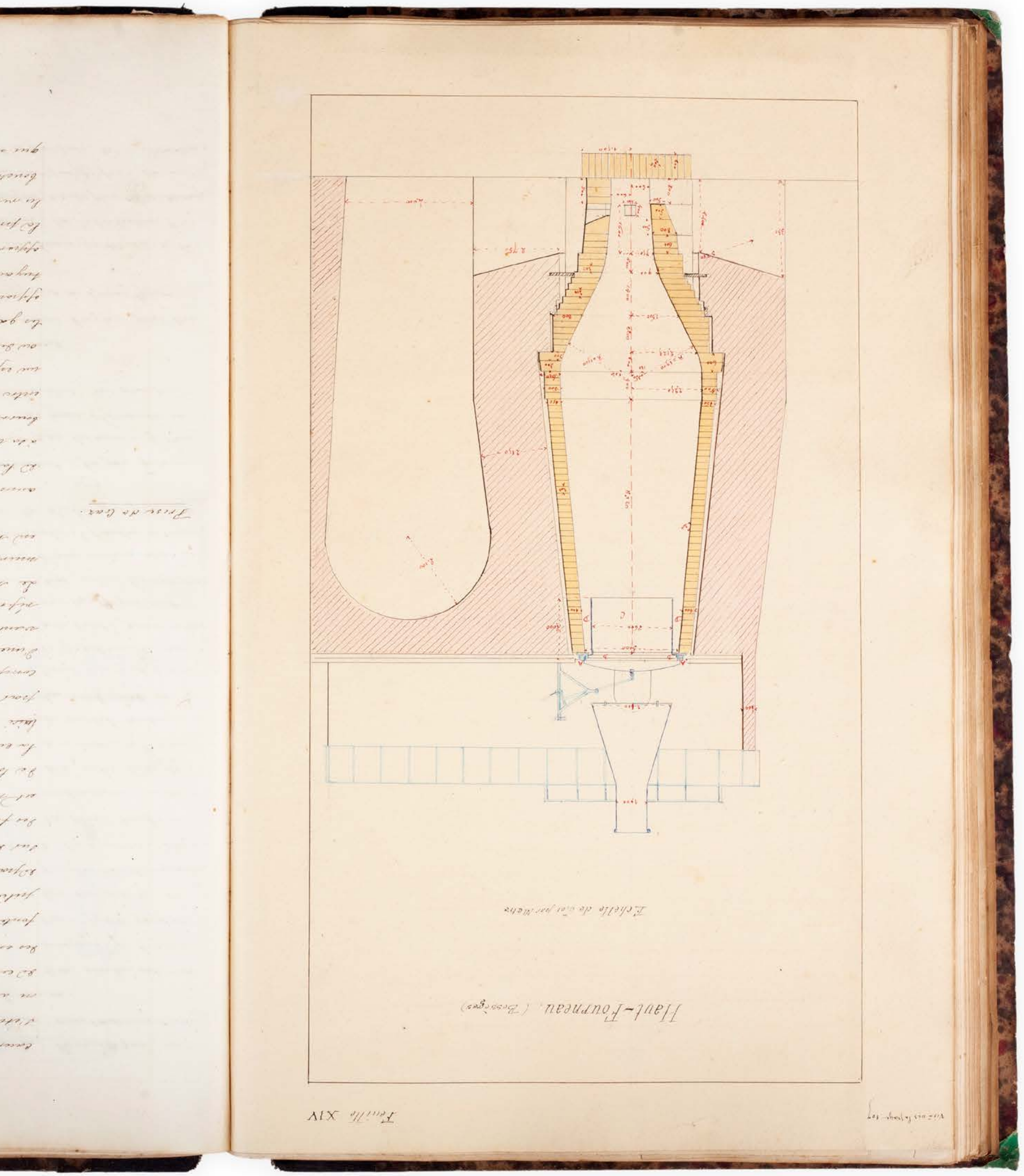
A handsome manuscript on mining engineering, apparently unpublished, recording visits undertaken by the engineer F. Humblot to coal mines and iron works in eastern and southern France in 1866, containing well over one hundred beautifully executed technical drawings.

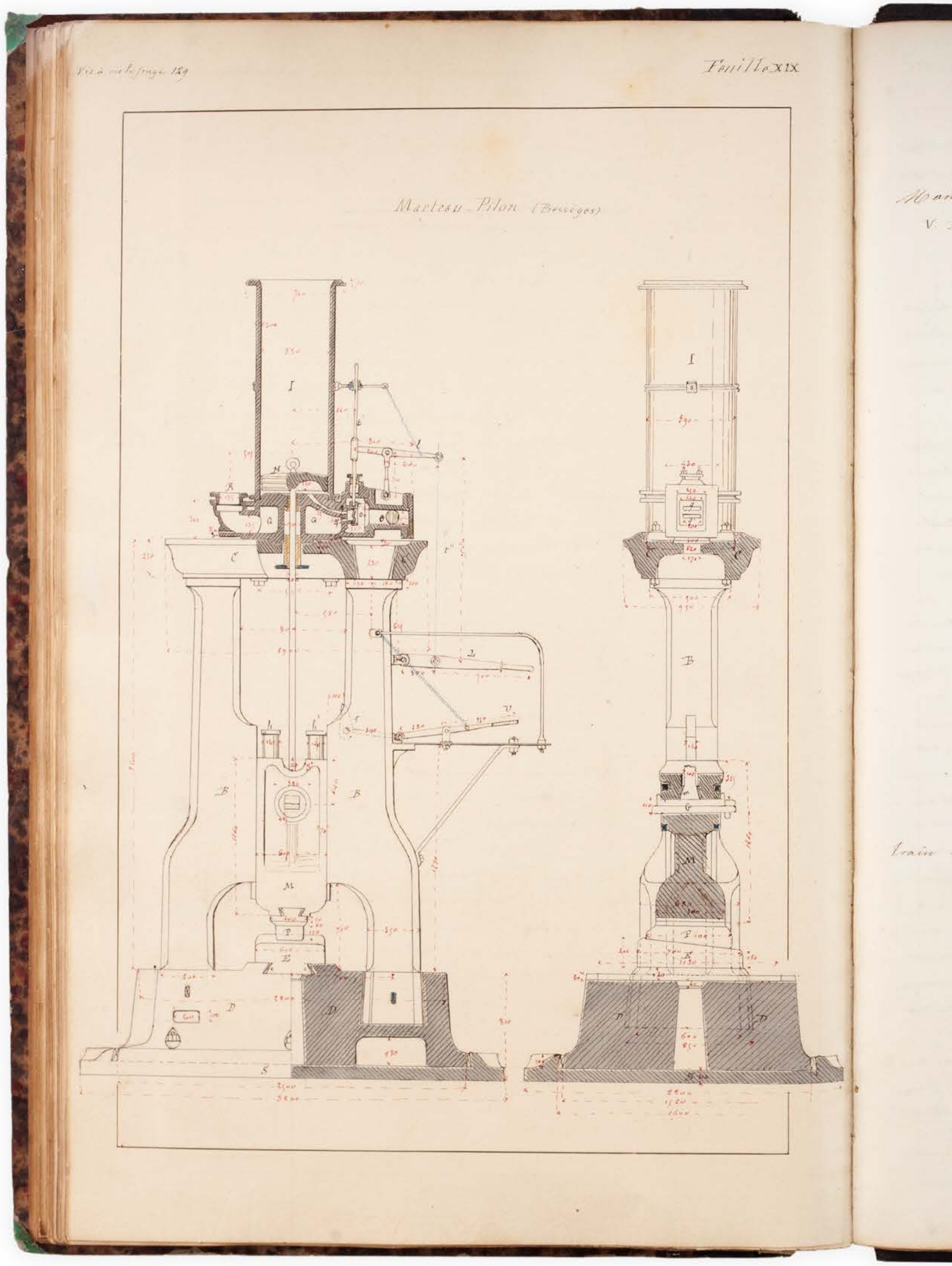
In June 1866 Humblot visited the coal mines of Sainte Marie and Cinq-Sous at Blanzy, moving on in August to the mines at Montrambert and La Béraudière near to Saint-Étienne, and finishing in September with a trip to the iron works at Bessèges. The text contains detailed descriptions of the workings of each site, with statistics, while the accompanying illustrations include site plans, maps, geological cross sections, barrows and wagons, rails, pulleys, hand tools, cross sections of galleries, pumping engines, headframes, furnaces, boilers, and steam hammers, all executed with considerable skill.

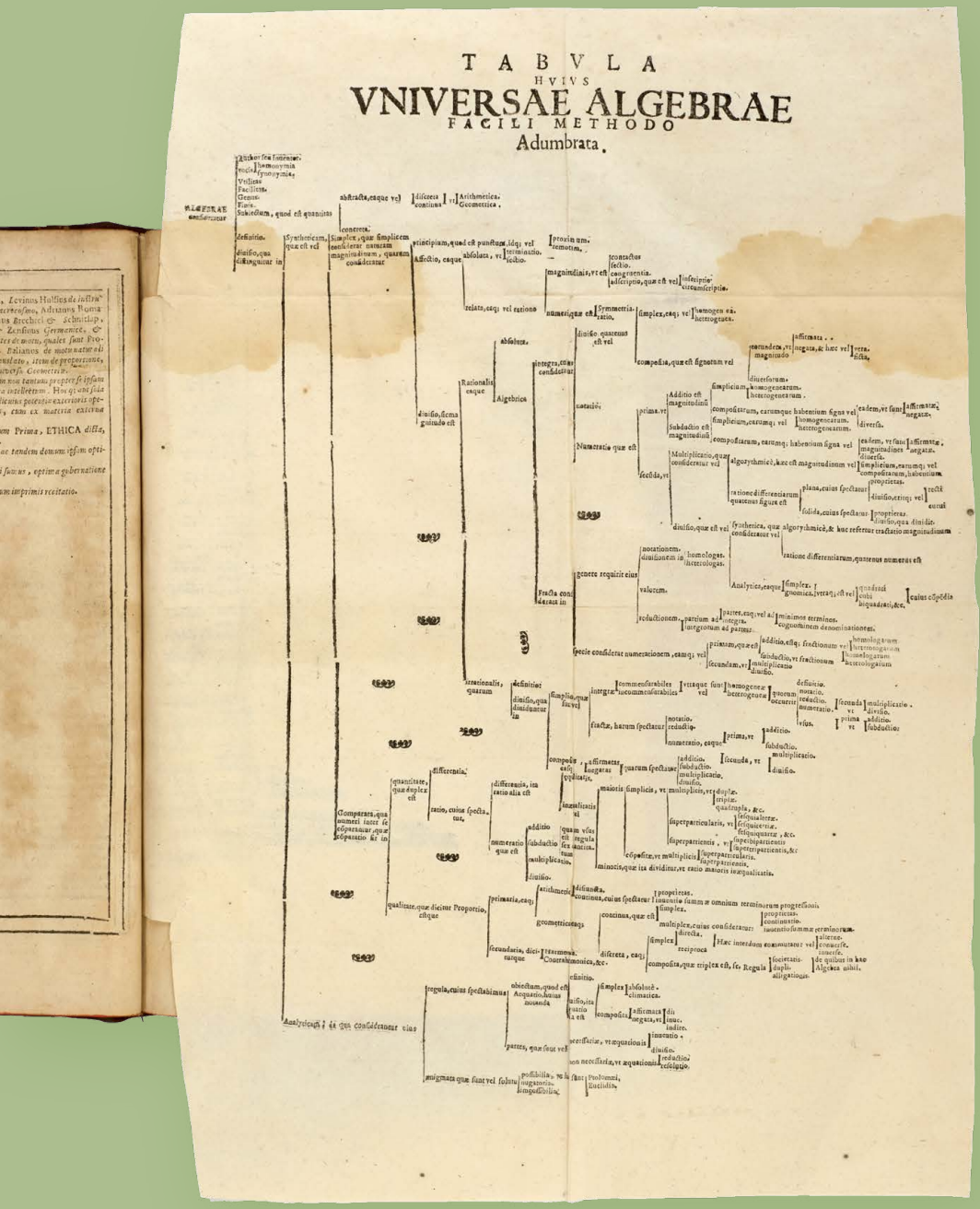
The author of this manuscript was perhaps related to Edmond Humblot (1830–1899), engineer of bridges, reservoirs and railways who served as *directeur général des services des eaux* in Paris.






Haut-Fourneau (Bessèges)
Feuille XIV


Feuille XIX
Marteau Pilon (Bessèges)



German Mathematics in Padua

22. LUNESCHLOS, Joannes de. Thesaurus mathematum reseratus per algebram novam tam speciebus quam numeris declaratam et demonstratam. Cui praefixa universae philosophiae mathematicarum in primis disciplinarum synopsis. *Padua, Giulio Crivellari, 1646.*

Folio, pp. [40], 311, [21]; lacking half-title and additional engraved title-page; each page within a printed double border, with occasional marginalia printed vertically within the frame, large engraved armorial of the dedicatee to title-page verso with a small ink drawing above, woodcut initials and tailpieces, 4 folding letterpress tables, woodcut and engraved diagrams; title-page soiled and with section of paper torn away (not affecting text but with loss of blank section of engraving on verso), lower corner of B4 torn (just touching text), occasional marginal soiling, final leaf soiled, though a good copy; bound in near-contemporary English calf over pasteboard, double blind fillet border, red edges; rebacked in leather (by Metcalf of Stonyhurst, with their ticket), binding a little rubbed, lacking front flyleaves, rear flyleaf defective, upper hinge repaired with a strip of buckram, paper shelflabel pasted to inside front cover. **£8500**

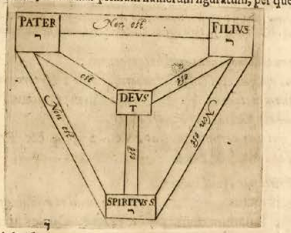
An uncommon mathematical text, written by a German scholar at the University of Padua; this copy arrived in England shortly after publication.

CAPVT IX.

DE

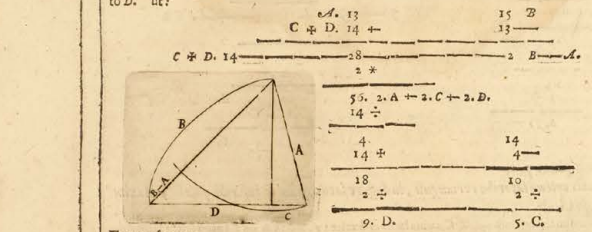
merorum Rationalium divisione considerata ratione differentiarum, quæ ex illa oriuntur trahunt.

ex Multiplicatione ortæ sunt magnitudinum differentiæ, ita ex divisione dimanant
ferentiæ numerorum.
autem numerus definitibus *Martiano Capella* lib. 7. de Nupt Merc. & Philol. con-
gatio monadum, vel è monade veniens multitudo, atq; in monadem desinens, et *Eu-*
lesin. 2. lib. 7. τὸ ἐκ μονάδων συγκείμενον πλῆθος. *Ex unitatibus composita multitudo*
ntur *Aristoteles* lib. 10. Metaph. cap 3. Quorum definitioni minime favent *Petrus*
Arithmeticis & scholis Mathem *Bernhardus Saligniacus* in Arithm. Integr. *Simon Ste-*
pendio Arithm. sect. 1. quæst. 5. & 9. aliiq; Ad quorum tamen argumenta aliquid
e sibi videtur *Iacobus Martinus* in exerc. Metaph. & *Petrus Laurembergius* in Logist.
orum sententia unitas numerus inadequatam erit, sed fons, radix atq; principium
itiuidinis. habetq; se respectu numerorum, ut inter dimensiones *Geometricas* signum
n, quod cum suo motu aut fluxu lineam efficiat, & ex consequenti reliquarum dimen-
igo sit, nullius tamen magnitudinis particeps est. In numeris autem designandis va-
es ut *Arabica* imprimis, *Hebraica*, *Græca*, & *Latina* variis characteribus uti solitæ
Hæc qui latius nosse volet (de hac re prolixius differere non est hujus instituti) con-
Latinos Valerium Probum, apud *Gregor Herodiani* de numeris libellum, apud *Hebræos*
Itanum Musterum, *Iohannem Isaacum* aliosq;. Sciendum tamen hoc loco est *Binarii*
n numerum; *Ternarium* primum numerum figuratum, per quē *Cabbalistæ* Sacrosanctā



ם Trinitatē ד ם per tres ם, tres divinas hypostases indigitantes, per unicā Camez tri-
ד
postam, divinam Naturam, quæ unicuiq; hypostasi, tota impartibiliter communi-
ngentes, quod grande Mysterium hoc diagrammate redditur dilucidius.
n-ת-ה unum ex deeē nominibus DEI; quod Dominum significat, & ut quibusdam pla-
breviatum pro יהוה. Et ab essendo nomen habet, quod semper fuit, est, & erit, om-
eaturis tribuit suum esse. Hinc nonnullis videtur compositum Iupiter, quasi dictum
rum *quaternarius* est primus numerus quadratus, per hunc repræsentatur nomen
τετρακτύος ἀπὸ qualia hoc habet arcana inquire a apud *Cabbalistas*, præsertim a-
linum & *Fluddum*. *Quinarius* est primus centralis; Senarius perfectus & mundanus;
primus virgineus & sacer, quietarius; *Octonarius* primus cubicus; *Novenarius* pri-
ximus ultimo, alter ex trigono quadratus; *Denarius* primus circularis. Hoc loco
equeo verba illa satis absurda, quę de mysteriis numerorum recenset *Hugo à S. Victo-*
udit. didascal. cap. 5. de quatuor animę progressionibus. Dic (inquit ille) ter u-
tria: dic ter tria, fiunt novem: dic ter novem, fiunt viginti septem: dic ter viginti se
ptem

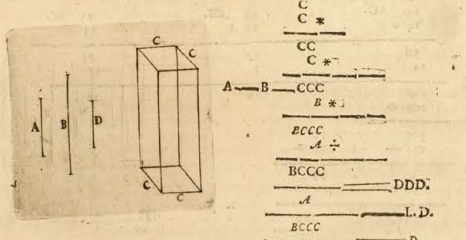
B——A 2 ad 4, quæ subducta à latere C + D 14 relinquunt 10, cuius semissis 5 est segmentum *C*. Tertrea 4 addantur lateri C + D 14, & summæ 18 capiatur dimidium 9 proaltero segmento *D*. ut:



Exemplum 9.

46 *Figuram Solidam augere vel minuere in proportione data.*

Ex. gr. sit parallelepipedum oblongum augendum in proportione data *A* ad *B*. Accepto latere C. ipsius hedræ inferioris, investigabis quartam proportionalem *D* inter *A*. *B*. & C. dicendo, ut *A* ad *B*, sic cubus *CCC* qui ipsius lateris C ad DDD cubum rectæ lineę *D*, tanquam homologum termino *C* solidum constitutum, sumsile dato, erit quæsitum. ut:



47 *Proportio Geometrica Reciproca est, quando se habet prior terminus rationis antecedentis ad priorem consequentis, ut posterior consequentis ad posteriorem antecedentis.*

Id est, quando se terminus primus habet ad tertium, ut quartus ad secundum. Idcirco quando secundus major fuerit primo, tanto quartus minor existit tertio. Vt in hisce numeris videre est: 6 8 4 2. quæ ratio in hisce est primi 6 ad tertiū 4, nempe sesquialtera, eadem ratio est quarti 12 ad secundum 8. ut:

6——8——4——2.

Ad hanc proportionem reciprocam pertinet hoc theorema staticum nobilissimum sc:

48 *Quæ æquiponderant, habent se reciproce, ut distantia ab hypomochlio ad distantiam, sic pondus ad pondus.*

Est conversio propositionis *Archimedeæ* 6 & 7 de æquiponderantibus, cuius demonstrationem vide apud *Archimedem* l. c. *Marium Bettinum* Apiar. 4. progymn. 2. suppos. 2, & propositionis 3. lemmate, *Paulum Guldinum* differt. de motu terræ, elem. 9. demonstrantem eandem ex *Luca Valerio* de centro grauitatis solidorum. Ex hac sequuntur hæc duo: 1. *ignotam in pō de-*

deroso gravitatis quantitatem per æquiponderantiam æqualiter grauium in distantiis æqualibus inquirere. 2. *Ignotam in ponderoso gravitatis quantitatem per æquiponderantiam inæqualium ponderum ex inæqualibus distantiis indagare:* quorum illud habet locum in libra, hoc verò in statera.

Exemplum.

Sit stateræ vectis *A* + *B* divisus in varias inæquales partes, & suspensus ex divisione inæquali, sic etiam datum ponderosum *D* appensum ex radio *A*, cuius gravitas est ignota. Aequipondium etiam sit datum *C*, quod moveatur per radium *B*, donec æquiponderet cum dato gravi D. Ex. gr. Quæratur quantitas 6. librarum in gravitate propositi ponderosi. Aequipondium *C* statuatur ad divisionem 6. librarum, & ex *A* radio appendatur ponderis inveniendi quantitas, quę efficiat æquilibrium ipsius D ad C; dico tunc gravitatis in ponderoso D quātitatem esse 6 librarum. Nam quia C & D æquiponderant, erit per prop. cit. ut distantia *B* ad *A* distantiam, ita pondus *D*. ad pondus C, sed *B* sexies major posita est, quam *A*, ergo & gravitas D sexies major erit quām C gravitas, quæ unius libræ esse statuitur, sex ergo librarum est appensum grave D. Præterea in eadem statera non tantum quęri potest ignota quantitas gravitatis in ponderoso D, sed et iam cognoscitur æquipondium C, quantæ sit gravitatis. Eam enim semper habet rationem ipsum C ad D, quām distantia *A* ad distantiam *B*. Scitur autem quotas ipsius *B* habeat particulas *A*, tot etiam habebit ipsum *C*. Quapropter sit datum æquipondium C librarum 10, erit g rave suspensum D libratum 30. Dic enim, ut se habent ex. gr. 8 partes ipsius *A*, ad 24 partes ipsius *B* sic se habebit ipsum pondus C 10. librarum, ad pondus quæsitum D libratum 30. ut

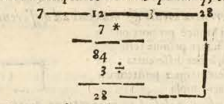
Exemplum aliud proportionis reciprocæ.

12. Rustici absolvunt opus spatio 7 septimanarum: quot requiruntur rustici, qui absolvāt illud ipsum opus spatio 3. septimanarum? R 28. dispositio est ejusmodi:

5. R. 5. R.
7——12——3——28.

49 Procede ergo iuxta *Regulam ejus, quæ talis est: Primum terminum multiplica per secundum, & factum divide per tertium, quotusq; constituet quartum proportionalem.*

Vt in priori exemplo.



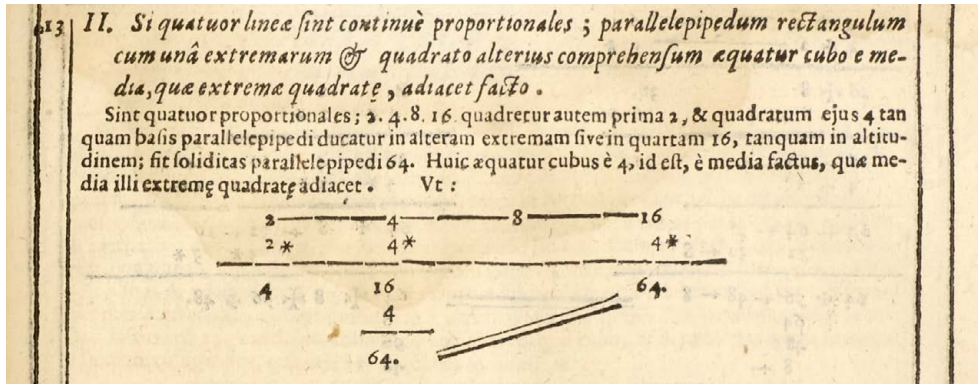
50 *Vtraq; hæc proportio tàm directa quàm reciproca interdum commutatur, idque vel alternè, vel converse, vel inverse.*

51 *Alternè, quando datorum mediorum terminorum secundus succedit in locum tertii, & tertius in locum secundi.*

Quia enim est, ut *A* ad B, sic C ad D; erit permutando, ut *A* ad C, ita *B* ad D. *In Numeris*, si sit ex. gr. in proportione directa, ut 4 ad 6, sic 10 ad 15, erit alternando, ut 4 ad 10, sic 6 ad 15. In reciproca, ut 6 ad 4, ita 12 ad 8; erit alternando, ut 6 ad 12, ita 4 ad 8.

52 *Converse, quando primi duo termini ordine succedunt in locum duorum ultimorum; & contra, si duo ultimi in locum duorum primorum.*

Vt sit *A* ad B, ita C ad D, erit convertendo, ut C ad D, ita *A* ad B. *In numeris*, ut in proportione directa, ut 4 ad 6, sic 10 ad 15, erit convertendo ut 10 ad 15, ita 4 ad 6. Et in reciproca, ut 6 ad 4, sic 12 ad 8, erit convertendo, ut 12 ad 8, sic 6 ad 4.



II. *Si quatuor lineæ ſint continuè proportionales ; parallelepipedum rectangulum cum unâ extremarum & quadrato alterius comprehenſum æquatur cubo e media, quæ extremæ quadratę, adiacet facto.*

Sint quatuor proportionales; 2. 4. 8. 16. quadretur autem prima 2, & quadratum ejus 4 tan quam baſis parallelepipedi ducatur in alteram extremam ſive in quartam 16, tanquam in altitudinem; fit ſoliditas parallelepipedi 64. Huic æquatur cubus è 4, id eſt, è media factus, quæ media illi extremę quadratę adiacet. Vt :

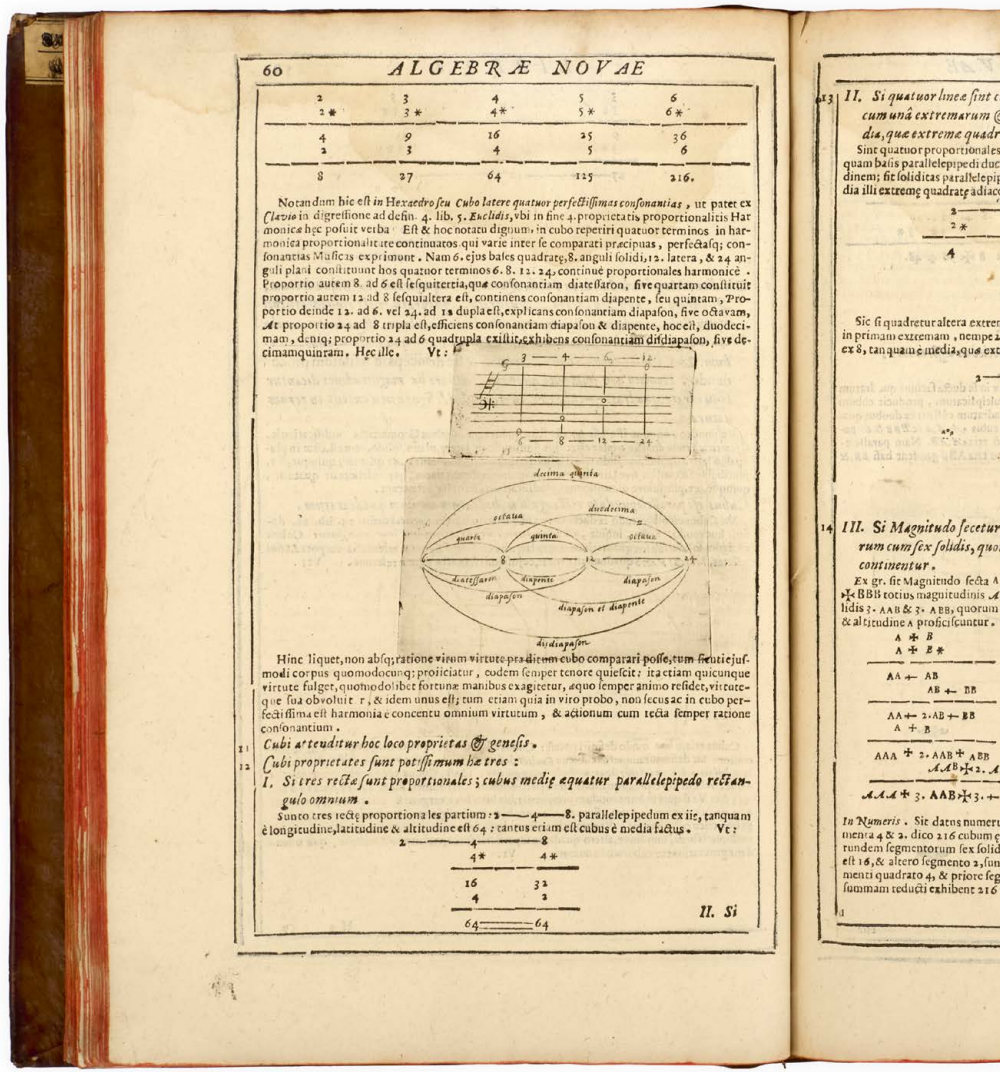
2 — 4 — 8 — 16

2 * 4 * 4 *

4 16 64.

4

64.



60 ALGEBRÆ NOVÆ

2 3 4 5 6

2 * 3 * 4 * 5 * 6 *

4 9 16 25 36

2 3 4 5 6

8 27 64 125 216.

Notandum hic eſt *in Hexaedro ſeu Cubo latere quatuor perfectiſſimas conſonantias*, ut patet ex *Clavio* in digreſſione ad defin. 4. lib. 5. *Euclidis*, vbi in fine 4. proprietatis proportionalitis Harmonicæ hęc poſuit verba : Eſt & hoc notatu dignum, in cubo reperiri quatuor terminos in harmonica proportionalitate continuatos, qui variè inter ſe comparati præcipuas, perfectaſq; conſonantias Muſicas exprimunt. Nam 6. ejus bales quadratę, 8. anguli ſolidi, 12. latera, & 24 anguli plani conſtituunt hos quatuor terminos 6. 8. 12. 24. continuè proportionales harmonicè. Proportio autem 8. ad 6 eſt ſeſquitertia, quæ conſonantiam diateſſaron, ſive quartam conſtituit proportio autem 12 ad 8 ſeſqualtera eſt, continens conſonantiam diapente, ſeu quintam, Proportio deinde 12. ad 6. vel 24. ad 12 dupla eſt, explicans conſonantiam diapaſon, ſive octavam, At proportio 24 ad 8 tripla eſt, efficiens conſonantiam diapaſon & diapente, hoc eſt, duodecimam, denique proportio 24 ad 6 quadrupla exiſtit, exhibens conſonantiam dis diapaſon, ſive decimamquintam. Hęc ille. Vt :

Hinc liquet, non abſq; ratione virum virtute prædicem cubo comparari poſſe, tum ſecutiejuſmodi corpus quomodocunq; projiciatur, eodem ſemper tenore quieſcit: ita etiam quicunque virtute fulget, quomodolibet fortunæ manibus exagitetur, æquo ſemper animo reſidet, virtuteque ſua obvoluit ſe, & idem unus eſt; tum etiam quia in viro probo, non ſecus ac in cubo perfectiſſima eſt harmonia è concentu omnium virtutum, & actionum cum tecta ſemper ratione conſonantium.

Cubi attenditur hoc loco proprietas & geneſis.

Cubi proprietates ſunt potiſſimum hæ tres :

I. Si tres rectæ ſunt proportionales ; cubus medię æquatur parallelepipedo rectangulo omnium.

Sunto tres rectę proportionales partium : 2 — 4 — 8. parallelepipedum ex iis, tanquam è longitudine, latitudine & altitudine eſt 64 ; tantus etiam eſt cubus è media factus. Vt :

2 — 4 — 8

4 * 4 *

16 32

4 2

64 — 64

II. Si

Joannes de Luneschlos (or Leuneschlos, 1620–1699, from Solingen) studied in the Netherlands and at the University of Padua, publishing his survey of mathematics in the year that he matriculated (he was awarded his doctorate in 1648). He dedicated it to the industrialist Lodewijk de Geer, for whom he later worked in Sweden, and he composed a separate preface addressed to students in all faculties from the substantial German Nation at Padua. After travelling around Europe, he became professor of mathematics and physics in 1651 at the newly refounded University of Heidelberg, a post he retained for forty years. He is known to have discussed Cartesian philosophy with Princess Elizabeth of the Palatinate during her time at Heidelberg in the 1650s; he was instrumental in the dissemination of Cartesianism in Heidelberg.

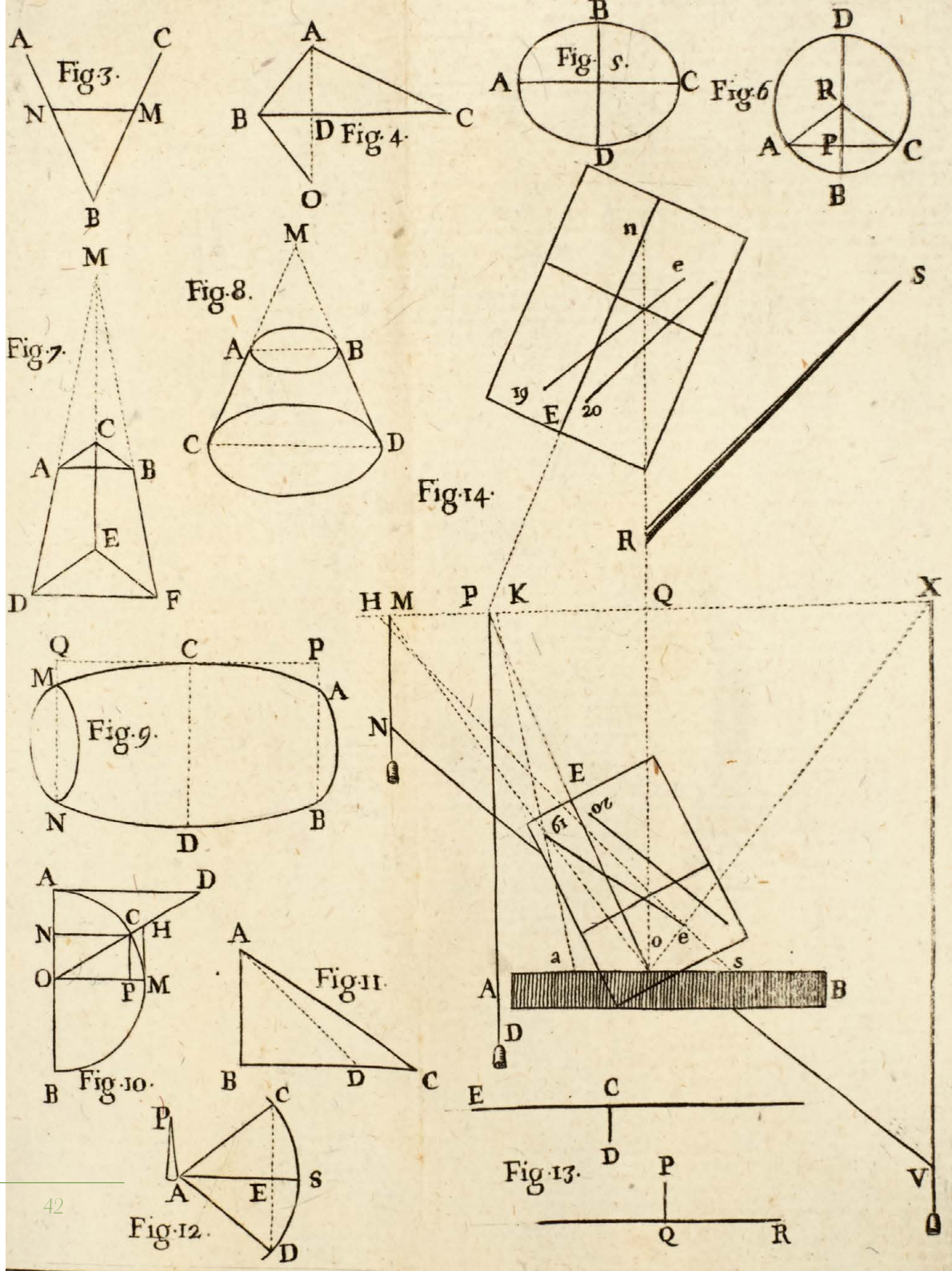
His work soon became known to English scholars; Robert Payne (1595–1651), a friend of Hobbes and chaplain to the Earl of Newcastle, made notes from Luneschlos (now in the Hobbes manuscripts at Chatsworth), though John Pell was somewhat uncomplimentary, opining that much of the text was taken from other sources, and that some of the propositions that weren't were incorrectly stated.

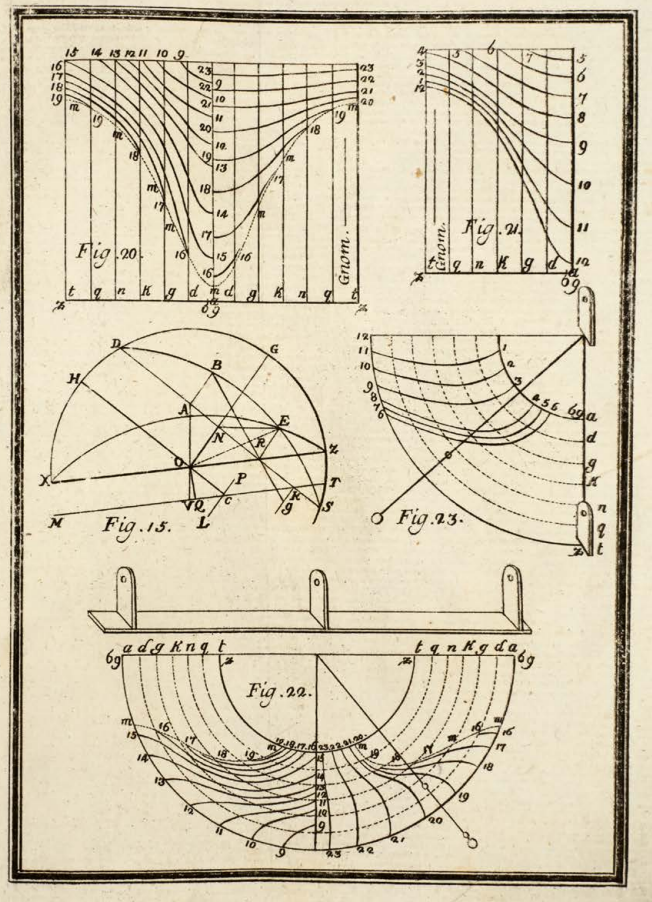
Uncommon: we have located four copies in the UK (British Library, Bodleian, UCL and Royal College of Physicians), one in the US (Michigan), and the only copy in Germany is in Göttingen. Only the Macclesfield and Honeyman copies have appeared at auction in recent years.

23. MARZAGLIA, Gaetano. Fascetto di pratiche matematiche spiegate alle persone popolari per uso del comercio umano, e civile, in questa seconda edizione corretto ed accresciuto di altre molte importanti notizie ... *Verona, Dionisio Ramanzini, 1780*.

8vo, pp. xvi, '186' (*i.e.* 188), I–IV, 187–190, 193–380, with four folding engraved plates; many tables in the text; occasional light foxing, but a very good copy in contemporary *carta rustica*; ink purchase note dated July 1792 to the front free endpaper, nineteenth-century armorial bookplate of the Carlotti di Riparbella family to the front pastedown, faded ink titling to the spine, remains of paper label at foot of spine. **£650**

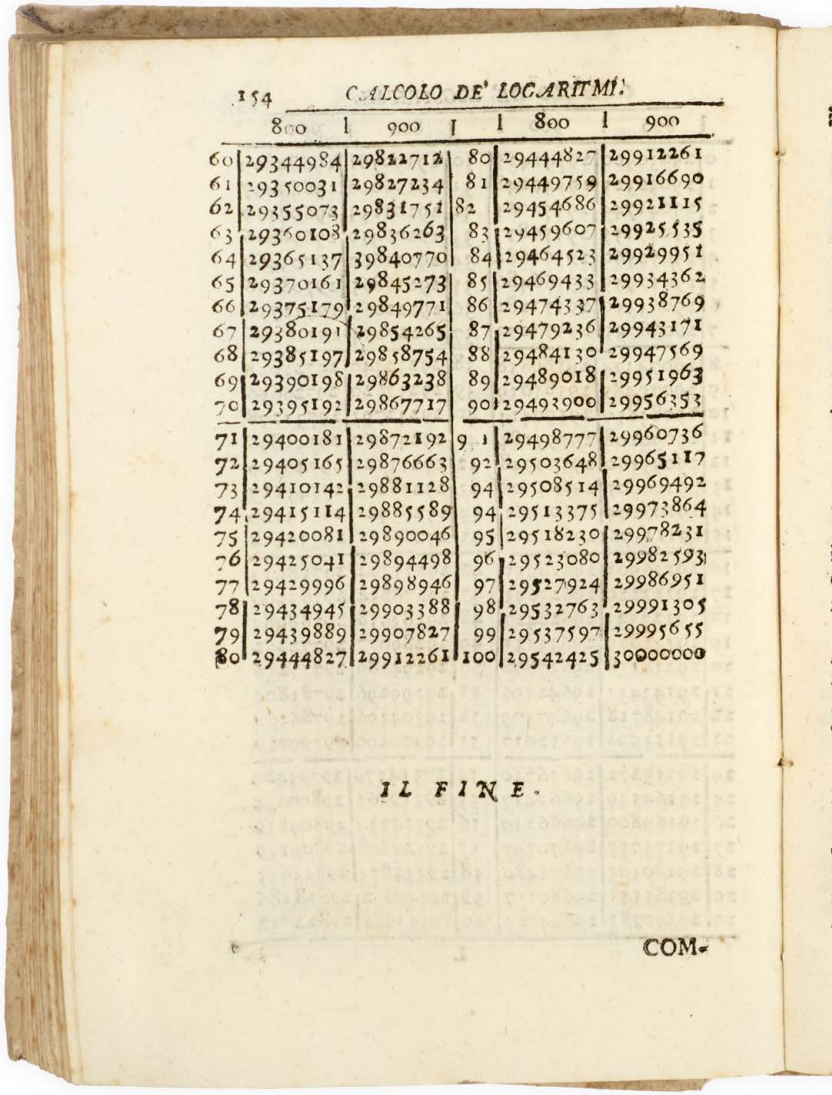
A lovely copy of the second edition, considerably augmented from the first of 1754, of this book of applied mathematical problems by the Veronese mathematician Gaetano Marzaglia (or Marcegaglia, 1716–1787), heavily influenced by the work of Wolff, who provides the motto to the book, and whose works he edited and expanded.





The work contains arithmetical and geometrical problems applied to mercantile, architectural, and industrial settings, dealing with the nature of money, and of weights and measures, the construction of sundials, and the division of royalties within trading companies, among many other questions. One interesting section discusses the measurement of metal coins through water displacement. Marzaglia was professor of mathematics at the military college in Verona and a correspondent of many of the leading scientists and mathematicians in Europe, in particular with Scipione Maffei.

Riccardi II, 130–131 (s.v. Marzagaglia). Beside a handful of copies in Italy, OCLC finds 2 copies in the UK (CUL and Oxford History of Science Museum) and one in the US (Stanford).



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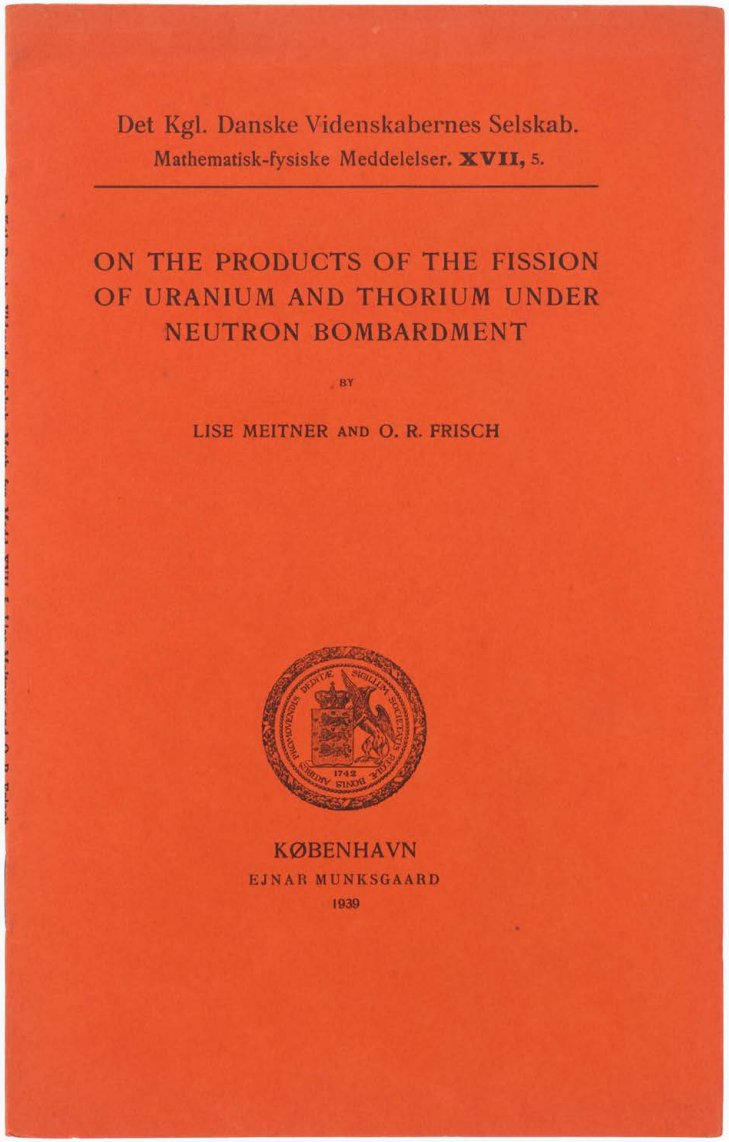
24. MEITNER, Lise, *and* Otto R. FRISCH. On the Products of the Fission of Uranium and Thorium under Neutron Bombardment. *Copenhagen, Ejnar Munksgaard, 1939.*

8vo, pp. 13, [1]; a fine and fresh copy in the original red printed wrappers.

£850

First edition of this highly important paper, published in *Det Kgl. Danske Videnskabernes Selskab. Mathematisk-Fysiske Meddelelser,* vol. 17, no. 5.

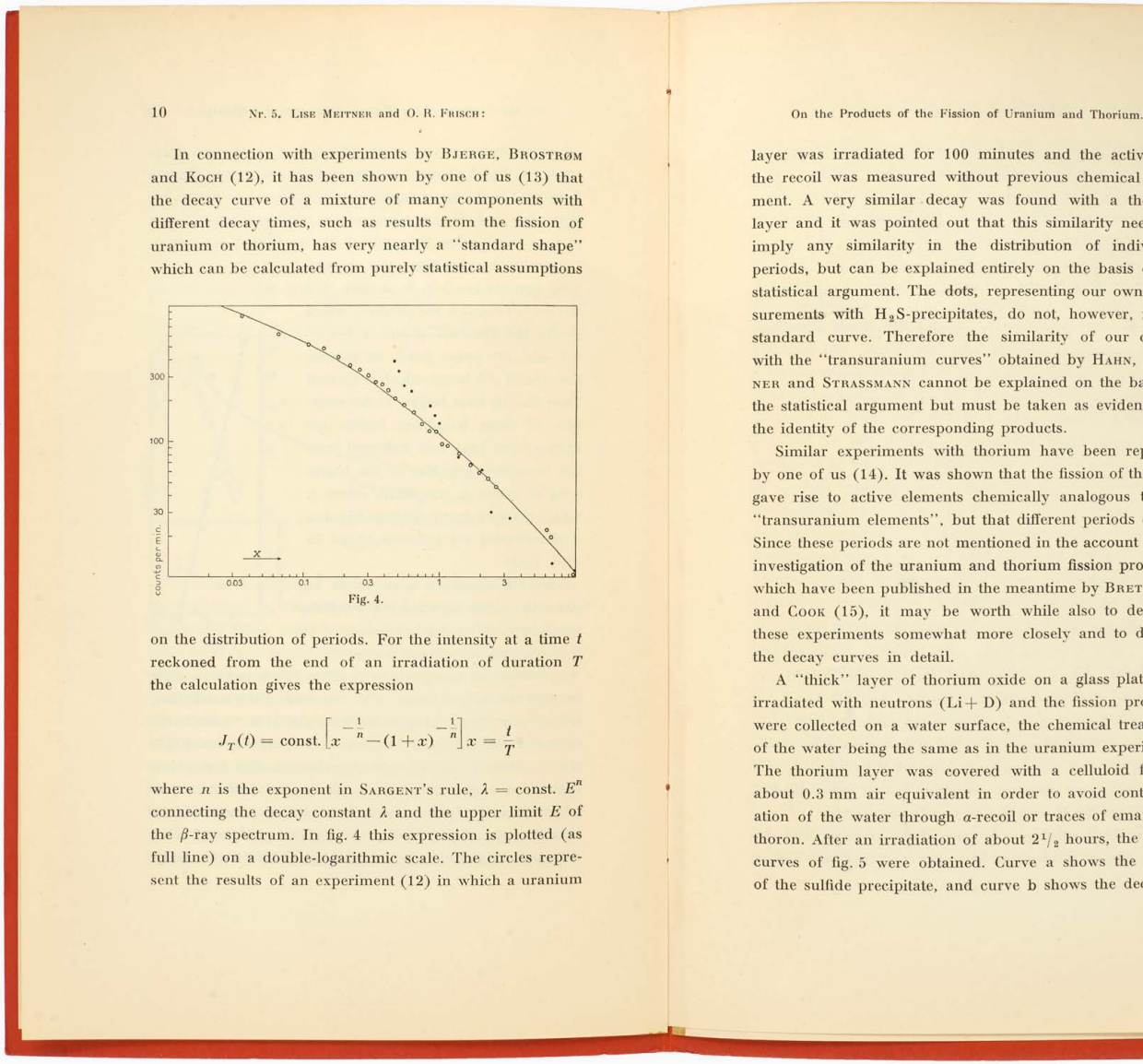
'The rapid developments in physics during the 1930s, such as the discovery of the neutron, artificial radioactivity and the positron, did not leave Meitner behind. In 1933, she used a Wilson cloud chamber to photograph positron production by gamma radiation and in the following year, she began to study the effects of neutron bombardment on uranium with Hahn. They were interested in confirming the results of Enrico Fermi (1901–1954) that suggested the production of transuranic elements, that is, elements with atomic numbers higher than that of uranium (92). In 1935, Meitner and Hahn used a hydrogen sulphide precipitation method to remove elements with atomic numbers between 84 and 92 from their neutron-irradiated sample of uranium. They thought they had found evidence for elements with atomic numbers 93, 94, 95 and 96. Then in 1938, after Meitner was forced to flee from Germany, Hahn and Strassmann found that the radioactive elements produced by neutron bombardment of uranium had properties like radium. From Sweden, Meitner requested firm chemical evidence for the identities of the products. Hahn and Strassmann were surprised to find that the neutron bombardment had produced not transuranic elements but three isotopes of barium, which has an atomic number of 96' (*Hutchinson's Dictionary of Scientific Biography* p. 474).



'The evidence for transuranic elements was thus placed in doubt, since sulphide precipitation did not eliminate elements lighter than plutonium. Meitner discussed this news with Frisch. It soon became clear that Bohr's droplet model of the nucleus must provide the clue to understanding how barium nuclei could be formed from uranium nuclei, which are almost twice as heavy. Frisch suggested that the division into two smaller nuclei was made possible through the mutual repulsion of the many protons of the uranium nucleus, making it behave like a droplet in which the surface tension has been greatly reduced by its electric charge. Meitner estimated the difference between the mass of the uranium nucleus (plus the extra neutron with which it had been bombarded) and the slightly smaller total mass of the two fragment nuclei; from this she worked out (by Einstein's mass-energy equivalence) the large amount of energy that was bound to be released. The two mutually repulsed fragments would, indeed, be driven apart with an energy that agreed with their value, so it all fitted.

'Meitner and Frisch reported these findings in a joint paper that described this "nuclear fission" (composed over the telephone, since she was in Stockholm and he had returned to Copenhagen)' (DSB).

'They predicted correctly that krypton would also be found among the products of this splitting process, which they named fission. A paper describing their analysis appeared in January 1939, and immediately set in motion a series of discoveries leading to the first nuclear reactor in 1942 and the first atomic bomb in 1945' (*Hutchinson's Dictionary of Scientific Biography, ibid.*).



10 Nr. 5. Lise Meitner and O. R. Frisch:

In connection with experiments by Bjerge, Brostrøm and Koch (12), it has been shown by one of us (13) that the decay curve of a mixture of many components with different decay times, such as results from the fission of uranium or thorium, has very nearly a "standard shape" which can be calculated from purely statistical assumptions

Fig. 4.

on the distribution of periods. For the intensity at a time t reckoned from the end of an irradiation of duration T the calculation gives the expression

$$J_T(t) = \text{const.}\left[x^{-\frac{1}{n}} - (1+x)^{-\frac{1}{n}}\right] x = \frac{t}{T}$$

where n is the exponent in Sargent's rule, $\lambda = \text{const.}\, E^n$ connecting the decay constant λ and the upper limit E of the β-ray spectrum. In fig. 4 this expression is plotted (as full line) on a double-logarithmic scale. The circles represent the results of an experiment (12) in which a uranium

On the Products of the Fission of Uranium and Thorium.

layer was irradiated for 100 minutes and the activ
the recoil was measured without previous chemical
ment. A very similar decay was found with a th
layer and it was pointed out that this similarity nee
imply any similarity in the distribution of indi
periods, but can be explained entirely on the basis
statistical argument. The dots, representing our own
surements with H_2S-precipitates, do not, however,
standard curve. Therefore the similarity of our
with the "transuranium curves" obtained by Hahn,
ner and Strassmann cannot be explained on the ba
the statistical argument but must be taken as eviden
the identity of the corresponding products.

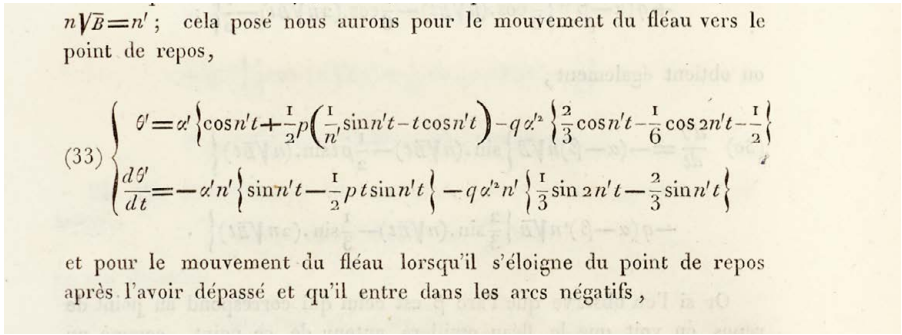
Similar experiments with thorium have been re
by one of us (14). It was shown that the fission of th
gave rise to active elements chemically analogous
"transuranium elements", but that different periods
Since these periods are not mentioned in the account
investigation of the uranium and thorium fission pro
which have been published in the meantime by Bret
and Cook (15), it may be worth while also to de
these experiments somewhat more closely and to d
the decay curves in detail.

A "thick" layer of thorium oxide on a glass plat
irradiated with neutrons (Li + D) and the fission pr
were collected on a water surface, the chemical trea
of the water being the same as in the uranium experi
The thorium layer was covered with a celluloid
about 0.3 mm air equivalent in order to avoid cont
ation of the water through α-recoil or traces of ema
thoron. After an irradiation of about $2^1/_2$ hours, the
curves of fig. 5 were obtained. Curve a shows the
of the sulfide precipitate, and curve b shows the de

25. MENABREA, Luigi Federico. Calcul de la densité de la terre suivi d'un mémoire sur un cas spécial du mouvement d'une pendule. [*Turin*], *Imprimerie Royale,* [*1840*].

Folio, pp. [4], 76, with two engraved plates, of which one folding; some foxing to plates, but overall a very good copy, in the original yellow wrappers; wrappers chipped and creased at edges; manuscript correction (likely authorial) to p.32; author's presentation inscription to front wrapper 'A Monsieur le Comte d'Jsasca L. Général commandant en chef le Royal Corps d'Artillerie hommage de l'auteur, L. F. Menabrea' (*see below*). **£650**

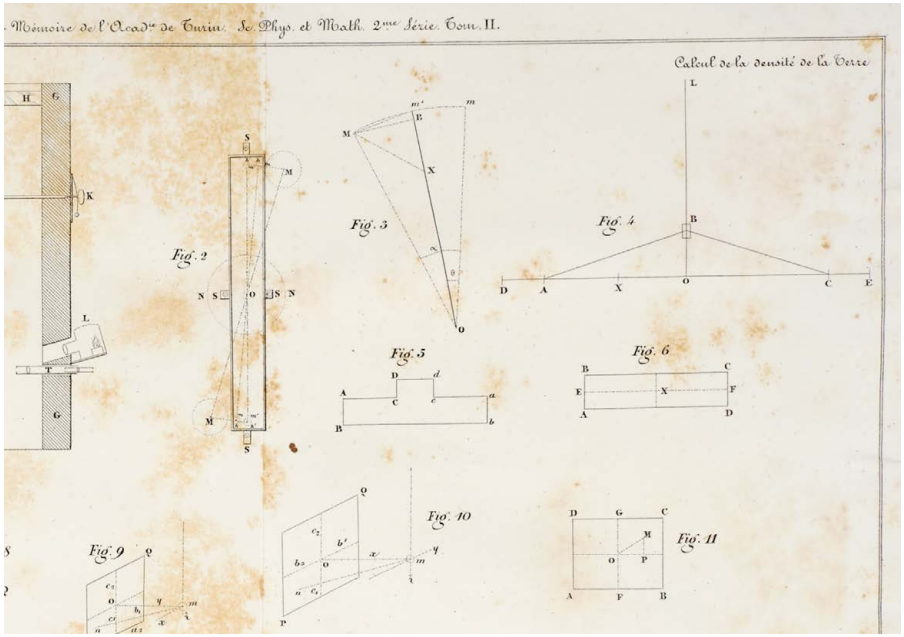
First separate edition, a rare presentation copy, of two essays by Luigi Federico Menabrea (1809–1896) on the measurement of the density of the Earth and the movement of the compound pendulum.



$n\sqrt{B}=n'$; cela posé nous aurons pour le mouvement du fléau vers le point de repos,

$$(33)\quad \begin{cases} \theta'=\alpha'\left\{\cos n't+\frac{1}{2}p\left(\frac{1}{n'}\sin n't-t\cos n't\right)-q\alpha'^2\left\{\frac{2}{3}\cos n't-\frac{1}{6}\cos 2n't-\frac{1}{2}\right\}\right. \\ \frac{d\theta'}{dt}=-\alpha'n'\left\{\sin n't-\frac{1}{2}pt\sin n't\right\}-q\alpha'^2n'\left\{\frac{1}{3}\sin 2n't-\frac{2}{3}\sin n't\right\} \end{cases}$$

et pour le mouvement du fléau lorsqu'il s'éloigne du point de repos après l'avoir dépassé et qu'il entre dans les arcs négatifs,



Menabrea's essays had appeared in the *Memorie della Reale Accademia delle Scienze di Torino*, the research journal of Turin's Academy of Sciences, in the same year (series II, vol. II, pp. 305–66 and 369–78). The first essay deals with the measurement of the density of the Earth through the Cavendish experiment. First performed between 1797 and 1798 by the English scientist Henry Cavendish (1731–1810), the experiment allowed to calculate the Earth's density and, consequently, its gravitational constant. It involved the use of a torsion balance instrument devised by Cavendish, consisting of two small lead spheres attached to each end of a wooden rod (*see* plate 1). Two massive lead balls, suspended separately, could be positioned away from or to either side of the smaller balls. The experiment measured the faint gravitational attraction between the small and large balls, causing a deflection of the torsion balance rod by approximately 0.16". Menabrea did not repeat Cavendish's mathematical calculations but addressed two physics problems related to the experiment: one dealing with air resistance affecting the movement of the balance rod which is subject to the attraction of the spheres, and the other examining the varying attraction and average density of an ellipsoid, rather than a sphere, made of heterogeneous layers, akin to the Earth.

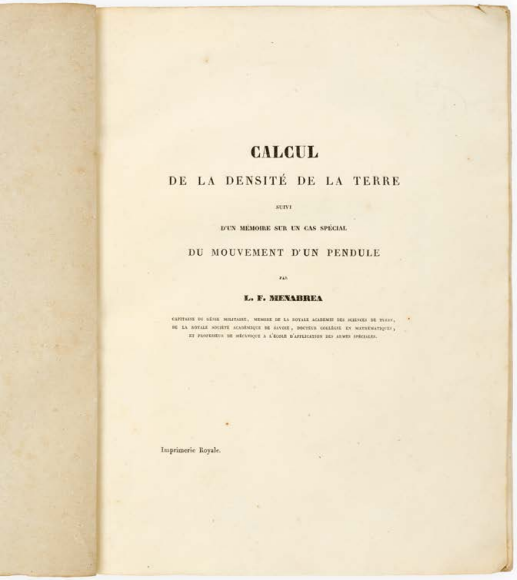
The second essay concerns the analytical solution to the problem for the motion of a compound pendulum developed by Leonhard Euler (1707–1783) and Pierre-Simon Laplace (1749–1827). The solution, originally devised for a pendulum oscillating around a cylindrical axis with a circular base and supported on a horizontal plane, was applied by Menabrea to a scenario where the axis moves within an equally cylindrical bearing, while also accounting the effects of friction.

A skilled scientist and mathematician, in 1846 Menabrea was appointed head of Building Science and Practical Geometry at the University of Turin. He later participated in the Italian wars of independence as commander of the Piedmontese military engineering corps and, following the country's unification, served as the seventh prime minister of the Kingdom of Italy from 1867 to 1869. In 1876, he assumed the post of Italian ambassador to London and, six years later, was assigned to the embassy in Paris. In acknowledgment of an illustrious career, Menabrea was bestowed with the titles of count and marquis of Valdora. He was also elected to memberships in several Italian and foreign scientific academies and received honorary degrees from the universities of Oxford and Cambridge.

Menabrea was an early and ardent supporter of Charles Babbage (1791–1871) and his pioneering work on the calculating machine since he had the chance to attend a presentation on the Analytical Engine given by Babbage in Turin in 1840. In 1842, Menabrea 'published "Notions sur la machine analytique de M. Charles Babbage" in *Bibliothèque universelle de Genève*, nouvelle série 41 (1842) 352–76. This was the first published account of Charles Babbage's Analytical Engine and the first account of its logical design, including the first examples of computer programs ever published' (Jeremy Norman's HistoryofInformation.com). Babbage, for his part, welcomed Menabrea's endorsement and commissioned the English translation of one of his essays to Ada Byron, countess of Lovelace (1815–1852), which appeared in London in 1843 as *Sketch of the analytical engine invented by Charles Babbage*, arguably 'the most important paper in the history of digital computing before modern times' (Bromley, 'Introduction' in Babbage, Henry Prevost, *Babbage's Calculating Engines*, xv).

Provenance: This copy was presented by Menabrea to Flaminio della Chiesa d'Isasca (1781–1872), a lieutenant general in the army of the Kingdom of Sardinia. A scion of an old aristocratic family from Saluzzo, he concluded a distinguished military career as the military governor of Cuneo.

Very rare outside Italy: OCLC finds a single copy in the US, at Columbia University. Library Hub locates only two copies in the UK, at the Institute of Astronomy in Cambridge and at the Royal Society.



CALCUL

DE LA DENSITÉ DE LA TERRE

SUIVI

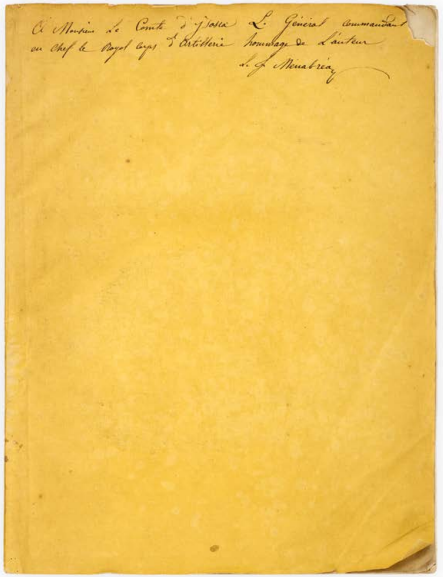
D'UN MÉMOIRE SUR UN CAS SPÉCIAL

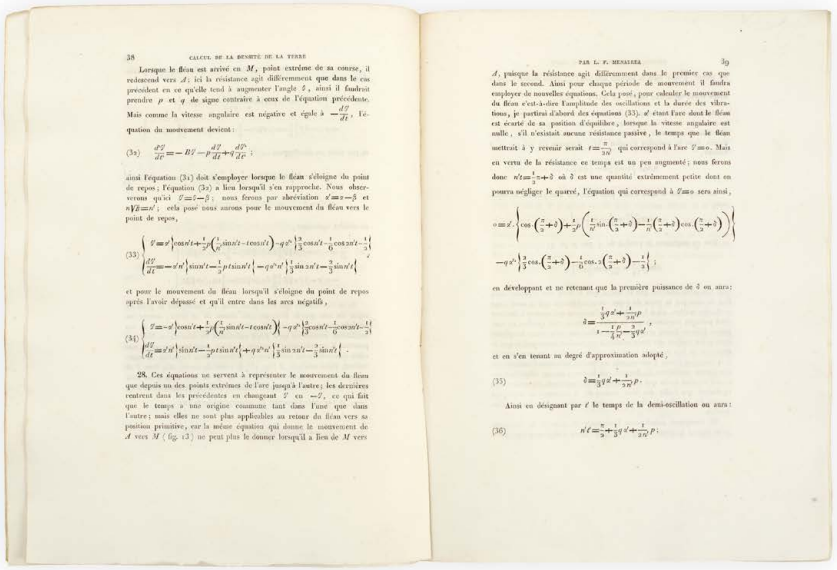
DU MOUVEMENT D'UN PENDULE

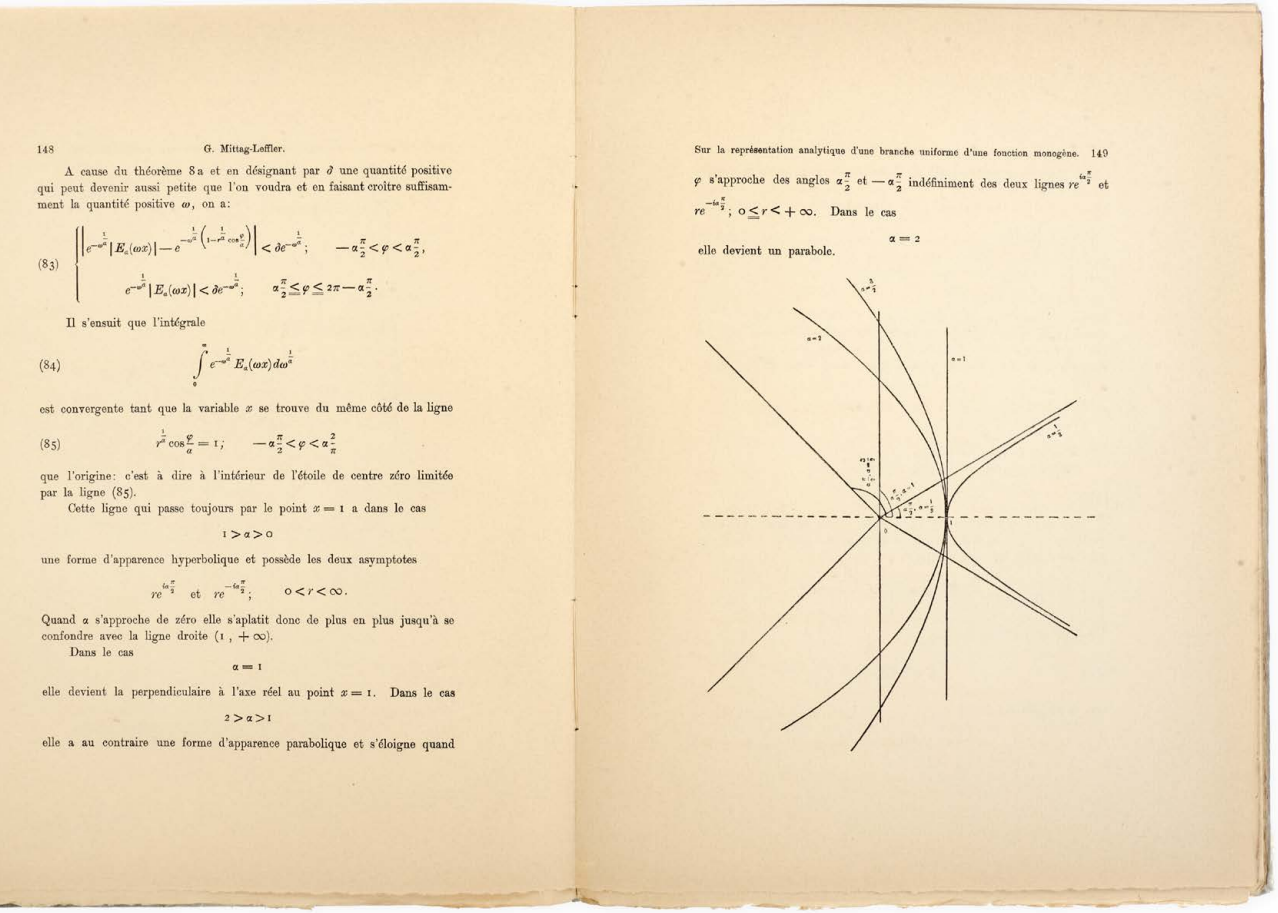
PAR

L. F. MENABREA

Imprimerie Royale.







148 G. Mittag-Leffler.

A cause du théorème 8a et en désignant par ∂ une quantité positive qui peut devenir aussi petite que l'on voudra et en faisant croitre suffisamment la quantité positive ω, on a:

$$(83)\quad \begin{cases} \left| e^{-\omega^{\frac{1}{\alpha}}} |E_\alpha(\omega x)| - e^{-\omega^{\frac{1}{\alpha}}\left(1-r^{\frac{1}{\alpha}}\cos\frac{\varphi}{\alpha}\right)} \right| < \partial e^{-\omega^{\frac{1}{\alpha}}}; & -\alpha\tfrac{\pi}{2} < \varphi < \alpha\tfrac{\pi}{2}, \\ e^{-\omega^{\frac{1}{\alpha}}} |E_\alpha(\omega x)| < \partial e^{-\omega^{\frac{1}{\alpha}}}; & \alpha\tfrac{\pi}{2} \leqq \varphi \leqq 2\pi - \alpha\tfrac{\pi}{2}. \end{cases}$$

Il s'ensuit que l'intégrale

$$(84)\quad \int_0^\infty e^{-\omega^{\frac{1}{\alpha}}} E_\alpha(\omega x)\, d\omega^{\frac{1}{\alpha}}$$

est convergente tant que la variable x se trouve du même côté de la ligne

$$(85)\quad r^{\frac{1}{\alpha}}\cos\frac{\varphi}{\alpha} = 1; \qquad -\alpha\tfrac{\pi}{2} < \varphi < \alpha\tfrac{2}{\pi}$$

que l'origine: c'est à dire à l'intérieur de l'étoile de centre zéro limitée par la ligne (85).

Cette ligne qui passe toujours par le point $x = 1$ a dans le cas

$$1 > \alpha > 0$$

une forme d'apparence hyperbolique et possède les deux asymptotes

$$re^{i\alpha\frac{\pi}{2}} \quad \text{et} \quad re^{-i\alpha\frac{\pi}{2}}; \qquad 0 < r < \infty.$$

Quand α s'approche de zéro elle s'aplatit donc de plus en plus jusqu'à se confondre avec la ligne droite $(1, +\infty)$.

Dans le cas

$$\alpha = 1$$

elle devient la perpendiculaire à l'axe réel au point $x = 1$. Dans le cas

$$2 > \alpha > 1$$

elle a au contraire une forme d'apparence parabolique et s'éloigne quand

Sur la représentation analytique d'une branche uniforme d'une fonction monogène. 149

φ s'approche des angles $\alpha\frac{\pi}{2}$ et $-\alpha\frac{\pi}{2}$ indéfiniment des deux lignes $re^{i\alpha\frac{\pi}{2}}$ et $re^{-i\alpha\frac{\pi}{2}}$; $0 \leqq r < +\infty$. Dans le cas

$$\alpha = 2$$

elle devient un parabole.

The Basis of the Mittag-Leffler Function

26. MITTAG-LEFFLER, Gösta. Sur la représentation analytique d'une branche uniforme d'une fonction monogène. *Stockholm, 1899–1909.*

Six parts, 4to; pp. 43–62; 183–204, 1 plate; 205–244, 2 plates; 353–392; 101–182; 285–308; fine copies in their original printed wrappers, 'offert par l'auteur' printed on upper covers; in a slipcase. **£750**

First edition of this important series of papers by Mittag-Leffler, offprints from *Acta Mathematica*, the international mathematical journal established by him in 1882.

Swedish mathematician Gösta Mittag-Leffler (1846–1927) published this series of six (not five, as sometimes erroneously stated) papers, which he called 'notes', on the summation of divergent series, between 1899 and 1909. 'The aim of these notes was to construct the analytical continuation of a power series outside its circle of convergence. The region in which he was able to do this is now called Mittag-Leffler's star' (MacTutor, *History of Mathematics)*.

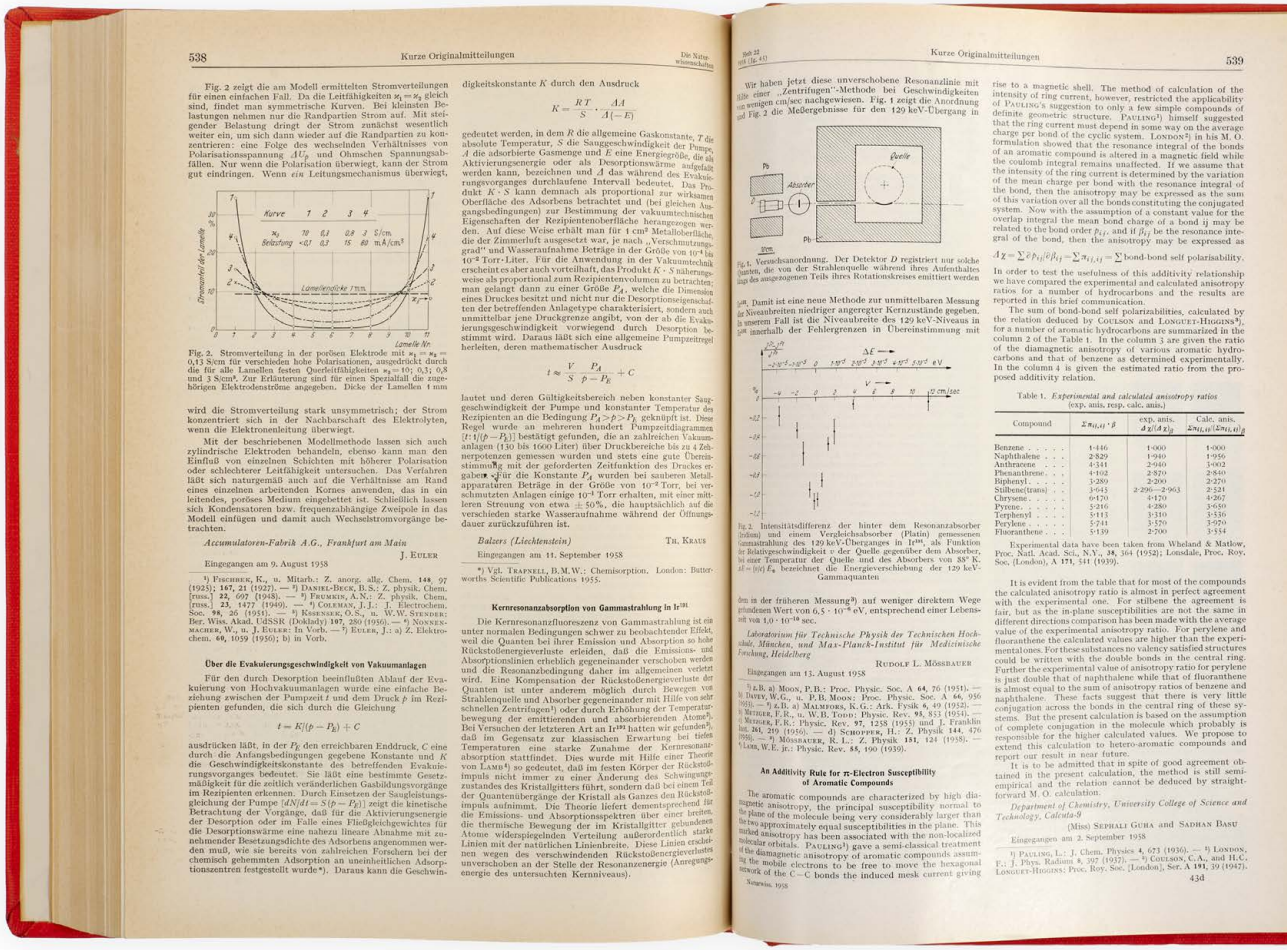
The Mittag-Leffler star of a complex-analytic function is a set in the complex plane obtained by attempting to extend that function along rays emanating from a given point. 'The later evolutions of this subject led to its being subsumed under the heading of the theory of summability, where certain infinite matrices are now known as Mittag-Leffler matrices' (*DSB*).

The Mössbauer Effect

27. MÖSSBAUER, Rudolf Ludwig. ‘Kernresonanzabsorption von Gammstrahlung in Ir[191]’ [*in:* Die Naturwissenschaften … fünfundvierzigster Jahrgang]. *Berlin, Springer, November 1958.*

Folio, pp. 538–539, in *Die Naturwissenschaften* 45, pp. xxviii, 632, 2, 2, 7, [1]; very lightly toned; bound in contemporary orange library buckram for the United States Atomic Energy Commission, with their stamp on title, binder’s instruction slip loosely inserted; Library of Congress Surplus Duplicate stamp on front free endpaper. **£200**

First appearance of Mössbauer’s PhD work on the recoilless nuclear fluorescence of gamma rays in 191 iridium, later named the Mössbauer effect, which involves the recoil-free emission and absorption of gamma radiation by an atomic nucleus bound in a solid. The effect was later used by Robert Pound and Glen Rebka to provide experimental verification for Albert Einstein’s general theory of relativity. For his discovery Mössbauer was awarded the Nobel Prize in Physics in 1961.



538 Kurze Originalmitteilungen Die Naturwissenschaften

Fig. 2 zeigt die am Modell ermittelten Stromverteilungen für einen einfachen Fall. Da die Leitfähigkeiten $\varkappa_1 = \varkappa_2$ gleich sind, findet man symmetrische Kurven. Bei kleinsten Belastungen nehmen nur die Randpartien Strom auf. Mit steigender Belastung dringt der Strom zunächst wesentlich weiter ein, um sich dann wieder auf die Randpartien zu konzentrieren: eine Folge des wechselnden Verhältnisses von Polarisationsspannung ΔU_p und Ohmschen Spannungsabfällen. Nur wenn die Polarisation überwiegt, kann der Strom gut eindringen. Wenn *ein* Leitungsmechanismus überwiegt,

Fig. 2. Stromverteilung in der porösen Elektrode mit $\varkappa_1 = \varkappa_2 = 0{,}13$ S/cm für verschieden hohe Polarisationen, ausgedrückt durch die für alle Lamellen festen Querleitfähigkeiten $\varkappa_3 = 10;\ 0{,}3;\ 0{,}8$ und 3 S/cm². Zur Erläuterung sind für einen Spezialfall die zugehörigen Elektrodenströme angegeben. Dicke der Lamellen 1 mm

wird die Stromverteilung stark unsymmetrisch; der Strom konzentriert sich in der Nachbarschaft des Elektrolyten, wenn die Elektronenleitung überwiegt.

Mit der beschriebenen Modellmethode lassen sich auch zylindrische Elektroden behandeln, ebenso kann man den Einfluß von einzelnen Schichten mit höherer Polarisation oder schlechterer Leitfähigkeit untersuchen. Das Verfahren läßt sich naturgemäß auch auf die Verhältnisse am Rand eines einzelnen arbeitenden Kornes anwenden, das in ein leitendes, poröses Medium eingebettet ist. Schließlich lassen sich Kondensatoren bzw. frequenzabhängige Zweipole in das Modell einfügen und damit auch Wechselstromvorgänge betrachten.

Accumulatoren-Fabrik A.G., Frankfurt am Main J. Euler

Eingegangen am 9. August 1958

[1] Fischbeck, K., u. Mitarb.: Z. anorg. allg. Chem. **148**, 97 (1925); **167**, 21 (1927). — [2] Daniel-Beck, B.S.: Z. physik. Chem. [russ.] **22**, 697 (1948). — [3] Frumkin, A.N.: Z. physik. Chem. [russ.] **23**, 1477 (1949). — [4] Coleman, J.J.: J. Electrochem. Soc., **98**, 26 (1951). — [5] Kissenberg, O.S., u. W.W. Stender: Ber. Wiss. Akad. UdSSR (Doklady) **107**, 280 (1956). — [6] Nonnenmacher, W., u. J. Euler: In Vorb. — [7] Euler, J.: a) Z. Elektrochem. **60**, 1059 (1956); b) in Vorb.

Über die Evakuierungsgeschwindigkeit von Vakuumanlagen

Für den durch Desorption beeinflußten Ablauf der Evakuierung von Hochvakuumanlagen wurde eine einfache Beziehung zwischen der Pumpzeit t und dem Druck p im Rezipienten gefunden, die sich durch die Gleichung

$$t = K[(p - P_E) + C$$

ausdrücken läßt, in der P_E den erreichbaren Enddruck, C eine durch die Anfangsbedingungen gegebene Konstante und K die Geschwindigkeitskonstante des betreffenden Evakuierungsvorganges bedeutet. Sie läßt eine bestimmte Gesetzmäßigkeit für die zeitlich veränderlichen Gasbildungsvorgänge im Rezipienten erkennen. Durch Einsetzen der Saugleistungsgleichung der Pumpe $[dN/dt = S(p - P_E)]$ zeigt die kinetische Betrachtung der Vorgänge, daß für die Aktivierungsenergie der Desorption oder im Falle eines Fließgleichgewichtes für die Desorptionswärme eine nahezu lineare Abnahme mit zunehmender Besetzungsdichte des Adsorbens angenommen werden muß, wie sie bereits von zahlreichen Forschern bei der chemisch gehemmten Adsorption an uneinheitlichen Adsorptionszentren festgestellt wurde*). Daraus kann die Geschwindigkeitskonstante K durch den Ausdruck

$$K = \frac{RT}{S} \cdot \frac{AA}{A(-E)}$$

gedeutet werden, in dem R die allgemeine Gaskonstante, T die absolute Temperatur, S die Saugeschwindigkeit der Pumpe, A die adsorbierte Gasmenge und E eine Energiegröße, die als Aktivierungsenergie oder als Desorptionswärme aufgefaßt werden kann, bezeichnen und A das während des Evakuierungsvorganges durchlaufene Intervall bedeutet. Das Produkt $K \cdot S$ kann demnach als proportional zur wirksamen Oberfläche des Adsorbens betrachtet und (bei gleichen Ausgangsbedingungen) zur Bestimmung der vakuumtechnischen Eigenschaften der Rezipientenoberfläche herangezogen werden. Auf diese Weise erhält man für 1 cm² Metalloberfläche, die der Zimmerluft ausgesetzt war, je nach „Verschmutzungsgrad“ und Wasseraufnahme Beträge in der Größe von 10^{-4} bis 10^{-2} Torr · Liter. Für die Anwendung in der Vakuumtechnik erscheint es aber auch vorteilhaft, das Produkt $K \cdot S$ näherungsweise als proportional zum Rezipientenvolumen zu betrachten; man gelangt dann zu einer Größe P_A, welche die Dimension eines Druckes besitzt und nicht nur die Desorptionseigenschaften der betreffenden Anlagetype charakterisiert, sondern auch unmittelbar jene Druckgrenze angibt, von der ab die Evakuierungsgeschwindigkeit vorwiegend durch Desorption bestimmt wird. Daraus läßt sich eine allgemeine Pumpzeitregel herleiten, deren mathematischer Ausdruck

$$t \approx \frac{V}{S} \frac{P_A}{p - P_E} + C$$

lautet und deren Gültigkeitsbereich neben konstanter Sauggeschwindigkeit der Pumpe und konstanter Temperatur des Rezipienten an die Bedingung $P_A > p > P_E$ geknüpft ist. Diese Regel wurde an mehreren hundert Pumpzeitdiagrammen $[t; 1/(p - P_E)]$ bestätigt gefunden, die an zahlreichen Vakuumanlagen (30 bis 1600 Liter) über Druckbereiche bis zu 4 Zehnerpotenzen gemessen wurden und stets eine gute Übereinstimmung mit der geforderten Zeitfunktion des Druckes ergaben. Für die Konstante P_A wurden bei sauberen Metallapparaturen Beträge in der Größe von 10^{-2} Torr, bei verschmutzten Anlagen einige 10^{-3} Torr erhalten, mit einer mittleren Streuung von etwa ± 50%, die hauptsächlich auf die verschieden starke Wasseraufnahme während der Öffnungsdauer zurückzuführen ist.

Balzers (Liechtenstein) Th. Kraus

Eingegangen am 11. September 1958

*) Vgl. Trapnell, B.M.W.: Chemisorption. London: Butterworths Scientific Publications 1955.

Kernresonanzabsorption von Gammastrahlung in Ir^{191}

Die Kernresonanzfluoreszenz von Gammastrahlung ist ein unter normalen Bedingungen schwer zu beobachtender Effekt, weil die Quanten bei ihrer Emission und Absorption so hohe Rückstoßenergieverluste erleiden, daß die Emissions- und Absorptionslinien erheblich gegeneinander verschoben werden und die Resonanzbedingung daher im allgemeinen verletzt wird. Eine Kompensation der Rückstoßenergieverluste der Quanten ist unter anderem möglich durch Bewegen der Strahlenquelle und Absorber gegeneinander mit Hilfe von sehr schnellen Zentrifugen[1]) oder durch Erhöhung der Temperaturbewegung der emittierenden und absorbierenden Atome[2]). Bei Versuchen der letzteren Art an Ir^{191} hatten wir gefunden[3]), daß im Gegensatz zur klassischen Erwartung bei tiefen Temperaturen eine starke Zunahme der Kernresonanzabsorption stattfindet. Dies wurde mit Hilfe einer Theorie von Lamb[4]) so gedeutet, daß im festen Körper der Rückstoßimpuls nicht immer zu einer Änderung des Schwingungszustandes des Kristallgitters führt, sondern daß bei einem Teil der Quantenübergänge der Kristall als Ganzes den Rückstoßimpuls aufnimmt. Die Theorie liefert dementsprechend für die Emissions- und Absorptionsspektren über einer breiten, die thermische Bewegung der im Kristallgitter gebundenen Atome widerspiegelnden Verteilung außerordentlich starke Linien mit der natürlichen Linienbreite. Diese Linien erscheinen wegen des verschwindenden Rückstoßenergieverlustes unverschoben an der Stelle der Resonanzenergie (Anregungsenergie des untersuchten Kernniveaus).

Heft 22 (Bd. 45) Kurze Originalmitteilungen 539

Wir haben jetzt diese unverschobene Resonanzlinie mit Hilfe einer „Zentrifugen“-Methode bei Geschwindigkeiten von wenigen cm/sec nachgewiesen. Fig. 1 zeigt die Anordnung und Fig. 2 die Meßergebnisse für den 129 keV-Übergang in

Fig. 1. Versuchsanordnung. Der Detektor D registriert nur solche Quanten, die von der Strahlenquelle während ihres Aufenthaltes längs des ausgezogenen Teils ihres Rotationskreises emittiert werden

$_{77}Ir^{191}$. Damit ist eine neue Methode zur unmittelbaren Messung der Niveaubreiten niedriger angeregter Kernzustände gegeben. In unserem Fall ist die Niveaubreite des 129 keV-Niveaus in $_{77}Ir^{191}$ innerhalb der Fehlergrenzen in Übereinstimmung mit

Fig. 2. Intensitätsdifferenz der hinter dem Resonanzabsorber (Iridium) und einem Vergleichsabsorber (Platin) gemessenen Gammastrahlung des 129 keV-Überganges in Ir^{191}, als Funktion der Relativgeschwindigkeit v der Quelle gegenüber dem Absorber, bei einer Temperatur der Quelle und des Absorbers von 83° K. $\Delta E = (v/c)\, E_\gamma$ bezeichnet die Energieverschiebung der 129 keV-Gammaquanten

dem in der früheren Messung[3]) auf weniger direktem Wege gefundenen Wert von $6{,}5 \cdot 10^{-8}$ eV, entsprechend einer Lebenszeit von $1{,}0 \cdot 10^{-10}$ sec.

Laboratorium für Technische Physik der Technischen Hochschule, München, und Max-Planck-Institut für Medizinische Forschung, Heidelberg Rudolf L. Mössbauer

Eingegangen am 13. August 1958

[1] a.R. a) Moon, P.B.: Proc. Physic. Soc. A **64**, 76 (1951). — b) Davey, W.G., u. P.B. Moon: Proc. Physic. Soc. A **66**, 956 (1953). — [2] z.B. a) Malmfors, K.G.: Ark. Fysik **6**, 49 (1952). — b) Metzger, F.R., u. W.B. Todd: Physic. Rev. **89**, 831 (1954). — c) Wegner, F.R.: Physic. Rev. **97**, 1258 (1955) und J. Franklin Inst. **261**, 219 (1956). — d) Schopper, H.: Z. Physik **144**, 476 (1956). — [3] Mössbauer, R. L.: Z. Physik **151**, 124 (1958). — [4] Lamb, W.E. jr.: Physic. Rev. **55**, 190 (1939).

An Additivity Rule for π-Electron Susceptibility of Aromatic Compounds

The aromatic compounds are characterized by high diamagnetic anisotropy, the principal susceptibility normal to the plane of the molecule being very considerably larger than the two approximately equal susceptibilities in the plane. This marked anisotropy has been associated with the non-localized molecular orbitals. Pauling[1]) gave a semi-classical treatment of the diamagnetic anisotropy of aromatic compounds assuming the mobile electrons to be free to move the hexagonal network of the C—C bonds the induced mesh current giving rise to a magnetic shell. The method of calculation of the intensity of ring current, however, restricted the applicability of Pauling’s suggestion to only a few simple compounds of definite geometric structure. Pauling[1]) himself suggested that the ring current must depend in some way on the average charge per bond of the cyclic system. London[2]) in his M. O. formulation showed that the resonance integral of the bonds of an aromatic compound is altered in a magnetic field while the coulomb integral remains unaffected. If we assume that the intensity of the ring current is determined by the variation of the mean charge per bond with the resonance integral of the bond, then the anisotropy may be expressed as the sum of this variation over all the bonds constituting the conjugated system. Now with the assumption of a constant value for the overlap integral the mean bond charge of a bond ij may be related to the bond order p_{ij}, and if β_{ij} be the resonance integral of the bond, then the anisotropy may be expressed as

$$\Delta\chi = \sum \varepsilon p_{ij} \varepsilon \beta_{ij} - \sum \sigma_{ij,ij} = \sum \text{bond-bond self polarisability.}$$

In order to test the usefulness of this additivity relationship we have compared the experimental and calculated anisotropy ratios for a number of hydrocarbons and the results are reported in this brief communication.

The sum of bond-bond self polarizabilities, calculated by the relation deduced by Coulson and Longuet-Higgins[3]), for a number of aromatic hydrocarbons are summarized in the column 2 of the Table 1. In the column 3 are given the ratio of the diamagnetic anisotropy of various aromatic hydrocarbons and that of benzene as determined experimentally. In the column 4 is given the estimated ratio from the proposed additivity relation.

Table 1. *Experimental and calculated anisotropy ratios* [exp. anis. resp. calc. anis.]

Compound	$\Sigma \sigma_{ij,ij} \cdot \beta$	exp. anis. $\Delta\chi/(\Delta\chi)_B$	Calc. anis. $\Sigma\sigma_{ij,ij}/(\Sigma\sigma_{ij,ij})_B$
Benzene	1·446	1·000	1·000
Naphthalene	2·829	1·940	1·956
Anthracene	4·341	2·940	3·002
Phenanthrene	4·102	2·970	2·840
Biphenyl	3·289	2·200	2·270
Stilbene(trans)	5·643	2·296–2·963	2·521
Chrysene	6·170	4·170	4·267
Pyrene	5·216	4·280	3·650
Terphenyl	5·113	3·310	3·536
Perylene	5·241	3·570	3·970
Fluoranthene	5·139	2·700	3·554

Experimental data have been taken from Wheland & Matlow, Proc. Natl. Acad. Sci., N.Y., **38**, 364 (1952); Lonsdale, Proc. Roy. Soc. (London), A **171**, 541 (1939).

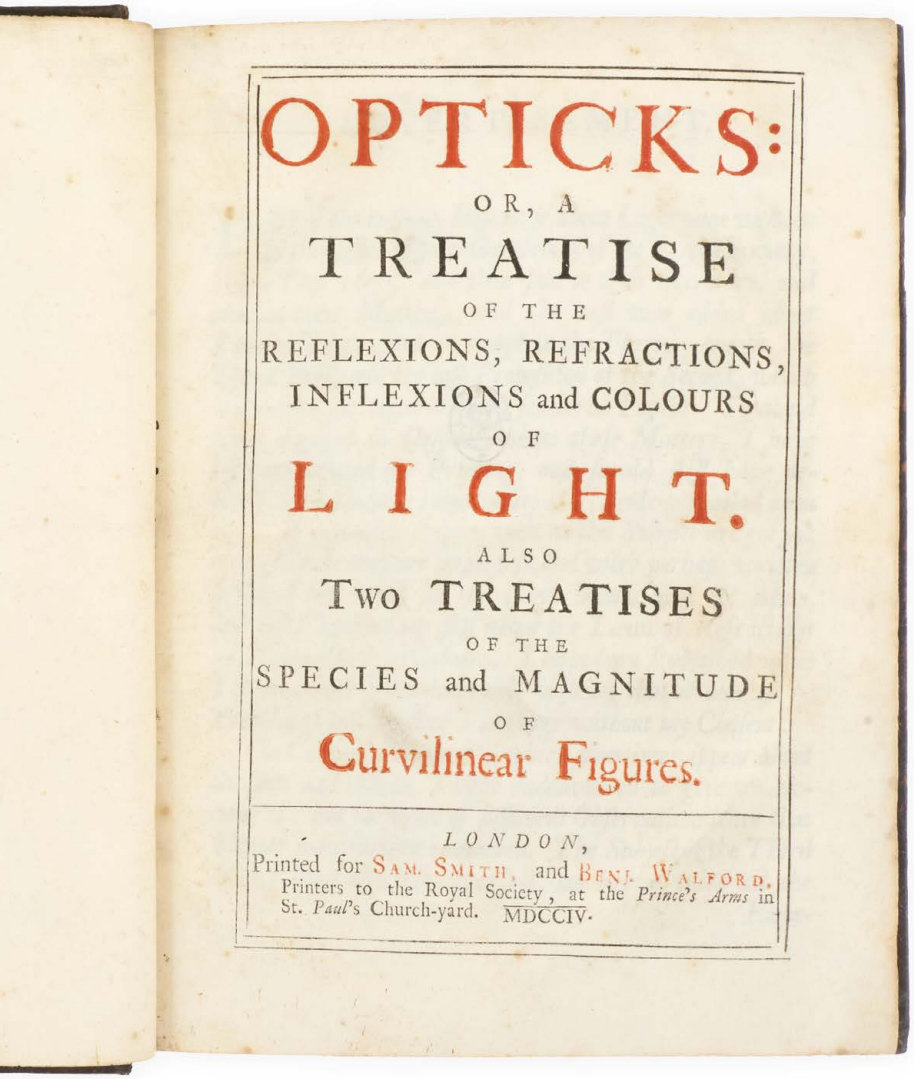
It is evident from the table that for most of the compounds the calculated anisotropy ratio is almost in perfect agreement with the experimental one. For stilbene the agreement is fair, but as the in-plane susceptibilities are not the same in different directions comparison has been made with the average value of the experimental anisotropy ratio. For perylene and fluoranthene the calculated values are higher than the experimental ones. For these substances no valency satisfied structures could be written with the double bonds in the central ring. Further the experimental value of anisotropy ratio for perylene is just double that of naphthalene while that of fluoranthene is almost equal to the sum of anisotropy ratios of benzene and naphthalene. These facts suggest that there is very little conjugation across the bonds in the central ring of these systems. But the present calculation is based on the assumption of complete conjugation in the molecule which probably is responsible for the higher calculated values. We propose to extend this calculation to hetero-aromatic compounds and report our result in near future.

It is to be admitted that in spite of good agreement obtained in the present calculation, the method is still semi-empirical and the relation cannot be deduced by straightforward M. O. calculation.

Department of Chemistry, University College of Science and Technology, Calcutta-9 (Miss) Sephali Guha and Sadhan Basu

Eingegangen am 2. September 1958

[1] Pauling, L.: J. Chem. Physics **4**, 673 (1936). — [2] London, F.: J. Phys. Radium **8**, 397 (1937). — [3] Coulson, C.A., and H.C. Longuet-Higgins: Proc. Roy. Soc. [London], Ser. A **191**, 39 (1947).



OPTICKS:
OR, A
TREATISE
OF THE
REFLEXIONS, REFRACTIONS,
INFLEXIONS and COLOURS
OF
LIGHT.
ALSO
Two TREATISES
OF THE
SPECIES and MAGNITUDE
OF
Curvilinear Figures.

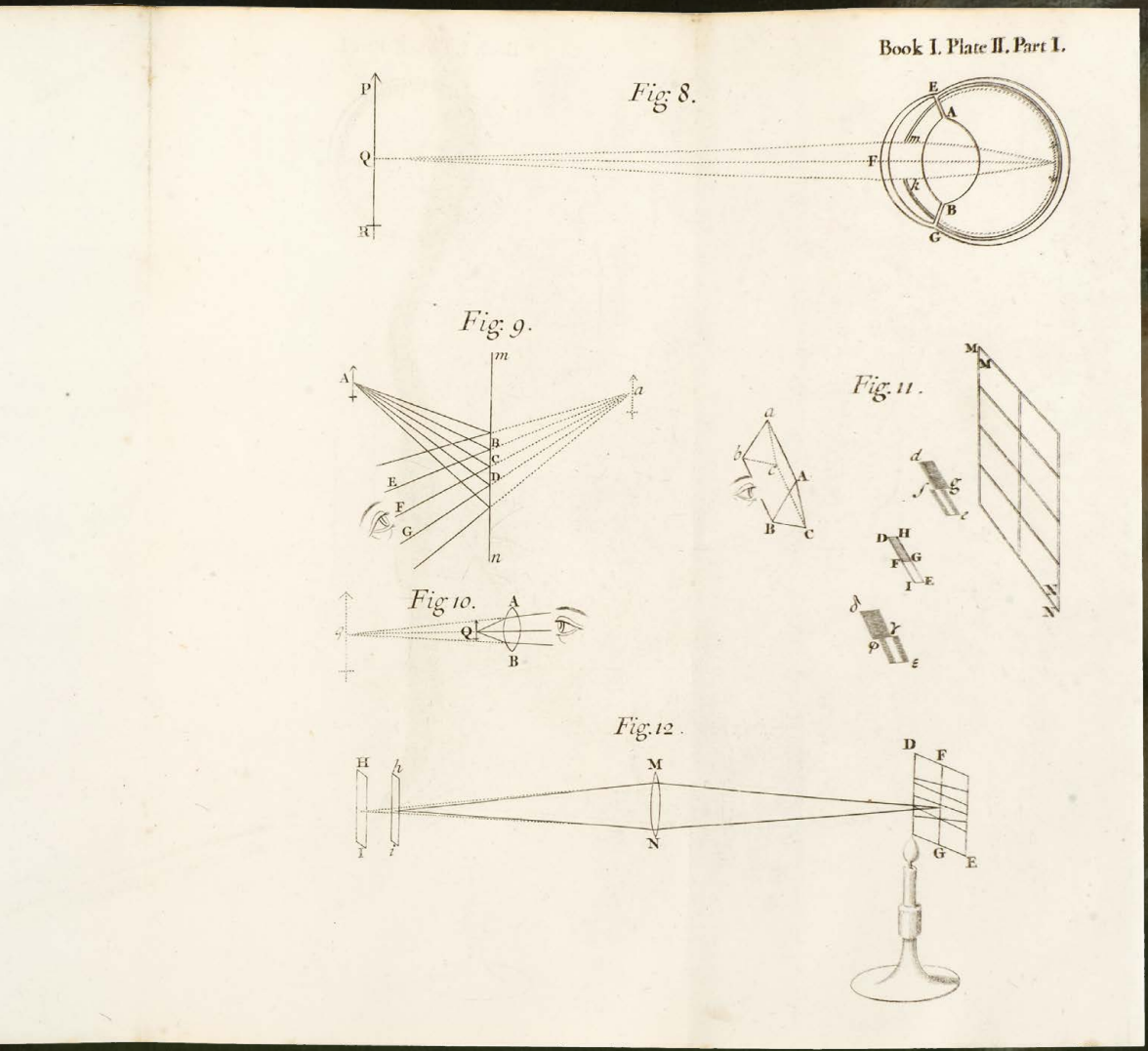
LONDON,
Printed for SAM. SMITH, and BENJ. WALFORD,
Printers to the Royal Society, at the *Prince's Arms* in
St. *Paul's* Church-yard. MDCCIV.

Newton on Colour

28. NEWTON, Isaac. Opticks: or, a Treatise of the Reflexions, Refractions, Inflexions, and Colours of Light. Also two treatises of the species and magnitude of curvilinear figures. *London, for Samuel Smith and Benjamin Walford, printers to the Royal Society, 1704.*

4to, pp. [iv], 144, '211' [*recte* 213], [1, errata], with 19 folding copper-engraved plates; title printed in red and black; occasional light foxing, last leaf with small marginal loss to lower outer corner, one plate stained at head, else a fine copy; bound in contemporary Cambridge-panelled calf, gilt green morocco lettering-piece to spine, edges speckled red; skilfully recornered and rebacked to style, extremities slightly rubbed; housed in a cloth box with gilt morocco lettering-piece to spine; small ink stamp 'R.H. Inglis' to title verso, modern bookplate of Jean Michel Cantacuzène to front pastedown. **£70,000**

First edition of Newton's *Opticks*, 'which did for light what his *Principia* had done for gravitation, namely, placed it on a scientific basis', and 'expounds Newton's corpuscular or emission theory of light, and first contains his important optical discoveries in a collected form' (Babson), also discussing rainbows and Newton's Rings.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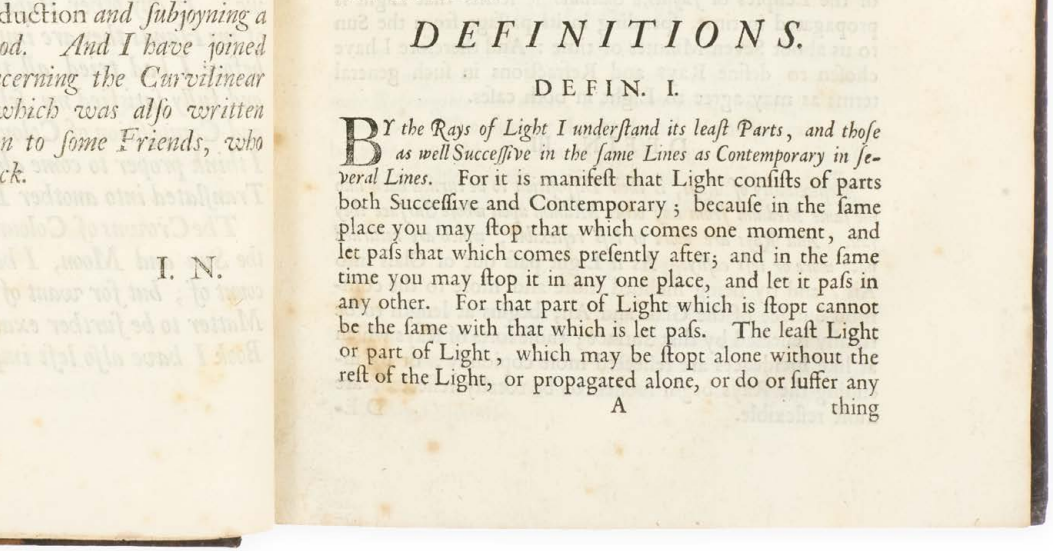

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od. And I have joined
cerning the Curvilinear
which was alſo written
n to ſome Friends, who
ck.

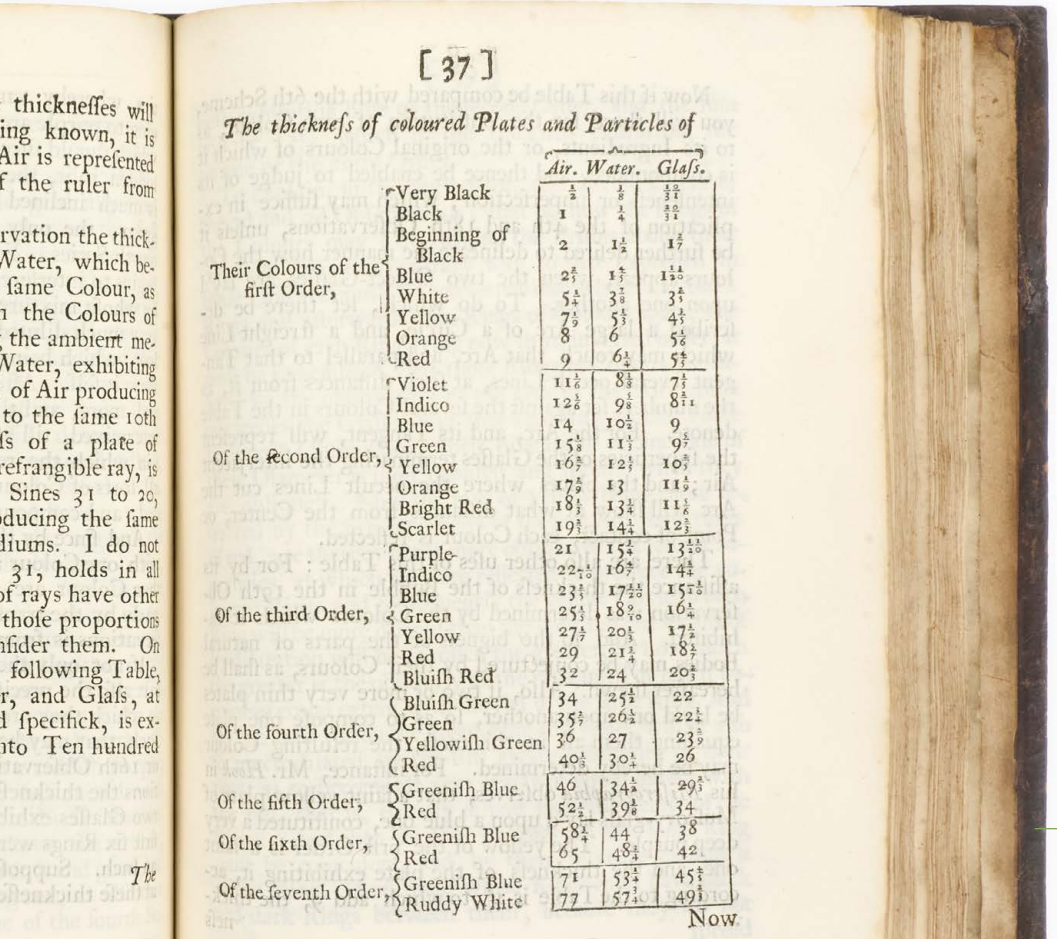
I. N.

DEFINITIONS.

DEFIN. I.

BY the Rays of Light I underſtand its leaſt Parts, and thoſe as well Succeſſive in the ſame Lines as Contemporary in ſeveral Lines. For it is manifeſt that Light conſiſts of parts both Succeſſive and Contemporary; becauſe in the ſame place you may ſtop that which comes one moment, and let paſs that which comes preſently after; and in the ſame time you may ſtop it in any one place, and let it paſs in any other. For that part of Light which is ſtopt cannot be the ſame with that which is let paſs. The leaſt Light or part of Light, which may be ſtopt alone without the reſt of the Light, or propagated alone, or do or ſuffer any

A thing



thickneſſes will
ing known, it is
Air is repreſented
f the ruler from

rvation the thick-
Water, which be-
ſame Colour, as
n the Colours of
the ambient me-
Water, exhibiting
of Air producing
to the ſame 10th
ſs of a plate of
refrangible ray, is
Sines 31 to 20,
ducing the ſame
diums. I do not
31, holds in all
of rays have other
thoſe proportions
nſider them. On
following Table,
r, and Glaſs, at
d ſpecifick, is ex-
nto Ten hundred

The

[37]

The thickneſs of coloured Plates and Particles of

		Air.	*Water.*	*Glaſs.*
Their Colours of the first Order,	Very Black	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{10}{31}$
	Black	1	$\frac{1}{4}$	$\frac{20}{31}$
	Beginning of Black	2	$1\frac{1}{2}$	$1\frac{2}{7}$
	Blue	$2\frac{2}{3}$	$1\frac{7}{8}$	$1\frac{11}{20}$
	White	$5\frac{1}{4}$	$3\frac{7}{8}$	$3\frac{4}{7}$
	Yellow	$7\frac{1}{2}$	$5\frac{1}{3}$	$4\frac{3}{5}$
	Orange	8	6	$5\frac{5}{6}$
	Red	9	$6\frac{3}{4}$	$5\frac{7}{8}$
Of the ſecond Order,	Violet	$11\frac{1}{2}$	$8\frac{3}{4}$	$7\frac{7}{8}$
	Indico	$12\frac{1}{2}$	$9\frac{1}{8}$	$8\frac{21}{31}$
	Blue	14	$10\frac{1}{2}$	9
	Green	$15\frac{1}{8}$	$11\frac{1}{3}$	$9\frac{7}{8}$
	Yellow	$16\frac{2}{3}$	$12\frac{1}{2}$	$10\frac{9}{10}$
	Orange	$17\frac{5}{9}$	13	$11\frac{1}{2}$
	Bright Red	$18\frac{1}{2}$	$13\frac{7}{8}$	$11\frac{5}{6}$
	Scarlet	$19\frac{1}{3}$	$14\frac{1}{4}$	$12\frac{2}{3}$
Of the third Order,	Purple	21	$15\frac{3}{4}$	$13\frac{13}{20}$
	Indico	$22\frac{1}{10}$	$16\frac{1}{2}$	$14\frac{4}{7}$
	Blue	$23\frac{1}{3}$	$17\frac{11}{20}$	$15\frac{1}{2}$
	Green	$25\frac{1}{3}$	$18\frac{9}{10}$	$16\frac{1}{4}$
	Yellow	$27\frac{1}{7}$	$20\frac{1}{3}$	$17\frac{1}{2}$
	Red	29	$21\frac{3}{4}$	$18\frac{2}{7}$
	Bluiſh Red	32	24	$20\frac{2}{3}$
Of the fourth Order,	Bluiſh Green	34	$25\frac{1}{2}$	22
	Green	$35\frac{2}{7}$	$26\frac{1}{2}$	$22\frac{1}{2}$
	Yellowiſh Green	36	27	$23\frac{5}{9}$
	Red	$40\frac{1}{3}$	$30\frac{1}{4}$	26
Of the fifth Order,	Greeniſh Blue	46	$34\frac{1}{2}$	$29\frac{1}{3}$
	Red	$52\frac{1}{2}$	$39\frac{3}{8}$	34
Of the ſixth Order,	Greeniſh Blue	$58\frac{1}{4}$	44	38
	Red	65	$48\frac{3}{4}$	42
Of the ſeventh Order,	Greeniſh Blue	71	$53\frac{1}{4}$	$45\frac{5}{7}$
	Ruddy White	77	$57\frac{3}{4}$	$49\frac{1}{3}$

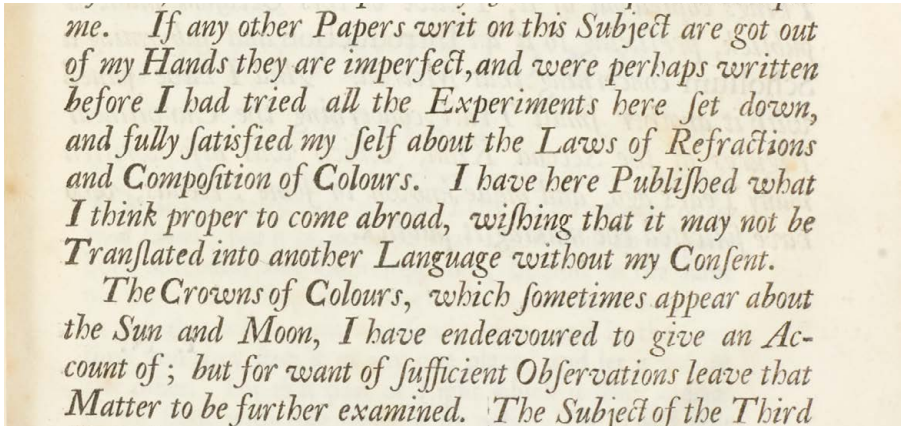
Now

The work is unusual in being issued almost entirely in English rather than Latin, and in contrast with his *Principia mathematica* reads more as a record of experiments and the conclusions drawn from them. Newton specifies in his *Advertisement* that 'I have here Published what I think proper to come abroad, wishing that it may not be Translated into another Language without my Consent'; 'My design in this book is not to explain the Properties of Light by Hypotheses, but to propose and prove them by Reason and Experiments' (p. 1). Newton explains the composition of colours, using prismatic experiments; discusses rainbows and the effect of light upon colour; and also calculates the varying wavelengths of different colours. The work concludes with a set of 'Queries', startling speculations on the nature of matter which had a profound influence on eighteenth-century and later thought. The two final mathematical tracts on curvilinear figures in Latin, published here for the first time, expressly assert Newton's priority over Leibniz in his third major contribution to science, the invention of calculus.

Provenance:
1. Ink stamp of 'R.H. Inglis', likely the Conservative politician Sir Robert Harry Inglis (1786–1855), MP for Dundalk, Ripon, and Oxford University.

2. Christie's, London, 20 November 1992, lot 198, to Jean Michel Cantacuzène.

Babson 132; *PMM* 172; Wallis 174. For a discussion of the development of Newton's optical work, see Shapiro, 'The evolving structure of Newton's theory of white light and color', in *Isis* 71 (1980), pp. 211–35.



me. If any other Papers writ on this Subject are got out of my Hands they are imperfect, and were perhaps written before I had tried all the Experiments here ſet down, and fully ſatisfied my ſelf about the Laws of Refractions and Compoſition of Colours. I have here Publiſhed what I think proper to come abroad, wiſhing that it may not be Tranſlated into another Language without my Conſent.

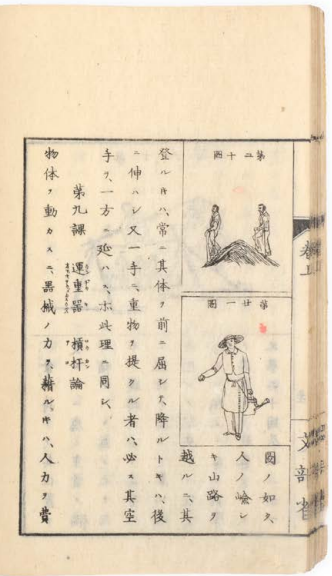
The Crowns of Colours, which ſometimes appear about the Sun and Moon, I have endeavoured to give an Account of; but for want of ſufficient Obſervations leave that Matter to be further examined. The Subject of the Third

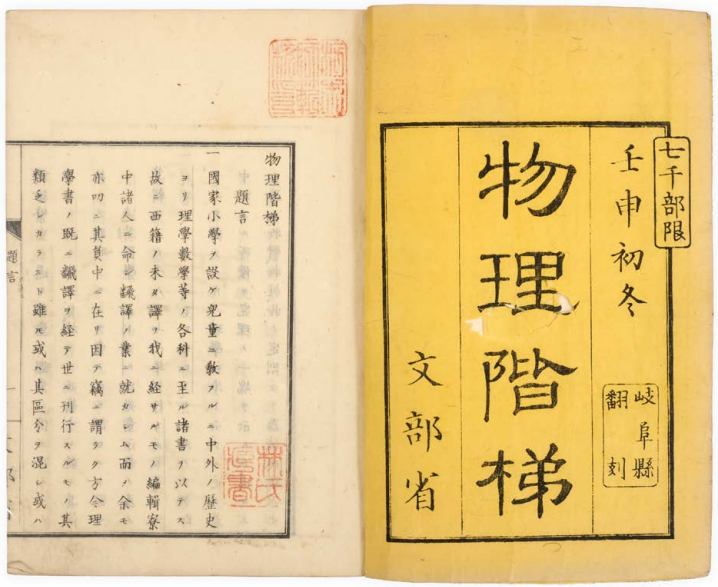
29. [PARKER, Richard Green; Junkichi KATAYAMA 片山 淳吉, *editor.*] 物理階梯 [*Butsuri kaitei*; 'A Guide to Physics']. *Gifu Prefecture, Ministry of Education, Mizunoesaru/Jinshin* [*i.e. 1872*].

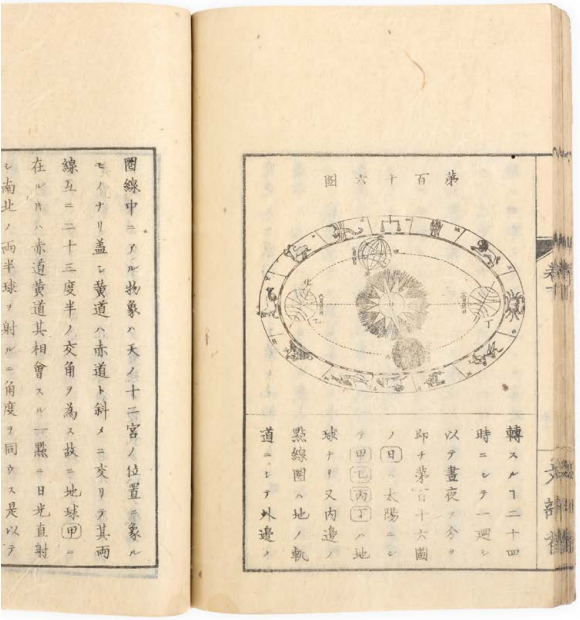
Three vols, 8vo; printed on double leaves, f. 60 of vol. III misbound after f. 64, *c.* 115 woodcut diagrams in-text; occasional minor stains, wormtrack to head of most of vol. III touching a handful of characters but sense intact, tear (mostly closed) to title affecting one character; else a good set in original yellow paper wrappers, *yotsume-toji* stitching; covers somewhat creased and soiled, stitching loose or split in a few sections but holding firm, silk corners (*kadogire*) a little worn, perished for vol. I; manuscript character (元 or え) in red to each front cover, red ownership seals of the 林 (Hayashi/Rin/Lin) family and of a normal college to the first page of each volume. **£1750**

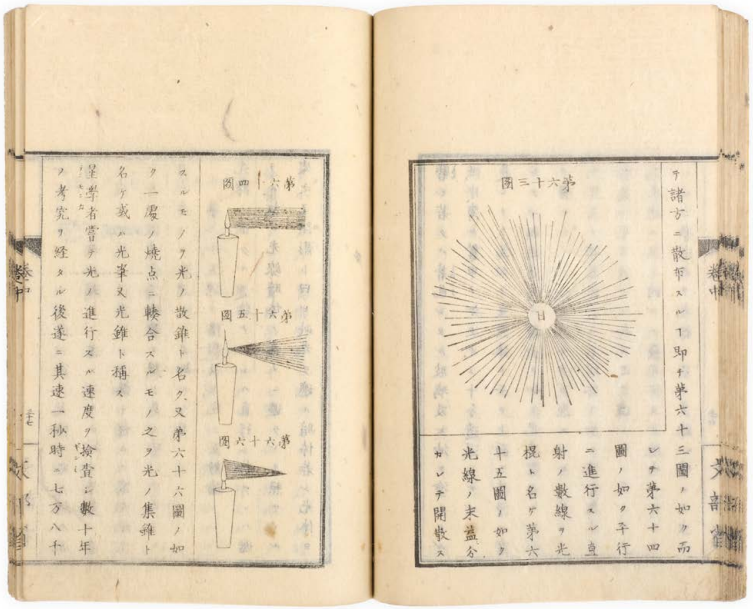
First edition, very rare, of Japan's first elementary science textbook, a major catalyst for the introduction of Western physics after the Meiji Restoration.

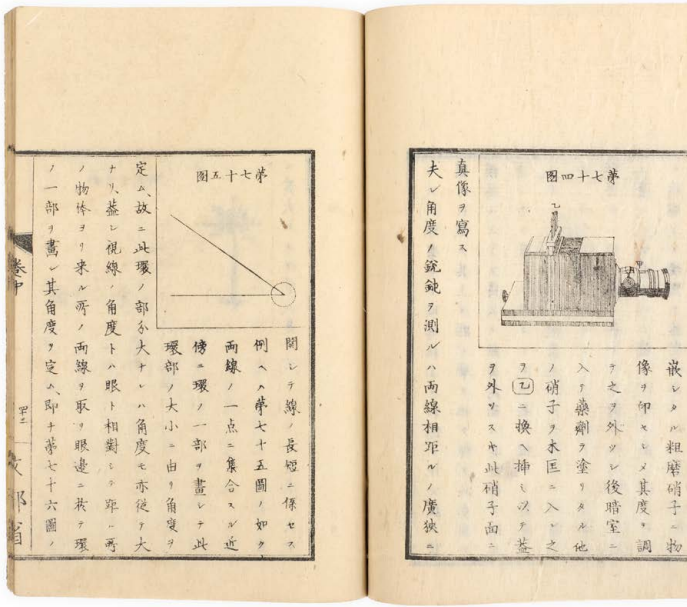
Titled *A Guide to Physics*, the work is chiefly a translation of the American pedagogue Richard Green Parker's *First Lessons in natural Philosophy* (first published in the 1840s), also making use of G.P. Quackenbos's *A Natural Philosophy* (1859). Published for use in schools by the Japanese Ministry of Education in an effort to introduce modern Western science to the newly open nation, the *Guide* covers subjects in physics, chemistry, and biology, including matter, mechanics, light and gas theory, acoustics, electricity, magnetism, the structure of the eye, and astronomy.



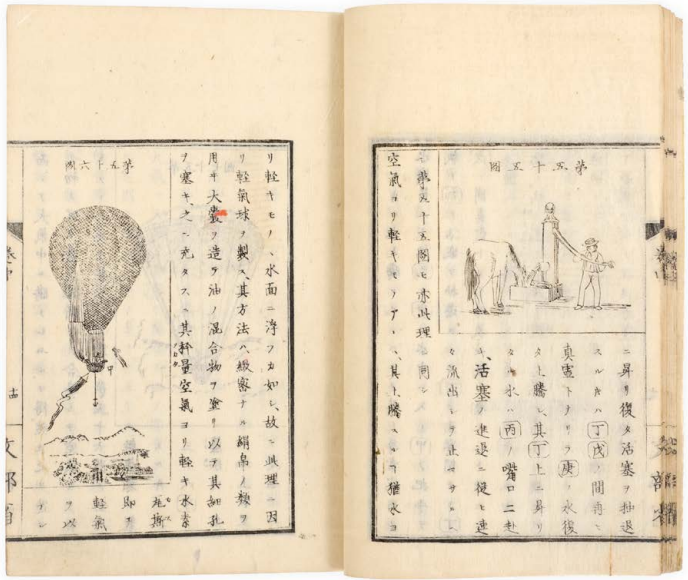








Accompanying the text are more than a hundred woodcut diagrams showing graphs, anatomical parts, and all manner of devices and inventions, such as pulleys, thermometers, pumps, a hot air balloon, and a camera. The preface, by the editor Katayama, puts a distinctly Neo-Confucian spin on the new science, applying to it the concept of *qi* (or *ki* in Japanese). The work was revised and reprinted many times in the later nineteenth century – some versions excising the section on astronomy after curricular revisions – and it remained dominant in Japanese schools for several decades after. **Through its use in Japan and its promotion by the government, the *Guide* played an 'important role' in disseminating the eponymous term and concept of physics** (物理) – *butsuri* in Japanese, *wuli* in Chinese, *mulli* in Korean, *vật lí* in Vietnamese – both in Japan and the broader Sinosphere (Yang, p. 57, *trans.*).



Not in Library Hub. OCLC finds only one complete copy outside Japan, at UC San Francisco. Chicago and Cornell each holds an incomplete set (vols I–II and II respectively).

See Masahisa Makino 牧野　正久,「科学史入門：明治初期の小学教科書『物理階梯』」, 『科学史研究』 46 (2007); Keiko Shinohara 篠原 圭子 and Ken Kawasaki 川崎 謙,「『物理階梯・總論』にみる日本人の自然科学理解」, 『日本理科教育学会研究紀要』 30/1 (1989); Yang Yu 楊玉,〈關於中譯「物理學」名稱的由來〉,《物理》 16/1 (1987).

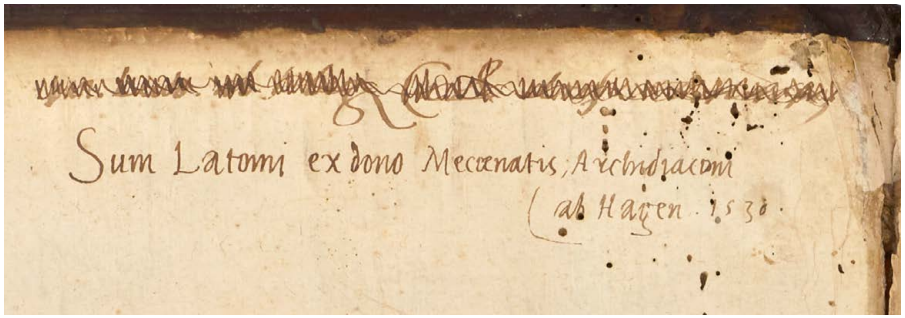

NES FROBENIVS LECTORI
EN DAMVS
INII SECVNI
VS CVI TITVLVS, HISTOR
ntehac unquam prodiit emaculatius: idq; pri
ditorum hominum, præsertim Hermolai Ba
ne exemplariorum, quæ hactenus opera do
n fieri potuit emendatissime sunt excusa: po
tustissimorum codicum, ex quibus non pauca
, quæ alioqui nemo, quamlibet eruditus, uel
ndit, uel deprehendere poterat. Absit inuidia
co. Vicimus superiores omneis. Si quis hanc p
mam nobis eripuerit, non illi quidē inuide
bimus, sed studijs publicis gratulabi/
mur. Bene uale lector, & fruere
Αγαθῇ τύχῃ.
Additus est index, in quo nihil desideres.
Basileæ apud Io. Frobenium, Mense
Martio. An. M. D. XXV.

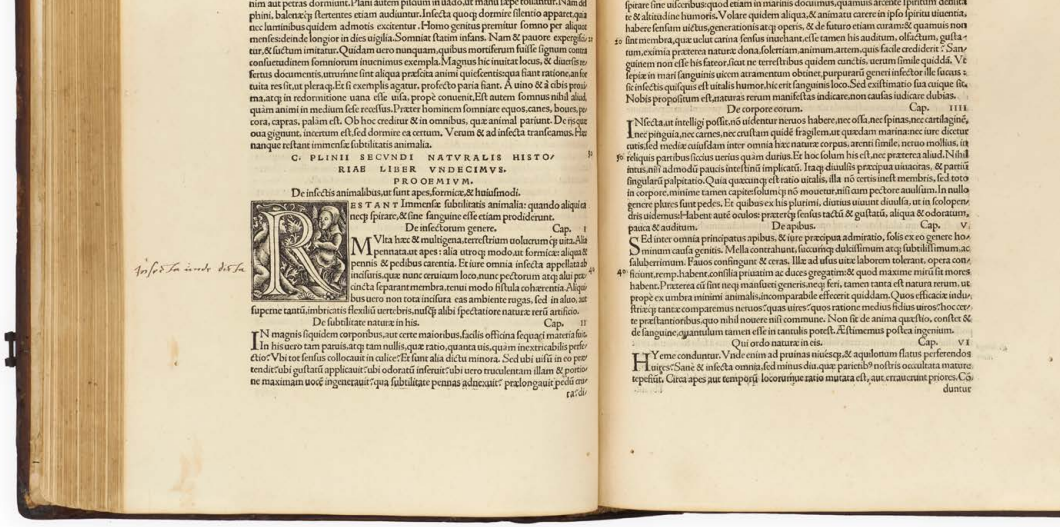
From the Library of Bartholomaeus Latomus – a Gift from the Archbishop of Trier

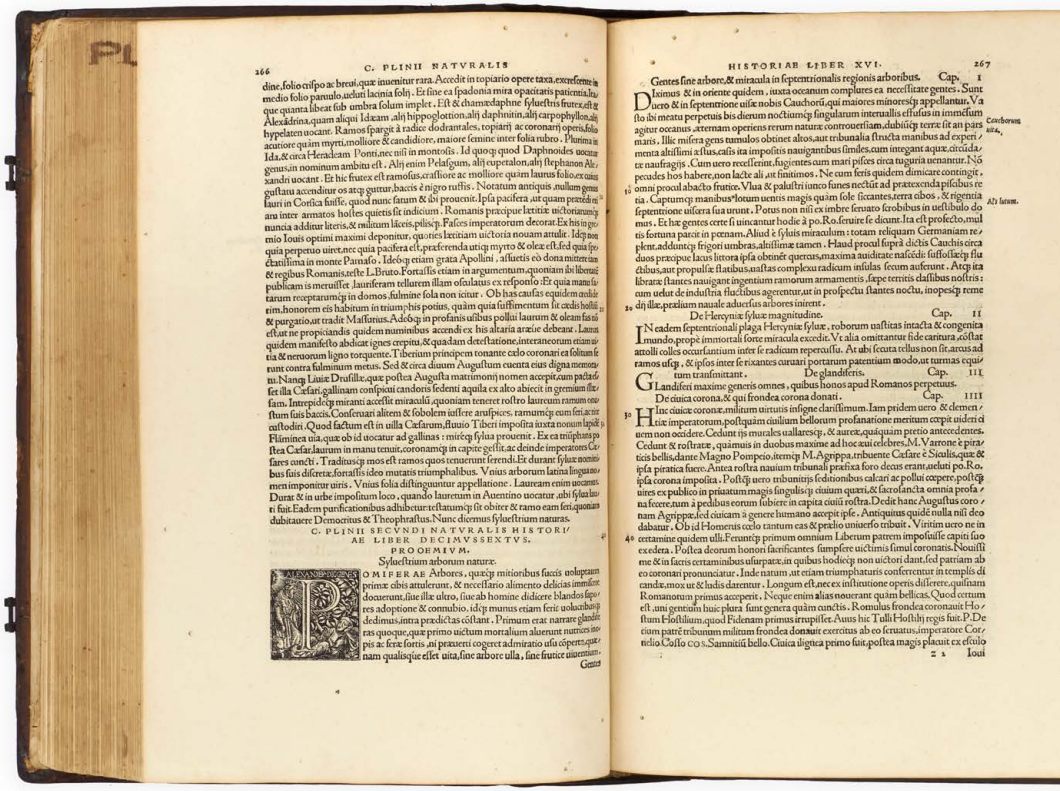
30. PLINY *the Elder.* Historia mundi, multo quam antehac unquam prodiit emaculatius [...] annotationibus eruditorum hominum praesertim Hermolai Barbari [...] additus est index, in quo nihil desideres [– Index in universum naturalis historiae C. Plinii opus, summa diligentia collectus]. *Basel, Johann Froben, March 1525.*

Two parts in one volume, folio, pp. [xxxvi], 671, [1], [144, *Index*]; large woodcut printer's device to title and part-title and final page of each part, several large historiated white-on-black initials and numerous smaller woodcut initials throughout; some worming (mostly marginal), but a beautiful, wide-margined copy in dark impression; in a contemporary Cologne binding of blind-stamped calf over wooden boards, boards panelled in blind with two rolls (both initialled 'IW', one with the arms of Cologne, the Holy Roman Empire, and the binder's device), remains of clasps to fore-edge, fore-edge lettered 'Plinius' in ink, sewn on 5 double cords, spine lined with vellum manuscript waste; skilfully rebacked and recornered, some worming to boards; contemporary inscription 'Sum Latomi ex dono mecoenatis archidiaconi ab Hagen 1530' to upper pastedown, inscription to front free endpaper 'Sum ex libris / Andr. Danquest Mosbacens. / 12th Juli 1767'. **£4800**

First Froben edition of Pliny's encyclopaedia, with a prologue by Erasmus and Hermolaus Barbarus's commentary, given to Erasmus's correspondent Bartholomaeus Latomus by his student and future patron, Johann Ludwig von Hagen.







Known by the Hellenized 'Latomus', the humanist classicist and controversialist Bartholomaeus Steinmetz (*c.* 1498–1570) probably first met Erasmus while studying at Freiburg in 1516 and '17, later travelling with him through Alsace in 1521 and becoming one of his epistolary correspondents until Erasmus's death. Teaching successively at Trier (from 1522), Cologne (1526), Louvain (1530), and the Collège de Sainte-Barbe in Paris (1531), he was a disciple and friend of Conradus Goclenius and counted among his students Calvin, Ignatius of Loyola, François Xavier, François Rabelais, and Pierre Ramus. He travelled extensively and established a reputation as one of the leading Latin scholars of the time.

The present volume was given to Latomus in 1530 by his former pupil Johann Ludwig von Hagen (1492–1547), then archdeacon at Trier. In 1541 Latomus reencountered Hagen as Elector-Archbishop of Trier at the diet of Regensburg, and the following year he resigned his professorship at Paris to enter Hagen's service. It was likely his position under Hagen that facilitated his appointment as assessor at the Reichskammergericht in Speyer in 1548 and, after resigning this post to return to Trier in 1555, his role in attending the diet of Speyer in 1556 and representing the Catholic party at Worms in 1557.

Adams P 1560; Schweiger II, 786; Van der Haeghen II, 45; VD16 P-3533; for the binding, see Haebler, pp. 489–490. See also L. Roersch, 'Barthélemy Latomus, le premier professeur d'éloquence latine au Collège royal de France' in *Bulletins de l'Académie royale de Belgique* 3rd ser. 14 (1887), pp. 132–176.

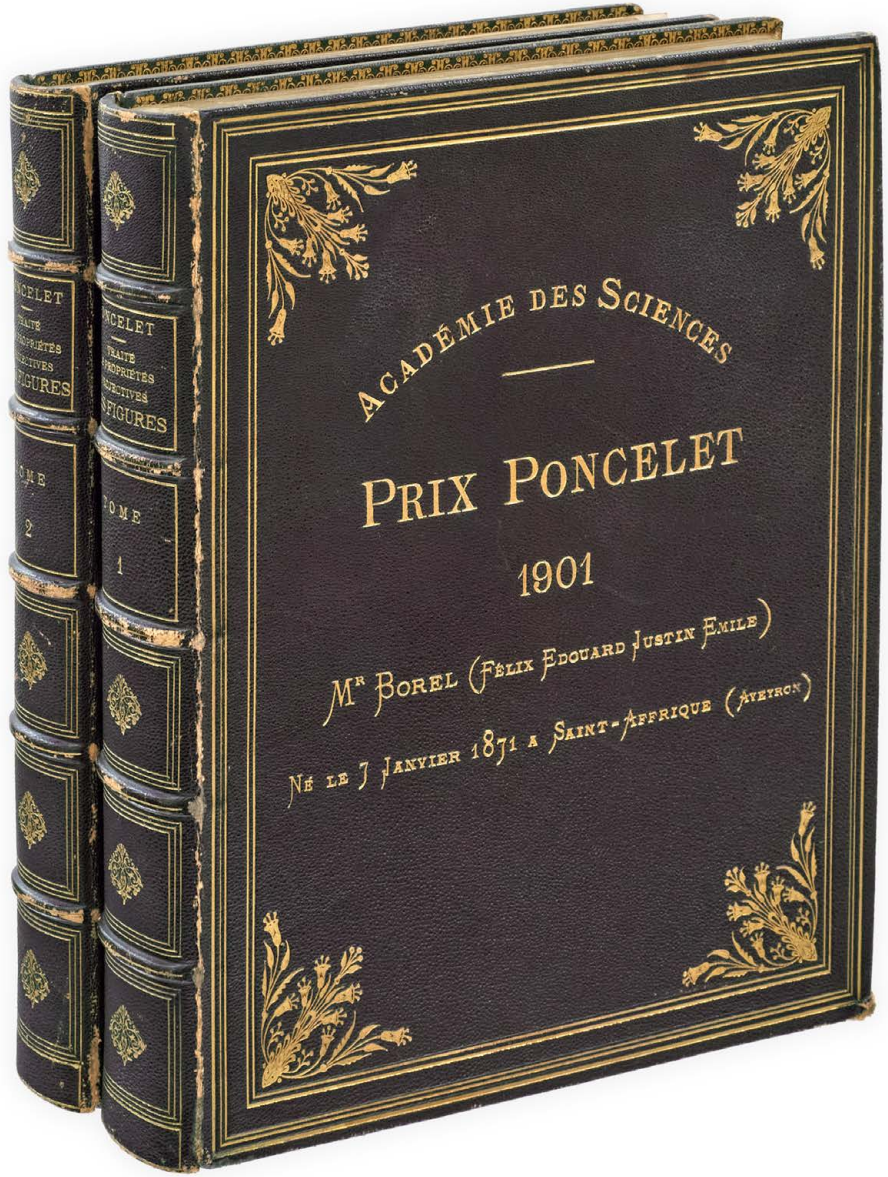
Prix Poncelet Prize Book Won by Émile Borel

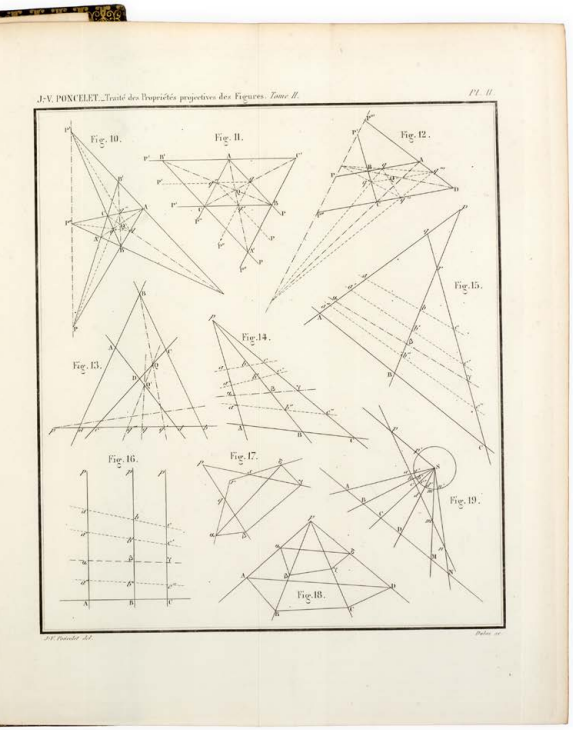
31. PONCELET, Jean-Victoire. Traité des propriétés projectives des figures, ouvrage utile à ceux qui s'occupent des applications de la géométrie descriptive et d'opérations géométriques sur le terrain. *Paris, Gauthier-Villars, 1865–1866.*

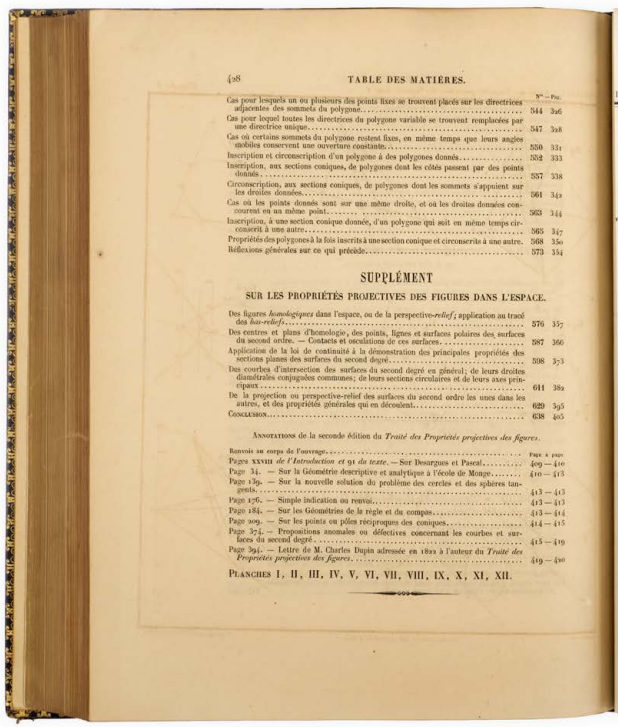
Two vols, 4to, pp. ix, [1, blank], [ix]–xxxii, 428; viii, 452; 12 and 6 engraved plates with line diagrams of geometrical figures by Dembour and Dulos after Poncelet, bound to throw clear, equations in the text; very occasional very light spotting in vol. I, very light offsetting from plates onto facing ll.; early twentieth-century richly gilt black morocco, boards with triple- and double-fillet gilt rule frames and large gilt floral cornerpieces, upper board of I lettered in gilt, gilt panelled spine, all edges and turn-ins gilt, cream watered silk endpapers, silk markers intact; extremities rubbed and bumped, first few leaves of vol. I slightly shaken, generally a very good copy; Émile Borel's copy, his name gilt on the upper board of vol. I and stamped on the free endpapers of vol. II. **£950**

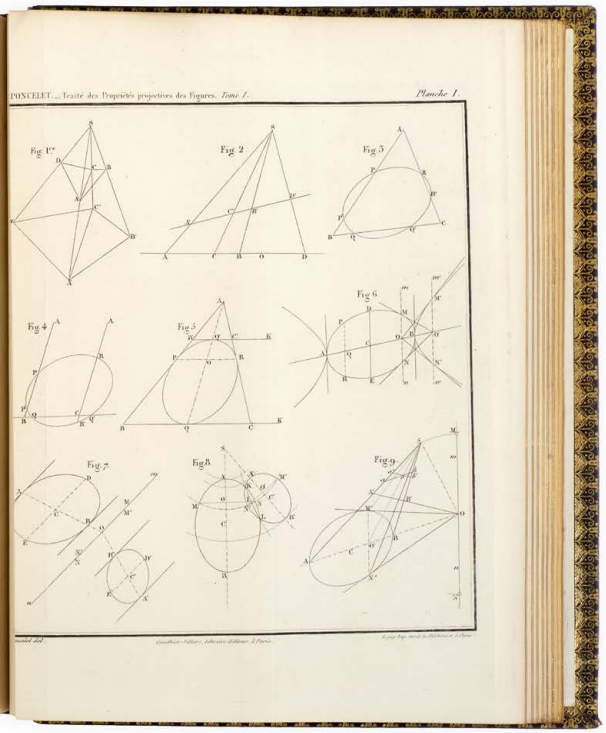
Second edition, revised and enlarged, Émile Borel's prize copy. A finely bound, well-preserved, and prestigious association set.

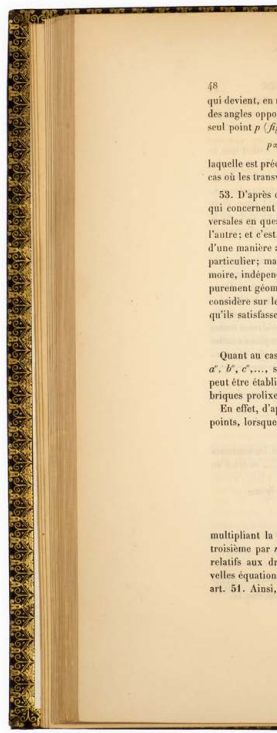
Émile Borel (1871–1956), the French mathematician best known for his work in measure theory and probability theory, was awarded several honours in the early twentieth century, when his career truly started to blossom: among them, in 1901, the Poncelet Prize, for which he received money as well as this handsomely bound set of the improved edition of the defining geometrical work of Jean-Victoire Poncelet (1788–1867). Given Borel's interests in applied geometrics, these volumes were particularly appropriate: they derive from Poncelet's work on the properties of geometrical figures, composed while Poncelet was imprisoned as part of Napoleon's army in Saratow, Russia (March 1813 to June 1814).





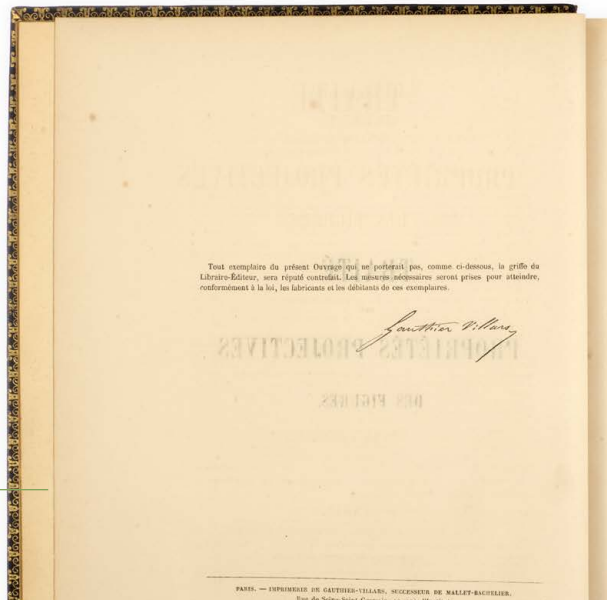


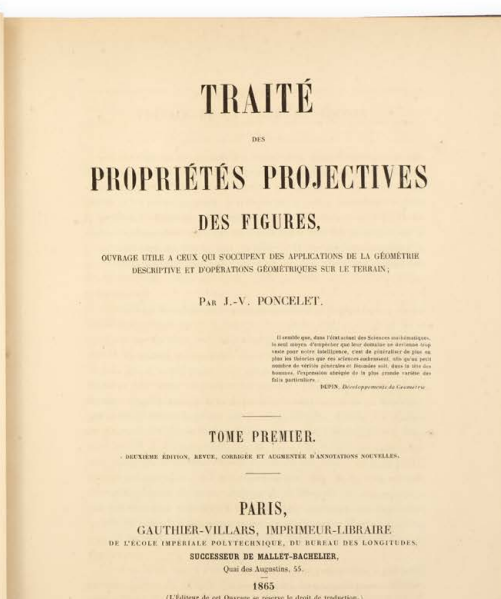




In his *History of Geometrical Methods* (1940), Julian Coolidge wrote about the *Traité* (then simply known as 'Poncelet') as a 'great work' and admitted to giving 'more attention to Poncelet than to previous writers on projective geometry because he really saw far deeper. He placed the subject in the right light' (Dover reprint, 2003, pp. 93 and 95). Here presented in the second edition, revised and enlarged by Poncelet just a couple of years before his death, it also includes the 'avertissement' or preface for the second edition.

Established by Poncelet's widow for the advancement of the sciences, especially applied mathematics, the Prix Poncelet was first awarded by the French Academy of Sciences in 1868, and annually thereafter. Borel lived through both World Wars, was decorated for his efforts in the First War and later became active in the French government, among other things, working for the Resistance.





From the Library of Ulisse Aldrovandi

32. PONTANO, Giovanni. De rebus coelestibus. *Naples, 'ex officina Sigismundi Mayr Germani : summo ingenio artificis Ioannetto Salodio : Antonio Vuerengrundt : Evangelista Papiensi : Petro Kirchberg : & Io. Philippo Nanio ministris', 1512.*

[*bound with:*]

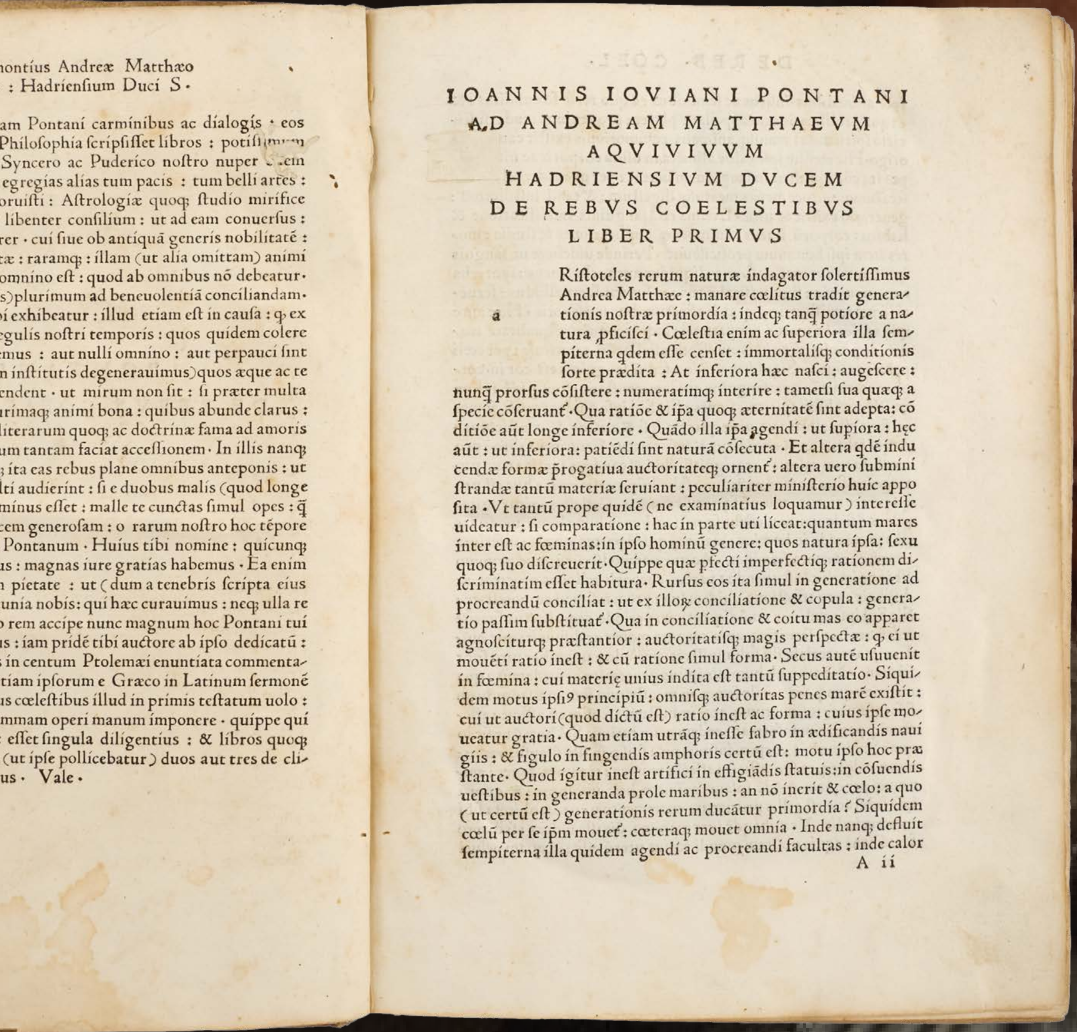
—. De fortuna. *Naples, 'per Sigismundum Mayr Germanum singularis ingenii artificem : Antonio Vuerengrundt : Hieronymo Taegio : Petroque Kirchberg ministris', 1 July 1512.*

[*and:*]

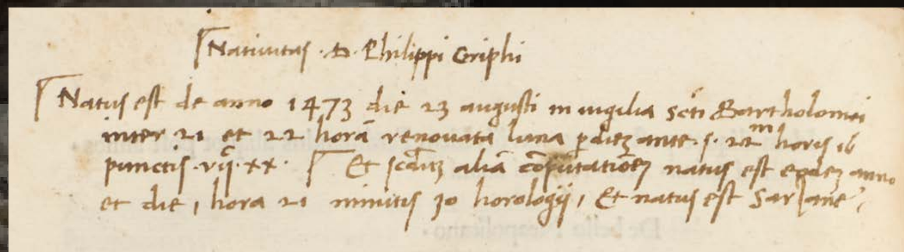
—. Commentationes super centum sententiis Ptolemaei. *Naples, 'ex officina Sigismundi Mayr Germani : summo ingenio artificis : Ioannetto Salodio : Hieronymo Taegio & Petro Kirchberg ministris', 1512.*

Three works bound in one vol., folio, ff. *De rebus coelestibus*: [182], *De fortuna*: [42], *Commentationes*: [80]; one small wormhole with old restoration to first two leaves (touching a few characters without loss of sense), the odd spot and a few minute wormholes to inner margins, but overall very good, crisp copies; in a near-contemporary (Bolognese?) binding of vellum manuscript waste over boards (reusing a bifolium from a fifteenth-century Italian (probably Florentine) codex, the outer side with only a fine white vine initial C left unscraped, another initial and original text visible to verso), spine in compartments with 3 exposed split tawed thongs, vestigial ties to fore-edge; some neat restoration to spine, front free endpaper renewed; ownership inscription of Ulisse Aldrovandi to head of first title ('Ad usu[m] Ulissis Aldrovandi') with manuscript shelfmark, a single annotation at the end of the second work in a slightly later hand (a hand also found in other books owned by Aldrovandi), author and title in manuscript along lower edges (as in many books from Aldrovandi's library). **£11,000**

First editions of three works on cosmology, ethics, and astrology by the Neapolitan humanist, poet, and polymath Giovanni Pontano (1426–1503), an important sammelband from the celebrated library of Ulisse Aldrovandi (1522–1605), professor of natural philosophy and natural history at the University of Bologna, and a witness to his most cherished endeavour, the bridging of the gap between collection and classification through a new, observation-based science.



Considered by Linnaeus and Buffon the founder of modern natural history, Ulisse Aldrovandi was among the leading collectors of his day, assembling vast collections of animal, plant, and mineral specimens which formed the nucleus of the first natural history museum open to the public. Aldrovandi was sought out by students, scholars, princes, and cardinals from all over Europe who wished to visit his *Wunderkammer*, as well as his extensive library, which housed thousands of printed books and a collection of manuscripts. 'Aldrovandi's taste in books was extremely varied … The encyclopedic scope of [his] interests makes him a hard individual to classify: he was a university professor charged with teaching philosophy, and as such he had to have a secure command of Aristotle's works and the commentary tradition (from ancient to contemporary times); yet he was also interested in observation and collecting, was capable of reading Aristotelian and other texts in the original Greek and had deep friendships with humanists working at Bologna's university' (Duroselle-Melish & Lines).



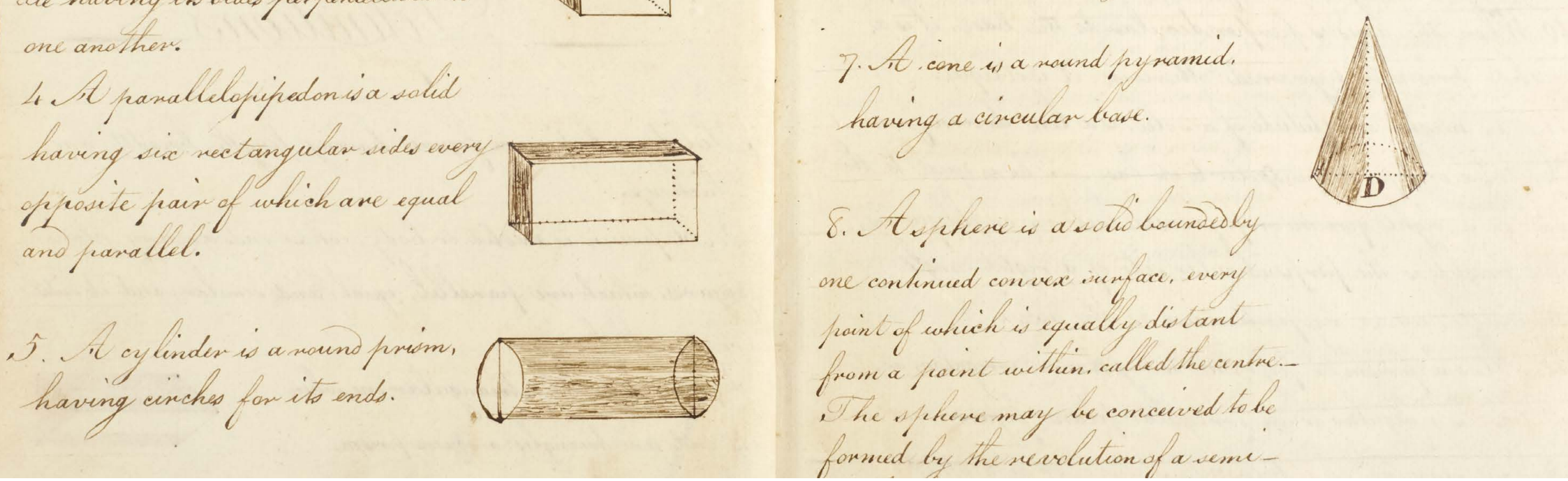
The presence of these works by Pontano in Aldrovandi's library is highly significant: firstly, as Aldrovandi's own work aimed at integrating and consolidating the knowledge of all processes occurring on Earth, Pontano's emphasis on the influence of cosmological matters upon earthly phenomena, including biology and pathology, must have supplied an important possible framework. Secondly, Pontano's methodology aligned closely with Aldrovandi's: for the Neapolitan polymath, knowledge of astrological phenomena was based on the relationship between established patterns and observation, uniting measurement and calculation with conjectural reasoning.

Even more compellingly, Pontano's use of biological analogies for the formulation of a theory of the heavens highlighted the potential for a scientific approach which harmonised natural sciences with cosmology. 'The most notable aspect of Pontano's astrological treatise is his constant use of analogies drawn from his or "our" terrestrial experience … He likens the relation of the superior determining realm to the inferior determined one to "that between males and females in the very act of the generation of mankind" … Pontano's analogy of sexuality and reproduction suggests also the close connection of astrology with medicine in the Renaissance. This connection leads him to a further biological analogy, one that is central to his conception of the heavens. The commanding and fostering role of the heart and the flow of the blood in the human and animal organism is used to illuminate the role of the sun in relation to the moon and the other bodies in the heavens, and through them to the earth and its creature' (Trinkaus, pp. 450–452).

In the second work, an ethical treatise on the relationship between virtue and fortune, Pontano presents a naturalistic, anti-religious, and astrological theory of fortune, stating that fortune depends on the influence of the stars, and is therefore unaffected by the exercise of virtue, before trying to reconcile the influence of the stars with the freedom of will and the action of providence. The third and final work comprises Pontano's extensive commentary on Ptolemy's *Centiloquium*, a standard set text for medical students at the University of Bologna in the fifteenth and sixteenth centuries. It includes, for each proposition, Pontano's translation of the text from the original Greek.

After his death in 1605, Aldrovandi's books and museum continued to be housed in his home until around 1617 when, in accordance with his 1603 will, the collections were transferred to the Palazzo Comunale of Bologna (although the reduced number of books in the 1657 inventory suggests that the library may have been subject to some neglect). In May 1742 all the collections were transferred to the newly founded Istituto delle Scienze, but while the manuscripts were kept together, the printed books were dispersed throughout the Istituto's holdings. Another blow to the collection arrived in 1797 when several books and manuscripts were removed by the Napoleonic commissioners and sent to France. The books and manuscripts that returned after the Restoration were returned to the Istituto's library (now the Biblioteca Universitaria di Bologna). Some duplicates and other books have since been sold or exchanged and have 'ended up in local and foreign libraries, while others made their way onto the antiquarian book market, where they still occasionally surface' (Duroselle-Melish & Lines).

On Aldrovandi's library, see Duroselle-Melish & Lines, 'The Library of Ulisse Aldrovandi (†1605): Acquiring and Organizing Books in Sixteenth-Century Bologna' in *The Library* (June 2015), pp. 133–161; see also Bacchi, 'Ulisse Aldrovandi e i suoi libri' in *Archiginnasio* (2005), pp. 255–365; and Tavoni, 'Nel laboratorio di Ulisse Aldrovandi: un indice manoscritto e segni di lettura in un volume a stampa' in *Le paratexte* 6 (2010). On Pontano, see Trinkaus, 'The Astrological Cosmos and Rhetorical Culture of Giovanni Gioviano Pontano' *Renaissance Quarterly* 38, no. 3 (1985), pp. 446–472.

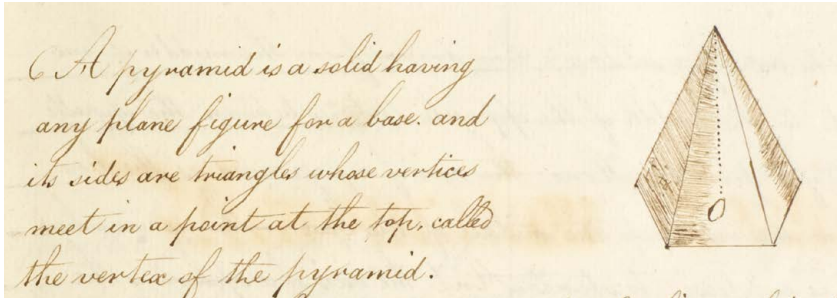


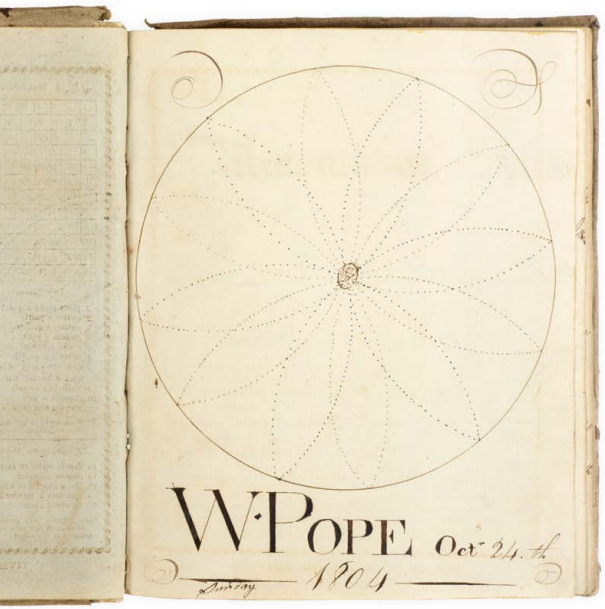
Arithmetical Endpapers and Homemade Dust-Jacket

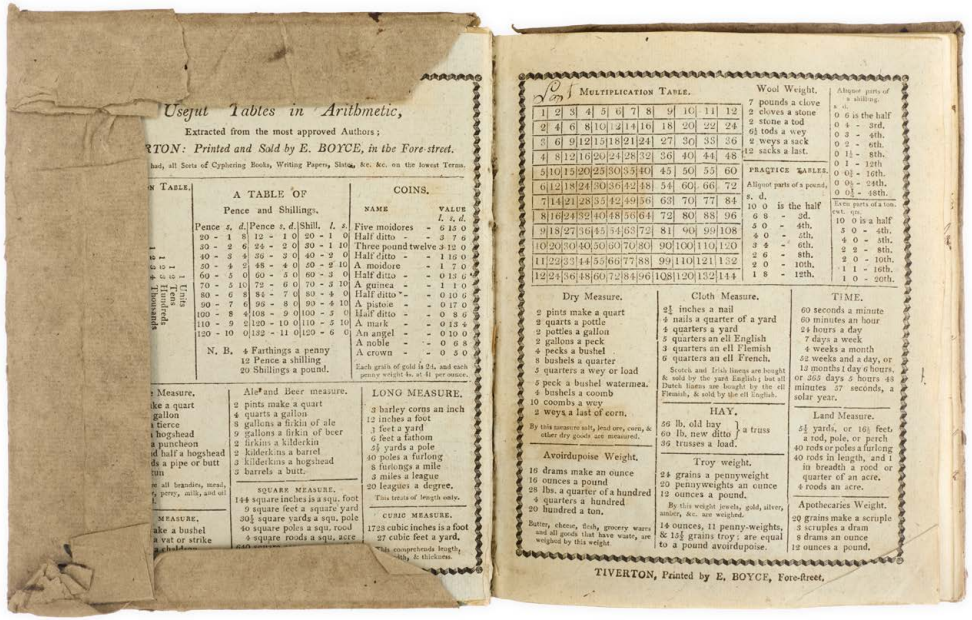
33. POPE, William. Manuscript arithmetic schoolbook. [*Tiverton?*] *'Sunday Oct^r 24.th 1804'.*

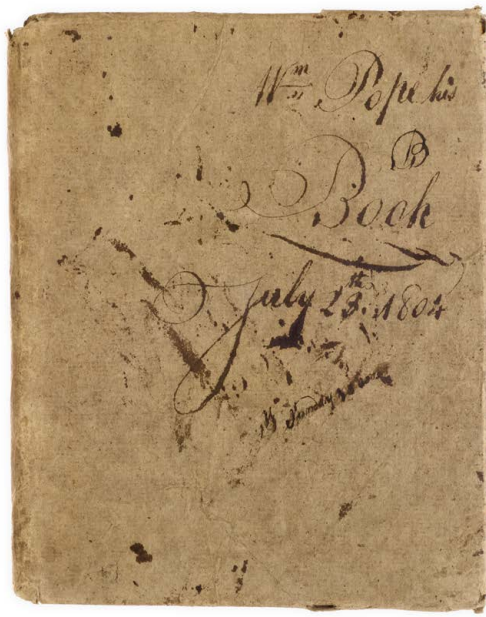
Manuscript on paper, 4to, pp. [74] with blanks; neatly written in a single hand in brown ink, up to 18 lines per page, with numerous pen-and-ink and ink-and-wash diagrams; bound in contemporary stationery vellum-backed boards with marbled sides and sheep tips, edges stained yellow, in a brown paper wrapper formerly affixed with red wax, bound with a letterpress 'Collection of Useful Tables in Arithmetic' as front endpapers ('Tiverton: Printed and Sold by E. Boyce, in the Fore-Street'); wrapper a little worn, tailcap chipped, else very well preserved; ink inscriptions of William Pope to wrapper ('July 23th. [*sic*] 1804' and rear pastedown ('August 8. 1804'), a longer note to rear free endpaper ('February 24. 1789 Wm Pope Born | Tuesday at half past 1 O Clock in the Morning'). **£850**

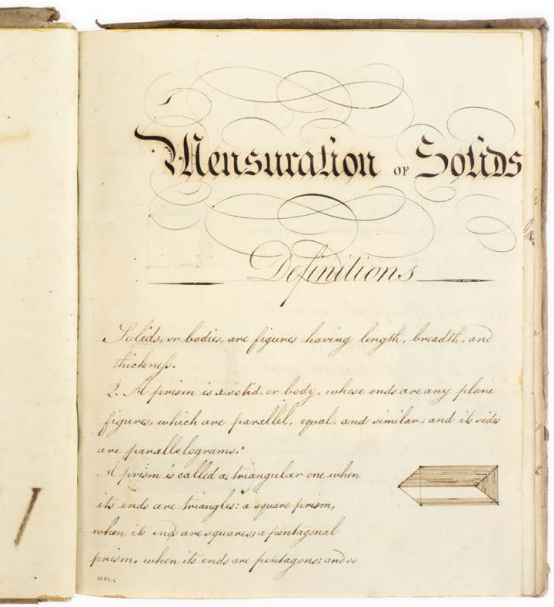
A manuscript arithmetic schoolbook belonging to one William Pope, very well preserved in its original stationery binding and wrapper, with provincially printed arithmetic tables as endpapers.

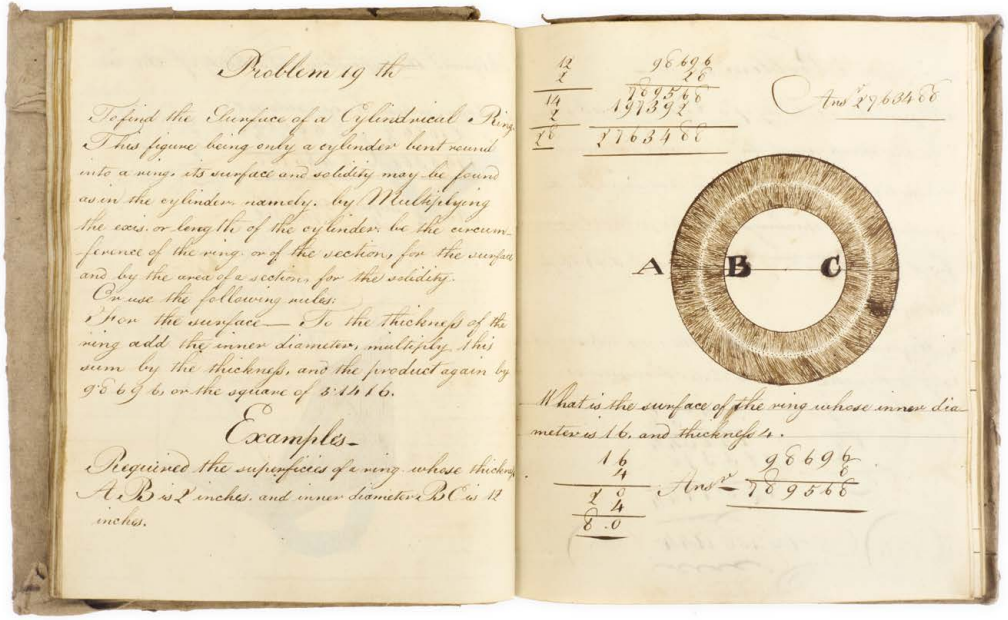




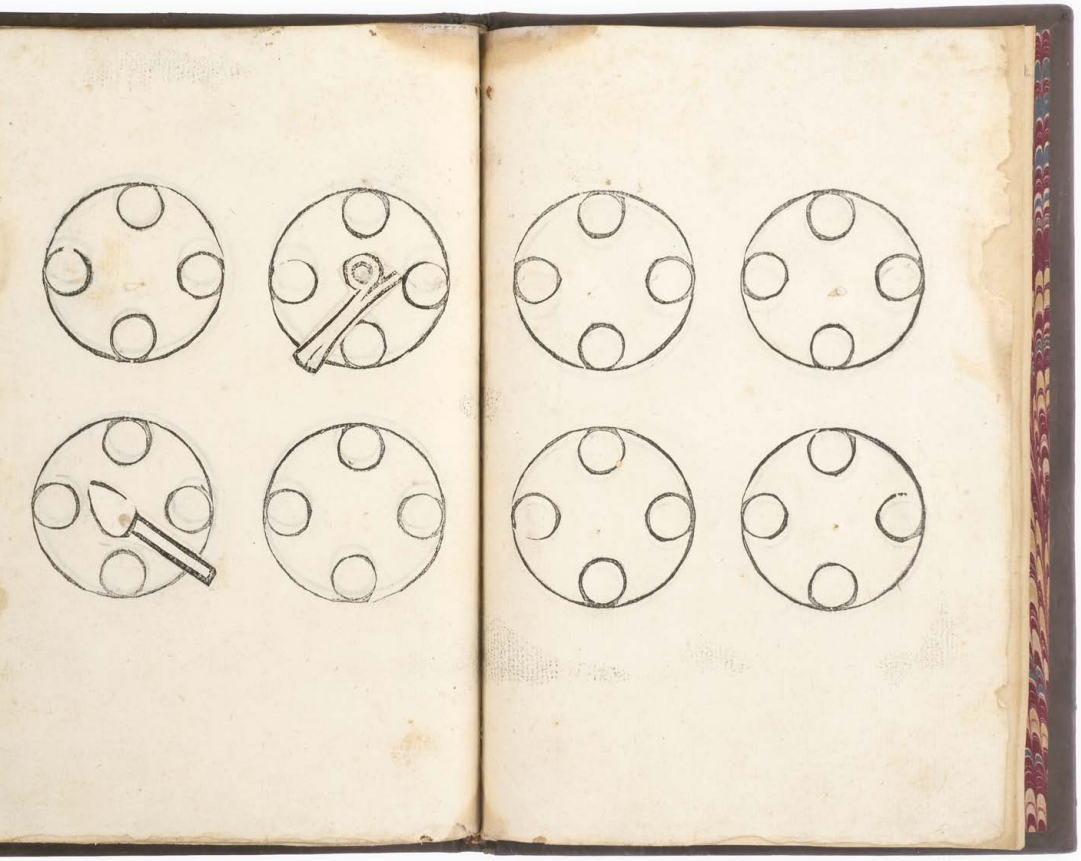








Pope's studies principally concern geometry and mensuration, with examples and exercises touching on their practical application. The 'Useful Tables in Arithmetic' printed as endpapers are largely devoted to the divisions of units of measurement.



Memory in Motion

34. [PUBLICIUS, Jacobus.] Ars memorativa. [*Cologne, Johann Guldenschaff, c. 1481.*]

4to, ff. 20 (of 22); [a^8 b^6 c^2 d^6], lacking [c^2] (2 ff. of mnemonic grids); comprising [28] pp. of text in gothic letter and [12] pp. of woodcut diagrams, each with 4 blank woodcut roundels, **2 roundels to penultimate leaf retaining woodcut volvelles**; some slight staining, mostly to [a1]^r, [b6]^v, and [d1]^r, a few small tears to diagrams where pointers have been lost, but a good, wide-margined copy; late nineteenth-century calf, front board lettered in gilt; early manuscript quiring, ink stamp of Stonyhurst College to [a1]^r and [b6]^v. **£18,000**

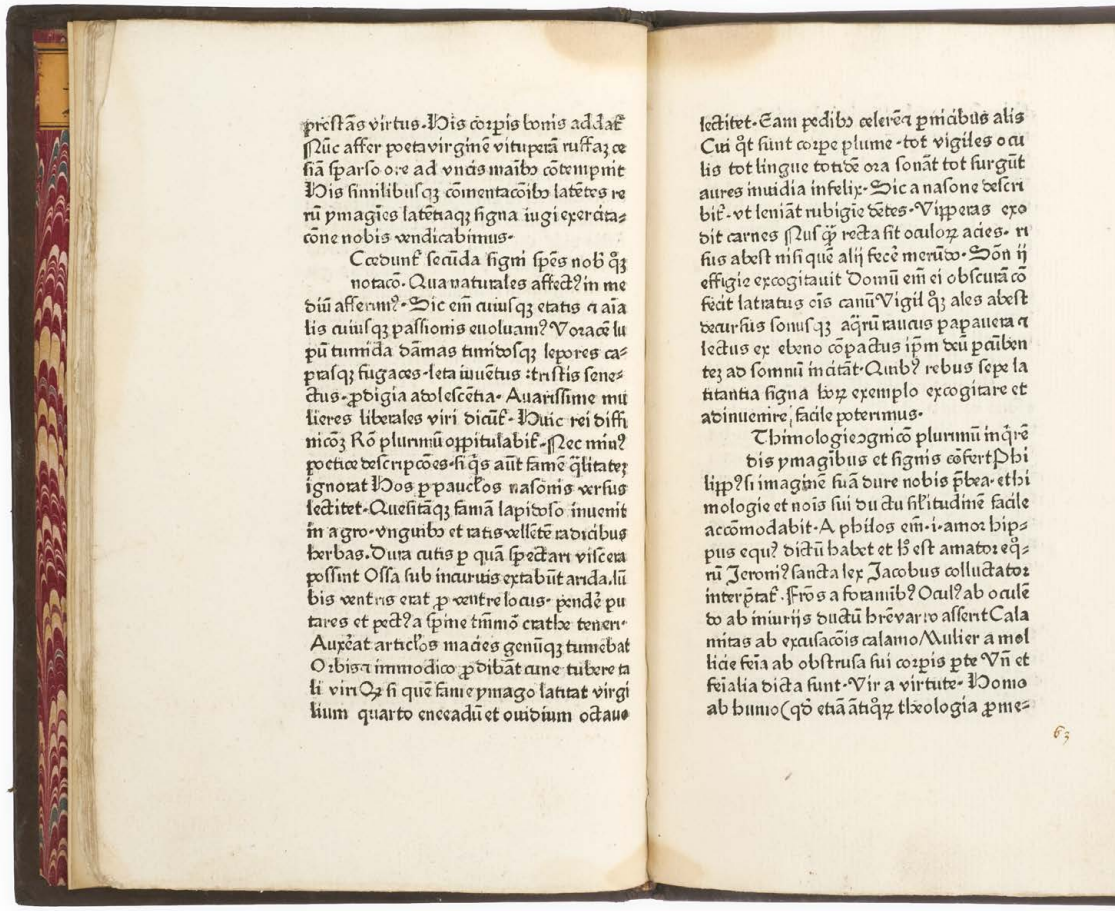
First illustrated edition, with moving parts, of the first general treatise on the art of memory to be printed.

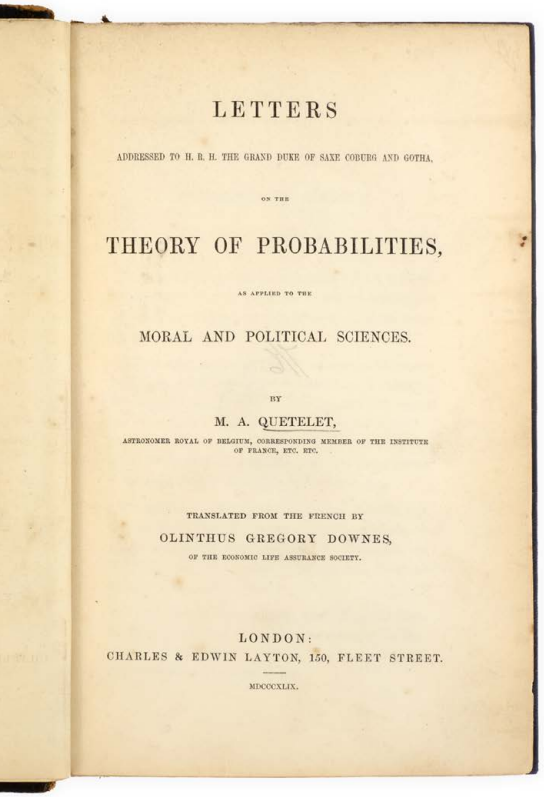
Jacobus Publicius was an itinerant scholar and poet of the mid to late fifteenth century, who taught in Salamanca, Erfurt, Leipzig, Cologne, and elsewhere. It is likely that this tract was printed to accompany his lectures, which would account for the variety of printing locations; from Toulouse, to Cologne, to Venice. Publicius seems to have trained as a physician, which would explain the medical aspects of memory training that appear in his text, for example urging readers to avoid 'noxious odours which damage the brain. We value aromatic things as if they contribute to our intelligence' (*trans.*).

The *Ars memorativa* appeared in print around twelve times in the fifteenth century: four as standalone editions, five alongside other works on memory or health, and three as part of a longer work by Publicius, his *Ars oratoria, ars epistolandi et ars memorativa*, which was printed perhaps most elegantly by Erhard Ratdolt in Venice. **This Cologne edition is considered the first edition with surviving illustrations.** The forty-eight roundels were designed to have woodcuts of objects attached to them to create a visual mnemonic alphabet, the majority coinciding with those of the Venetian edition of 1482 (forty-two circular woodcut initials without moving parts); they comprise animals, tools, people, and household objects. Our copy retains two of these moving parts, depicting what appear to be a pair of scissors and a paintbrush, respectively. While most editions name Publicius as the author, he is not mentioned here.

ISTC lists eleven copies, only one of which in the US (NYPL).

Hain 13549; HCR 1824; Proctor 1225; BMC I 256.IA; GW M36437; Goff P1094; CIBN P-692; Bod-Inc P-535; ISTC ip01094000. See Luis Merino Jerez, 'Iacobus Publicius's *Ars memorativa*: An Approach to the History of the (printed) Text', in *AUC Philologica* 2020, no. 2 (2020), pp. 85–105.





LETTERS

ADDRESSED TO H. R. H. THE GRAND DUKE OF SAXE COBURG AND GOTHA,

ON THE

THEORY OF PROBABILITIES,

AS APPLIED TO THE

MORAL AND POLITICAL SCIENCES.

BY

M. A. QUETELET,

ASTRONOMER ROYAL OF BELGIUM, CORRESPONDING MEMBER OF THE INSTITUTE OF FRANCE, ETC. ETC.

TRANSLATED FROM THE FRENCH BY

OLINTHUS GREGORY DOWNES,

OF THE ECONOMIC LIFE ASSURANCE SOCIETY.

LONDON:

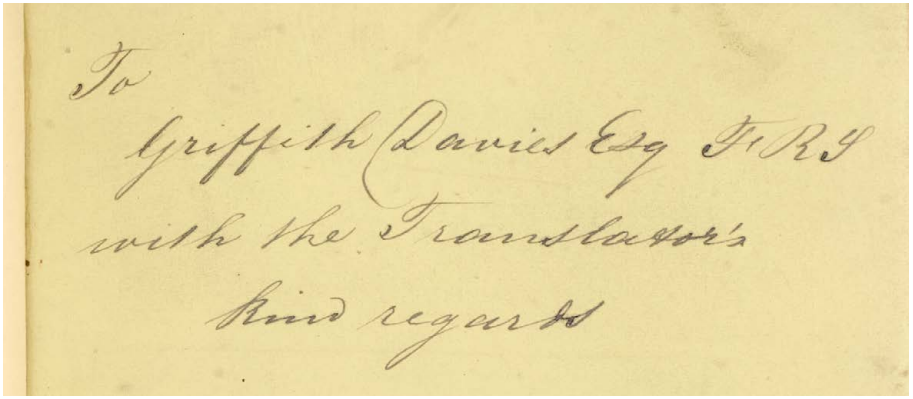
CHARLES & EDWIN LAYTON, 150, FLEET STREET.

MDCCCXLIX.

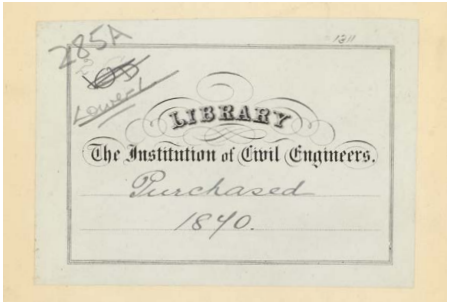
35. QUETELET, M. A. Letters Addressed to H. R. H. the Grand Duke of Saxe Coburg and Gotha on the Theory of Probabilities, as Applied to the Moral and Political Sciences. Translated from the French by Olinthus Gregory Downes. *London, Charles & Edwin Layton, 1849.*

8vo, pp. xvi, 309, [1]; a very good copy bound in quarter calf for the Institute of Civil Engineers, the Institute's label on the front free end-paper; spine edges rubbed; **translator's presentation copy to Griffith Davies**. **£550**

First edition in English. 'This book is really an original, if elementary, treatise on probability and social statistics, written in the form of a series of letters to the Belgian king's two nephews, Ernest (the duke to whom the book was dedicated) and Albert (who by 1846 was husband to Queen Victoria of Great Britain). Quetelet had tutored the two in the 1830s, and in writing his book as a series of letters he was adopting a form that had been used with great success by Euler in 1768, with *Letters to a German Princess*, a popular exposition of physical science'. Stigler, *History of Statistics*, p. 206.



To
Griffith Davies Esq F.R.S
with the Translator's
Kind regards



285A

LIBRARY
The Institution of Civil Engineers.
Purchased
1870.

'Quetelet is credited with the first published visual images of normal and skewed probability distributions' (J.L. Klein, *Statistical Visions in Time: A History of Time Series Analysis, 1662–1938*, 1997, p. 164).

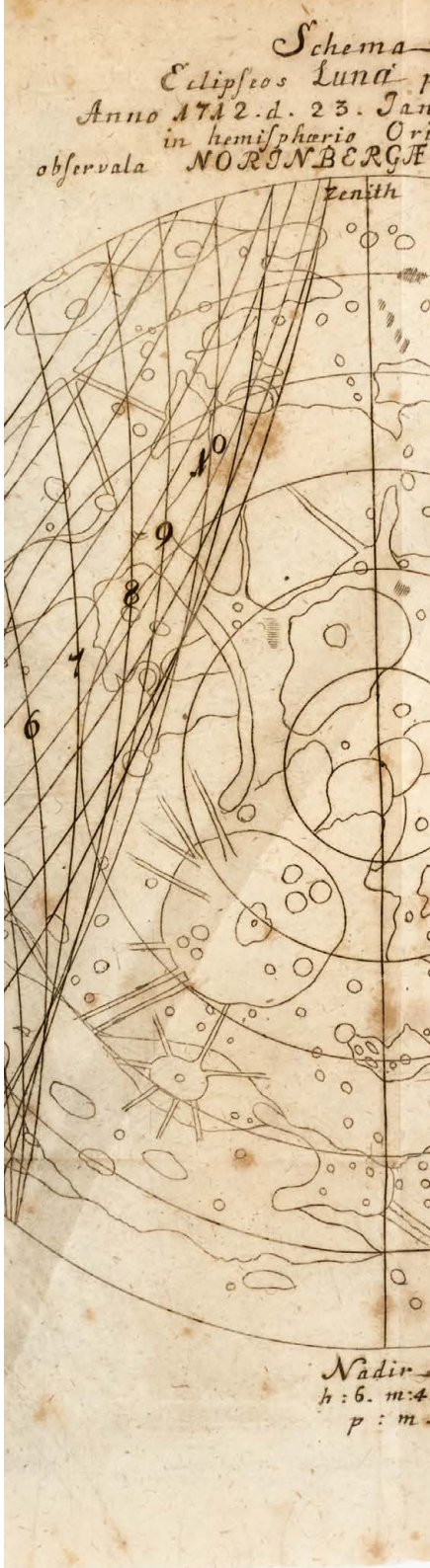
'In his autobiography Galton explains how he first encountered Quetelet's statistical methods in 1863, two years before the publication of his first article on heredity. He had immediately been attracted to Quetelet's examination of the 'law of deviation from an average', which he had discovered when reading the 1849 English translation of Quetelet's 1846 book *Lettres à Son Altesse Royale le Duc regnant de Saxe-Coburg et Gotha sur la théorie des probabilités, appliquée aux science morales et politiques*... In his 1846 *Lettres*, Quetelet used [Laplace's curve of 'possible error'] to interpret anthropomorphic data, thus giving it a new methodological significance, as has been pointed out by Stigler. Quetelet used Laplace's theorem to determine whether a series of real objects and not mere measures) could be considered homogeneous. Laplace's theorem implied that a group of measures affected by the same major causes, and varying only in terms of many minor, accidental causes, should be distributed according to Gauss' law. Quetelet's innovation was to use the Gaussian distribution as a way of detecting groups of homogeneous objects. He thus made explicit what had previously been merely implicit in Laplace's work: a Gaussian (or 'normal' distribution) is a necessary and sufficient condition of homogeneity. The Laplace-Gauss law thus left the arcane realm of the estimation of error (in the measurement of a given object) to become a tool for detecting homogeneity in groups of real objects. In particular, it became a method for identifying 'populations' as objective entities. If, for example, the chest size or stature of soldiers was approximately distributed according to Gauss' law, this would indicate that it was a real population, within which variation was merely accidental. For Quetelet, a Gaussian distribution revealed both order in apparent chaos, and also an underlying ideal type that nature tries to attain, implying that variation has no real significance. This would also explain why Darwin, if he did read Quetelet, would hardly have been attracted by his concept of a 'population" (Jean Gayon, *Darwinism's Struggle for Survival: Heredity and the Hypothesis of Natural Selection*, tr. by Matthew Cobb, 1998, pp. 117–8).

Following in Leibniz's Footsteps

36. [ROYAL PRUSSIAN SOCIETY OF SCIENCES.] Miscellanea berolinensia ad incrementum scientiarum, ex scriptis societati regiae scientiarum exhibitis, edita, continuatio I. cum figuris et indice materiarum. *Berlin, Johann Christoph Papen, 1723.*

4to, pp. [xii], 160, [4], 161–188, with folding engraved frontispiece and 8 folding plates; woodcut initials and illustrations in the text; variable browning with some foxing and offset to plates; bound in contemporary vellum over boards, sewn two-up on 5 cords, edges speckled red and green; dust-stained and a little rubbed, slight rust-marks to upper board; nineteenth-century bookseller's label (F. Ostinelli, Como) to upper pastedown, bookplate of the University of California, with duplicate release stamp to upper pastedown and unobtrusive perforated stamp to title and plates. **£575**

First continuation of Leibniz's *Miscellanea berolinensia*, the scientific periodical of the Royal Prussian Society of Sciences, comprising articles on literature, mathematics, and mechanics.



Nachricht, an den Buchbinder.

Die zugehörigen Kupffer müssen in ihrer Ordnung am Ende des Buchs nacheinander dergestalt eingehefftet werden, daß wenn sie aufgeschlagen, sie frey ausser dem Buch gegen das Gesicht zu liegen kommen, zu welchem Ende auf der Seiten eines jeden Kupfferblats so viel lediges Papiers gelassen ist, daß sie zugleich mit eingehefftet werden können.

Monitum ad Bibliopegos.

IN consuendo hoc Libro Tabulæ figurarum æri incisarum in fine omnes ordine ita collocandæ & complicandæ sunt, ut si explicentur, visui se statim offerant & commodi usus gratia extra Librum integræ promineant, quem in Finem ad latus dextrum fere omnium Tabularum illarum satis chartæ vacuæ adest ut Libro una opera etiam assui possint.

)o(

First appearing in 1710, the publication of the *Miscellanea* was revived in 1723 as the official journal of the Royal Prussian Society of Sciences after the death of Leibniz, its founding President. The *Continuatio* features contributions by the astronomers Johann Wilhelm Wagner, Johann Philipp von Wurzelbauer, and Christfried Kirch, the mathematicians Christoph Langhansen, Jakob Hermann, and Philippe Naudé the younger, and the linguists Gisbert Cuper, Johann Georg Wachter, and Justus Christoph Dithmar.

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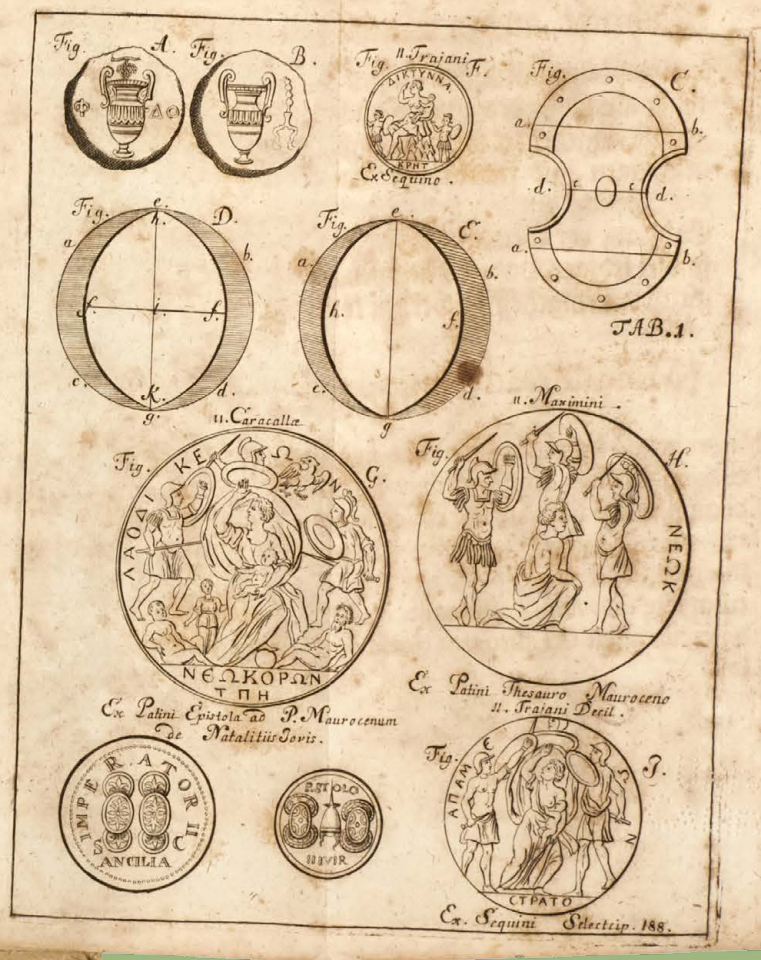
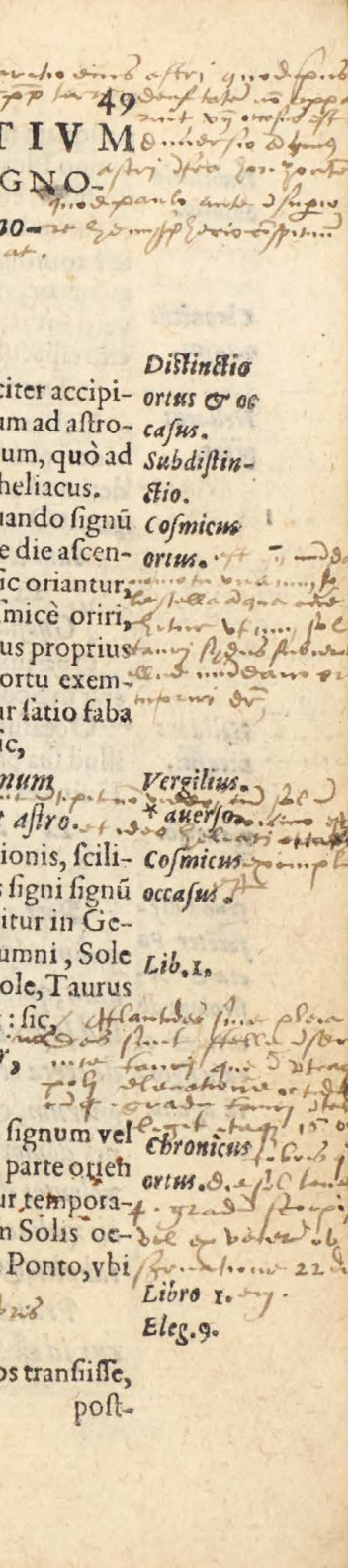




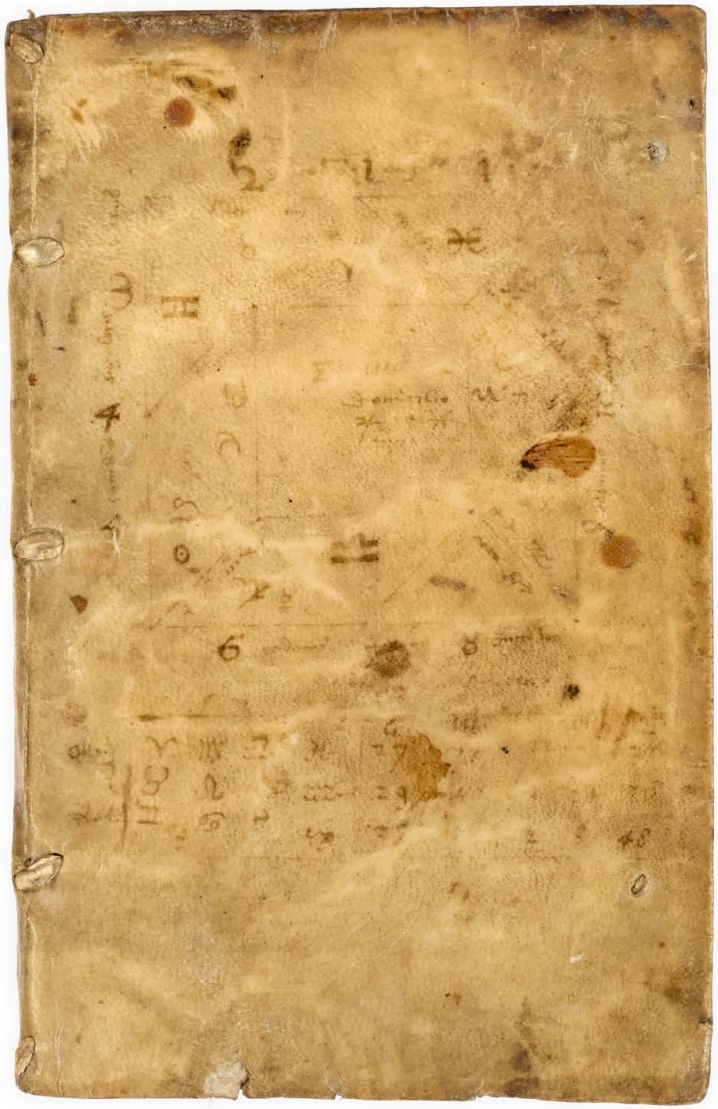
Hand-drawn Horoscope

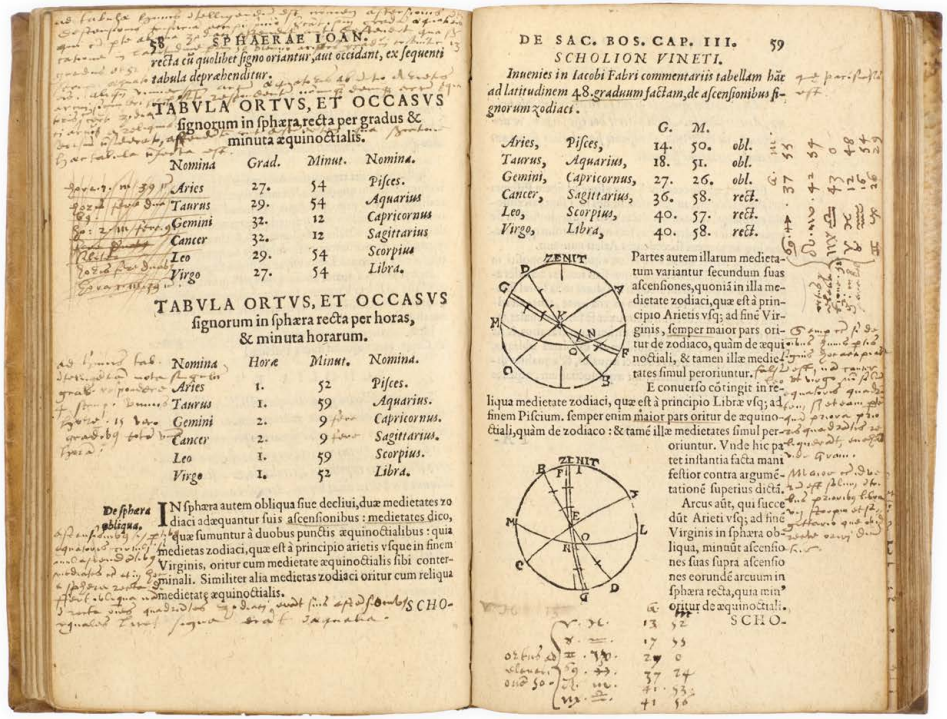
37. SACROBOSCO, Johannes de; Francesco GIUNTINI, *editor*. Sphaera Ioannis de Sacro Bosco emendata. Cum additionibus in margine ... collectis a Francisco Iunctino ... Interserta etiam sunt Eliae Vineti Santonis egregia Scholia in eandem Sphaeram. Adiunximus eiusdem auctoris Computum Ecclesiasticum. Et Petri Noni Salaciensis demonstratione[m] eorum ... eode[m] Vineto interprete. *Antwerp, heirs of Arnold Birckmann, 1566.*

8vo, pp. [xvi], 144, [64], last leaf blank; woodcut printer's device to main title, woodcut vignette depicting an ouroboros to section title for *De anni ratione*, woodcut initials and numerous diagrams and illustrations; lacking volvelles for four diagrams, but a very good copy; bound in contemporary limp vellum, stubs from two pairs of alum-tawed ties; **upper and rear covers with a contemporary manuscript horoscope and other astrological markings in manuscript**, somewhat faded, **contemporary manuscript annotations in Latin in a French hand to *c*. 75 pp.,** *on* **front and rear flyleaves, and on inside lower cover**, contemporary ownership inscription to verso of rear flyleaf 'Hic liber est emptus ex pecunia Ludi. Andrieux' (this book was bought with the money of Louis Andrieux) partially obscured. **£3000**

A richly annotated and illustrated copy of Sacrobosco's textbook of astronomy, with additions by Élie Vinet and Pedro Nuñes, edited by Francesco Giuntini.

Joannes de Sacrobosco (died *c*. 1256) compiled his textbook on astronomy, explaining the use of the armillary sphere, for students at the University of Paris. It stayed in use, subjected to numerous commentaries and adaptations, until the mid-seventeenth century; it has been calculated that more than 350 editions were printed from 1472 onwards.



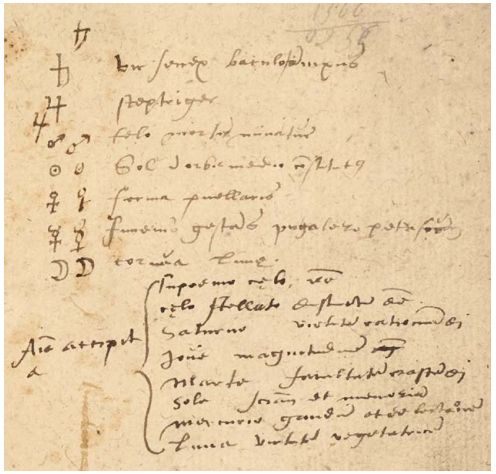


Pedro Nuñes (1502–1578) translated parts of *De sphaera* along with other astronomical texts into Portuguese; his *Tratado da sphera* was printed in 1537. His notes were translated and incorporated by Élie Vinet (1509–1587) into his *Sphaera emendata* (Paris, 1556); it is likely that Nuñes and Vinet were acquainted. Francesco Giuntini (1523–?1590) entered the fray in 1564 with an edition printed in Lyon, incorporating the work of Vinet and Nuñes, which is reprinted here. This 1566 Antwerp edition was also issued with Jean Richard's name in the imprint.

This copy shows close engagement and expansion of the text by a contemporary scholar, with lengthy annotations across numerous pages. The annotations are in a small contemporary, seemingly French, hand, and while some of the notes reference words or phrases in the text, with some underlining of significant passages, many show a much more detailed engagement with the text, including calculations and annotations to diagrams, with the use of astrological symbols. The horoscope drawn on the upper cover of the binding, now somewhat faded, indicates a reader very much familiar with astrological practice.

USTC 404499; STCV 12926187; Cantamessa 7026; not in Adams, though there is a copy in the Whipple Museum.

For Clavius's later commentary on Sacrobosco, see following item.



Copernicanism Condemned

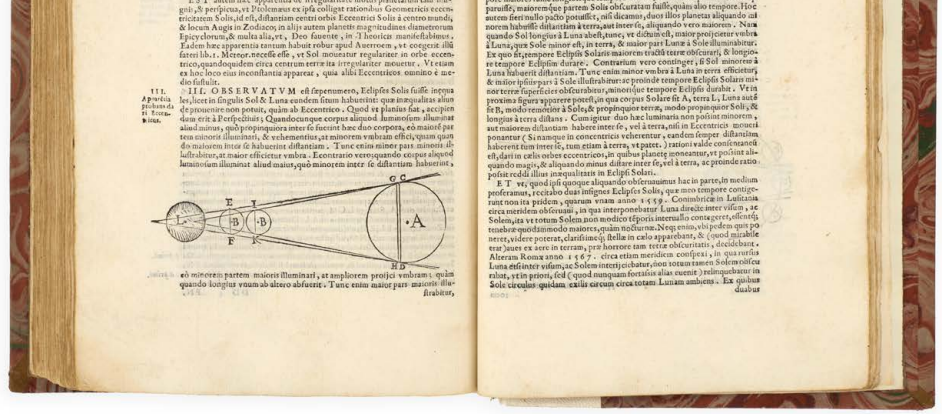
38. [SACROBOSCO, Johannes de.] CLAVIUS, Christophorus. In sphaeram Ioannis de Sacro Bosco commentarius, nunc iterum ab ipso Auctore recognitus, & multis ac variis locis locupletatus. *Rome, Francesco Zanetti for Domenico Basa, 1581.*

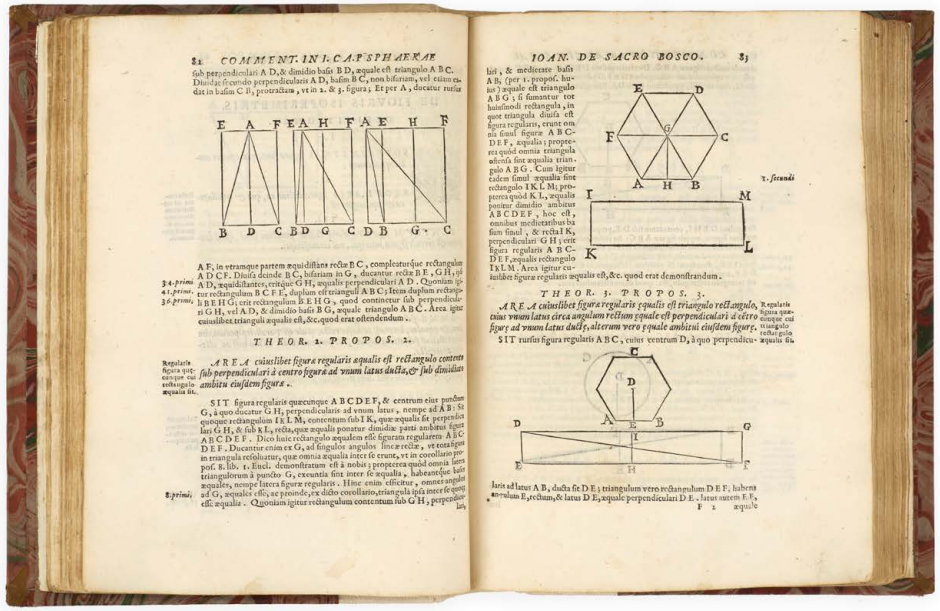
4to, pp. [32], 467, [1]; large woodcut illustration of armillary sphere to title (repeated on p. 24), woodcut printer's device to colophon, woodcut initials and numerous woodcut diagrams in text, letterpress tables; occasional light foxing, partially repaired tear to 2C³ with no loss; otherwise a very good copy in modern vellum-backed boards with marbled sides and cloth tips, gilt red morocco lettering-piece, marbled endpapers; corners a little bumped; contemporary deleted ink ownership inscriptions ('D. Alessandro Padoani f[...]' and 'B[...] Valerius') to title, erased seventeenth- or early eighteenth-century armorial ink stamp, another small ink stamp excised and repaired at an early date, C.E. Rappaport bookseller's ticket to upper pastedown.

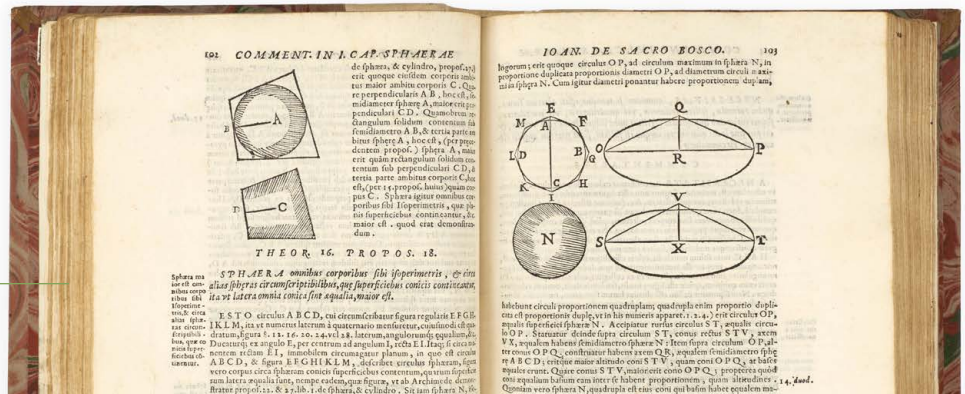
£2500

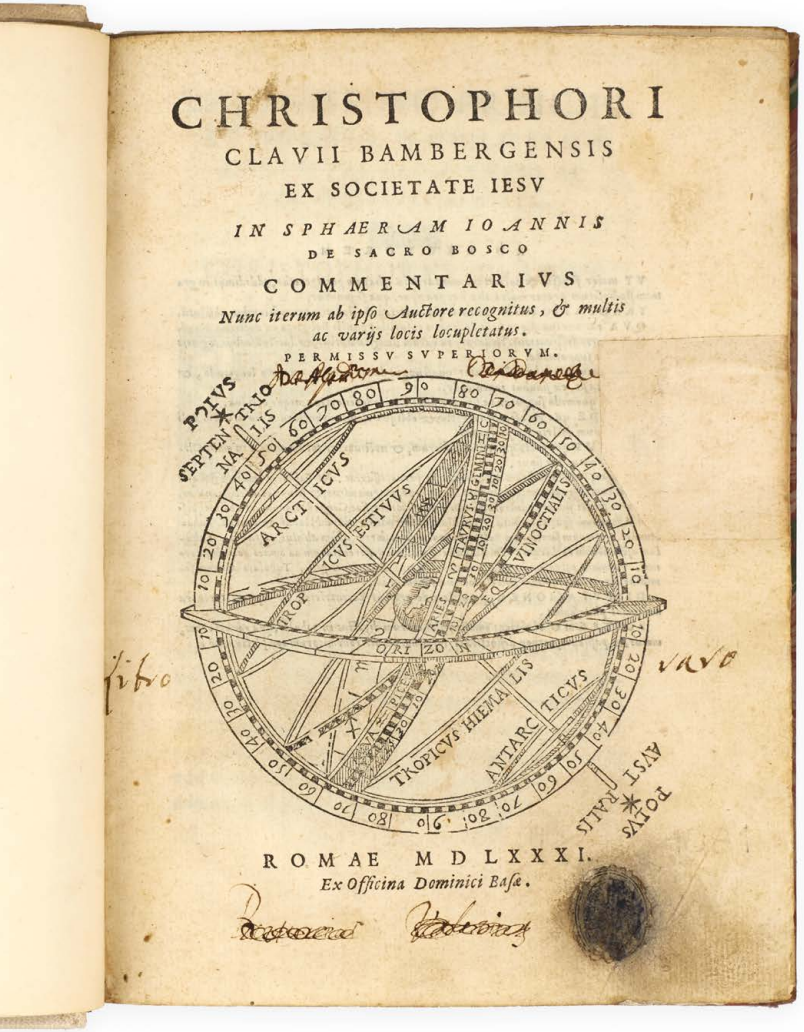
Third edition, the first to contain Clavius's condemnation of Copernicus, with ten highly detailed woodcut diagrams of solar and lunar eclipses not included in the first edition.

First published in 1570, Clavius's commentary on Sacrobosco's *Sphere* was repeatedly revised to follow developments in astronomical knowledge. The edition of 1581 is considerably expanded and contains an analysis of eccentrics, epicycles, and eclipses (ch. IV, pp. 415–67), including Clavius's first-hand accounts of the eclipses of 1560 and 1567, the first known record of an annular solar eclipse. It is in the present edition that Clavius provides, for the first time, an extensive and methodical denunciation of Copernican heliocentrism (see especially pp. 436–7), becoming 'the first to accuse Copernicus not only of having presented a physically absurd doctrine but also of having contradicted numerous scriptural passages' (DSB).





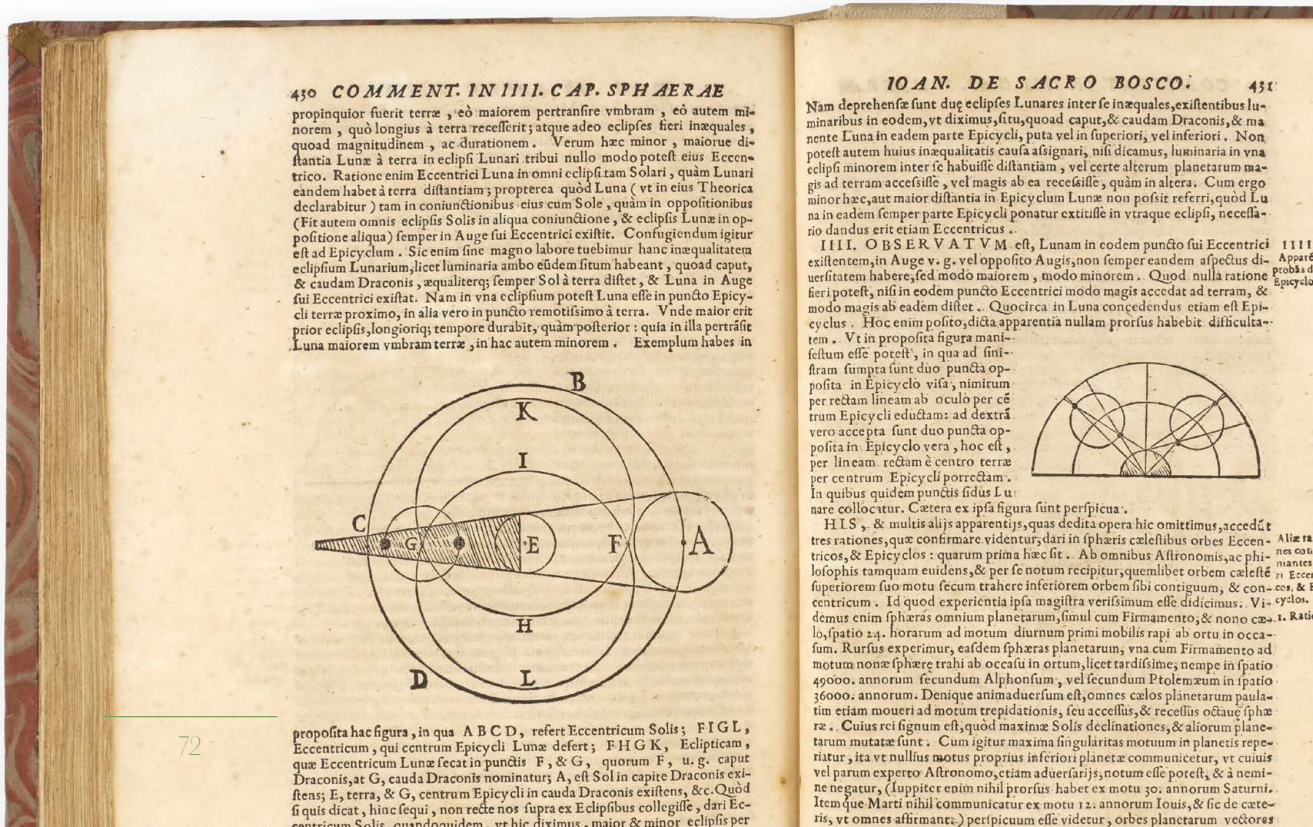


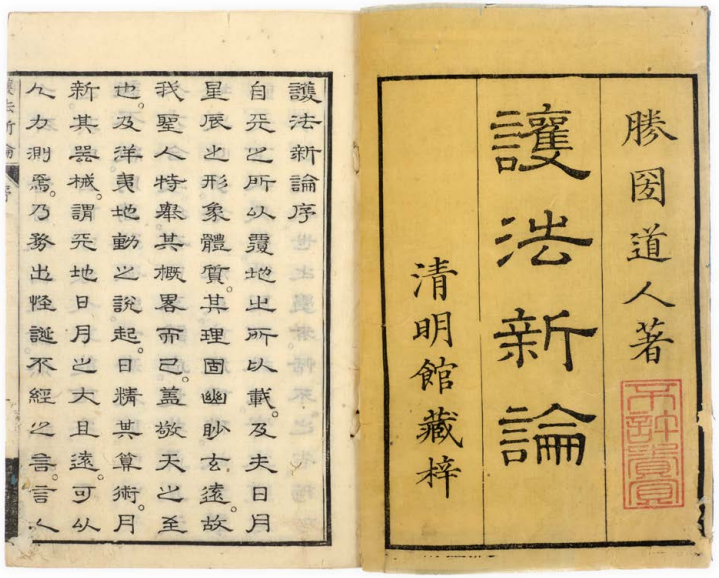


Despite his anti-Copernicanism, however, Clavius maintained a friendship with Galileo and in April 1611 submitted a report to Cardinal Bellarmine confirming Galileo's discoveries in *Sidereus nuncius* (1610), and corresponded with Galileo regarding his discovery of Jupiter's satellites.

Although usually described as the third, the present edition is in fact plausibly the second: the reported edition of 1575 is found only in the records of the Frankfurt book fair of the following year, likely a reissue of the first edition intended to make the book seem 'as up to date as possible, or to qualify for declaration at a Book Fair under the category "libri novi"' (Maclean, p. 200).

Adams C-2100; BM STC Italian 597; EDIT6 12672; Houzeau & Lancaster 2678; Sommervogel I, col. 1212; USTC 822863; see Gattei, *On the Life of Galileo* (2019); Lalande 111; Lattis, *Between Copernicus and Galileo* (1994); Maclean, 'Sacrobosco at the Book Fairs', in *Publishing Sacrobosco's* De Sphaera (2022).





Against Western Astronomy

39. SHŌKOKU Dōjin 勝圀道人, *pseud.* [KAMURO An'e 禿安慧]. 護法新論 [*Gohō shinron*; 'A New Treatise in Defence of the Dharma']. [*Japan*], *Seimeikan,* (*colophon*:) *Keiō 3* [*1867*].

Three vols, 8vo, ff. I: [1], 2, 33, II: 37, III: 38, [1]; printed on double-leaves, woodcut illustrations in-text throughout; occasional worming affecting a handful of characters in a few cases, some repaired, sporadic light dampstains; else a very good set, stitched in the original blue paper wrappers, printed paper label to front cover of each volume; minor worming and wear to covers; tail-edges lettered with title in manuscript, red ownership seals to title of vol. I and final leaves of each volume. **£1250**

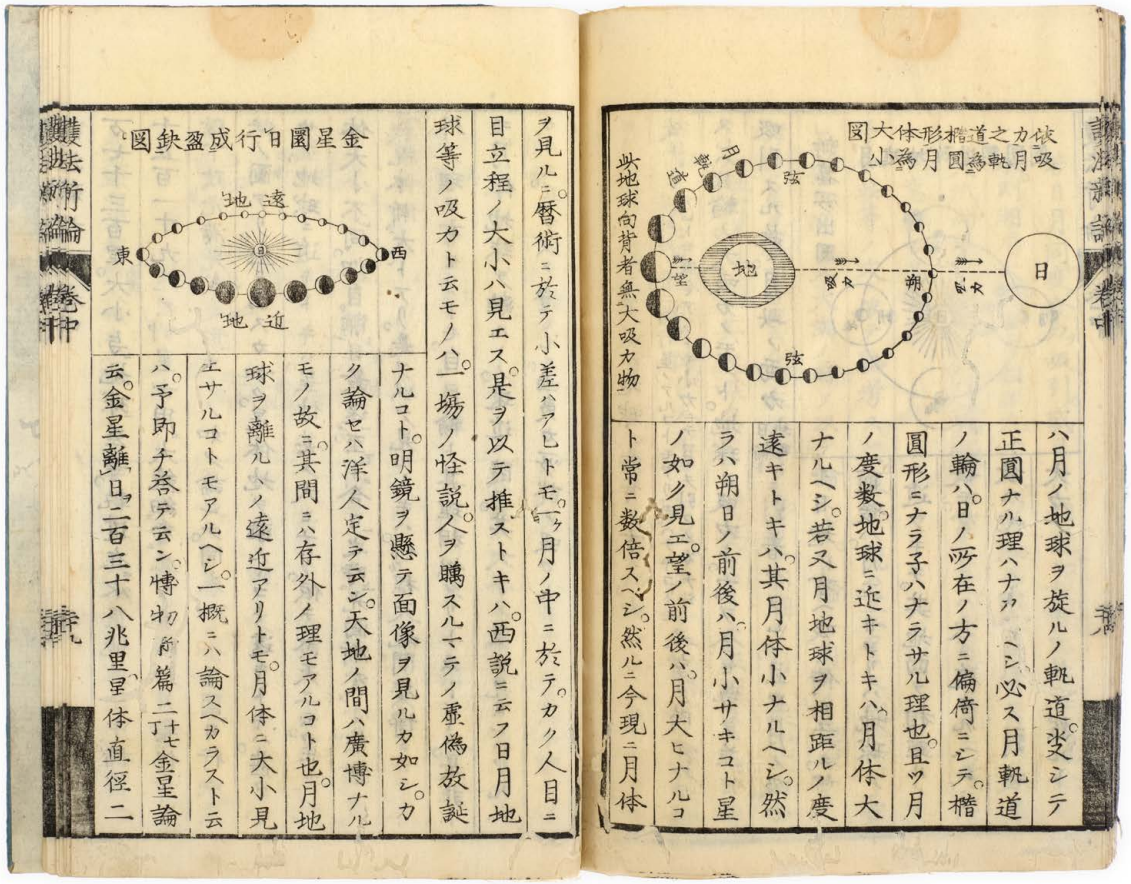
First edition, very rare, of this illustrated attack on Western cosmology in favour of Buddhist astronomy published in pre-Meiji Japan.

The author Kamuro (1819–1901) – a member of the *bonreki* school of Japanese Buddhist cosmology, writing here as Shōkoku Dōjin – begins his polemic by declaring that 'the greatest threat in the world today to laws and to the Buddha's teachings are the astronomical theories of the Western barbarians' (*trans*.). His treatise aims to refute these theories and defend the traditional cosmological teachings of Buddhist India.

Of particular interest is his 'rather unusual' first volume, on optics: 'Instead of the scholastic arguments and scriptural citations of earlier defenses of Buddhist cosmology, Kamuro opens with what looks like a primer on modern physics. He explains, though the use of simplified illustrations, the nature of optical phenomena in order to argue that the distortions produced by the refraction of light reveal the limitations and flaws of human vision. … [He] attempts to show how the "small matters of human vision" are flawed, limited, and ultimately unreal. **Turning the empirical facts of ocular perception against themselves, Kamuro mobilizes the visual vocabulary of Western science for the purposes of its own undoing'** (Moerman, p. 354). **Aiding his argument is a series of more than sixty woodcut illustrations and diagrams borrowed, curiously, from a Western work** – Benjamin Hobson's *Natural Philosophy*, published at Canton in 1855 and in Japan in 1864: 'The technical and visual vocabulary of scientific explanation, the laws of physics, and the empiricism of the experimental method are here turned against themselves' (*ibid*., p. 357).

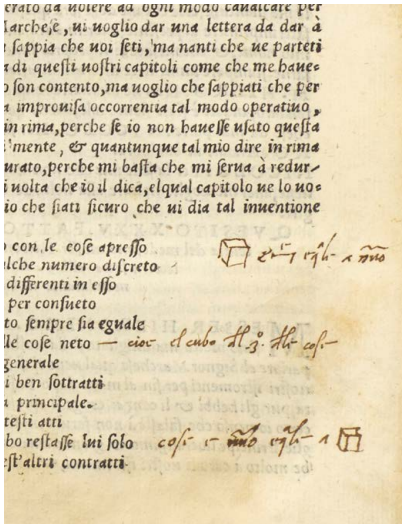
Very rare: OCLC and Library Hub find only two copies outside Japan (CUL, Stanford).

See Moerman, 'The Epistemology of Vision: Buddhist *versus* Jesuit Cosmology in early modern Japan' in Curvelo and Cattaneo eds, *Interactions between Rivals: the Christian Mission and Buddhist Sects in Japan (c.1549–c.1647)*.




QVESITI, ET INVENTIONI DI-
VERSE DE NICOLO TARTALEA
BRISCIANO.

Con gratia, & priuilegio dal Illustrissimo Senato Veneto, che niuno ardisca ne presuma, di stampare le presente opere, ne stampate altrone vendere ne far vendere in Venetia, ne in alcuno altro luoco, o terre del Dominio Veneto, per anni diece sotto pena de ducati trecento, & perdere le opere, el terzo delle quel pena immediate che sie denontiate, si applica al Arsenale, & un terzo sia del magistrato, ouer rettore del luoco done se fare la sfecutione, & laltro terzo sara del denuntiante, ouer accusatore, & sara tenuto secreto, come nel priuilegio appare.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larche, se, ui uoglio dar una lettera da dar à
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son contento, ma uoglio che sappiati che per
impromisa occorrentia tal modo operatiuo,
in rima, perche se io non hauesse usato questa
mente, & quantunque tal mio dire in rima
urato, perche mi basta che mi serua à redur-
uolta che io il dica, el qual capitolo ue lo uo-
io che siati sicuro che ui dia tal inuentione

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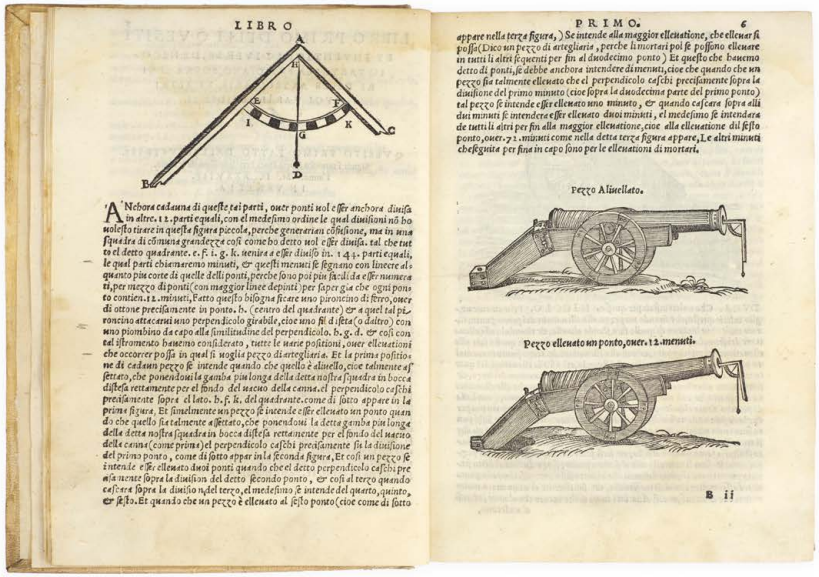
testi atti
bo restasse lui solo
st'altri contratti


LIBRO

PRIMO. 6

Pezzo Alisciellato.

Pezzo ellenato un ponto, ouer. 12. minuti.

B ii

With Annotations on Artillery and Algebra

40. TARTAGLIA, Niccolò Fontana. Quesiti, et inventioni diverse. [(*Colophon:*) *Venice, Venturino Ruffinelli 'ad instantia et requisitione, & a proprie spese de Nicolo Tartalea Brisciano Autire', July 1546.*]

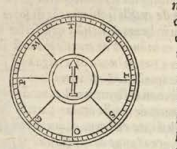
4to, ff. 132, [2, contents], without folding plate as usual; large woodcut portrait of Tartaglia to title-page with the motto 'Le inventioni sono difficili ma lo aggiungervi è facile', woodcut historiated initials, over 60 woodcut in-text diagrams and illustrations; very light marginal dampstaining to first and last leaves, occasional slight foxing, small closed marginal paperflaw to title-page neatly repaired verso, a single marginal annotation on f. 124 excised, but a very good copy; recased in old vellum, rebacked; small chip at foot of spine; contemporary annotations in Italian in light brown ink to *c.* 44 pp. with small marginal drawings including a cannon and a book, errata corrected in manuscript. **£6750**

First edition, annotated throughout by a contemporary reader, of Tartaglia's highly influential work on ballistics and algebra, containing his polemical rule for solving cubic equations.

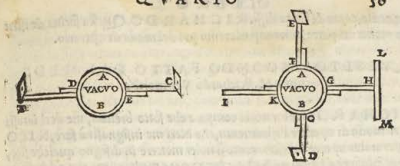
Brescian mathematician Niccolò Tartaglia (or Tartalea, 1499/1500–1557) taught mathematics at Verona in 1521 and in Venice in 1534, publishing the first Italian translations of Euclid and Archimedes and originating the science of ballistics in his 1537 *Nova scientia*. Divided into nine books, the present work is dedicated to Henry VIII, whose interest in the study of warfare had been indicated to Tartaglia by Richard Wentworth, the king's envoy in Venice. Wentworth is one of the many interlocutors in Tartaglia's 171 *quesiti*, dialogues in which the author discusses the merits of cannonballs made from lead, iron, and stone, saltpetre and the creation of gunpowder, methods of fortification, arithmetic, geometry, and algebra.

ne apre la uia à potere inuestigare infiniti altri capitoli, & sel non fusse che al presente io son occupato nella tradutione di Euclide, in uolgare (& per fin à questa hora l'ho tradutto per fin al suo terzodecimo libro) à molti altri capitoli haueria gia trouato regola generale, ma spedito che habbia questa mia fatica di Euclide gia principiata ho designato di componere una opera di pratica, & insieme con quella, una nouà Algebra nella qualle non solamente ho deliberato di publicare ad ogni huomo tutte le dette mie inuentioni de capitoli noui, ma molti altri che spero de ritrouare, & anchora uoglio mostrare la regola di poterne inuestigarne infiniti altri qual spero che la sara una cosa utile, & bella, & questa e la causa che me li fa negar ad ogniuno, perche io al presente non ui pongo alcuna cura sopra di loro (per

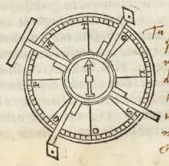
dere esser diuisa pur in le dette. 360. parti equali, cioe in. 360. gradi, & pero nel computar le sotto scritte. 72. diuisioni, per cadauna di quelle, ui se computa. 5 gradi perche. 5. fia. 72. uien à fare li detti. 360. gradi, & dapoi che se hauran fatte tutte queste cose, ouer diuisioni, ui se debbe far assaldare una armilla della medesima sorte di banda di ottone, ouer di rame à torno al centro, cioe uno cerchio della detta bãda larga al men dui dedi, qual uenghi affare à modo di una scatolina à torno al detto centro della detta prima, lamina circolare talmente che sia concentrica con quella, & nel centro poi ui se de far assettar una ponta alta circa per la mita della detta scattolina, è questa ponta è p meterui suso la lanzetta acontia con la calamita, alla similitudine di quelle che hãno quelli horologietti che nẽgono da alamagna, ma alquãto piu grãda, & nel fondo di questa scattola ui se de segnar una linea quasi alla similitudine della lanzetta che uà da la tramontana uerso Ostro retamente, accio che si possa conoscere quando che el bossolo sia ben assettato (perche el bossolo se intende esser ben assettato, quando che la ponta della detta lanzetta,



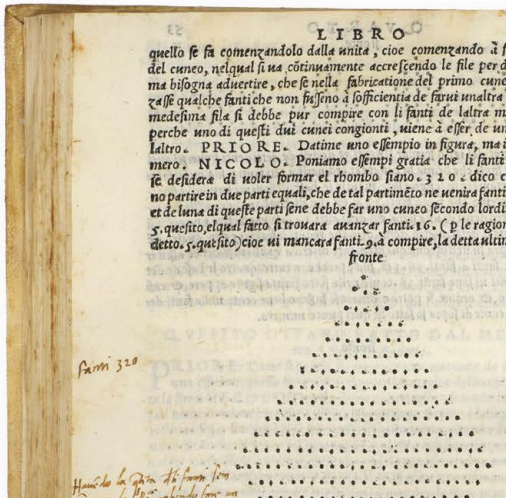
guarda rettamente uerso la Tramontana (si come nella figura appare) la qual cosa facilmente si conosce per mezzo della detta linea, cioe come se fa precise con li sopradetti horologietti quando se uol saper quante hore sono, & fatto questo ue se de poner la detta lanzetta acconcia (come detto) con la calamita, & dipoi si fa uno coperchio alla detta scattolina de uitrio chiaro come se costuma alli bossoli da nauicare accio si possa uedere el star, & landar della detta lanzetta, & doppo questo ui se de metter una dioptra, ouer trasguardo, la qual dioptra ouer trasguardo solea costumarsi alla similitudine della prima figura a.b. con quelli dui brazzi. c.d. et. e.f. el qual modo per mettere in disegno un paese era sufficiente assai, ma per mettere in disegno la pianta de una Citta era alquanto discomodo, onde p farlo piu accomodo, & generale ui se costuma à ponerui un altro trasuerso in croce, perfettamente à squadra, essempi gratia à quella armilla uacua. a.b. ui se assalda prima nelli dui brazzi. c.d. et. e.f. della principal dioptra, ouer trasguardo, con quelle due lamette in alto elleuate nel le istremita di quella, con un busetino in cadauna da trasguardare, per quelli le cose che acadera, abenche anchor due pontine acute seruiano si come quelli dui busttini, & forsi meglio, & dapoi ui se salda anchora quelli altri dui brazeti. g.h et. ik. perfettamente in croce, cio perfettamente à squara sopra la principal dioptra, & nel capo de lun de questi secondi brazzi ui si assetta, ouer sal da quel altro brazzetto. l m. pur à squadra come nella seconda figura appare, & la forma di quale si uoglia delle due sottoscritte sorte de dioptre uol essere



talmente fabricata che la detta armilla. a.b. sia di tal grandezza che ui possa intrare fazzatamente quellaltra armilla, ouer scatolina del sopra scritto nostro istromẽto, et che quelli dui, ouer quatro brazzi, cioe. c.d. e.f. h g. et. i k. siano talmente fabricati che da luna, & laltra banda dimostrino giustamente li gradi sopra la prima lamina circulare gia signati, et li dui principali, cioe. c d. et. e f. uoleno esser di tanta longhezza che da luna & laltra banda uscischano alquanto fora del cerchio della nostra prima lamina circulare, & nella istremita de lun e laltro de questi dui brazzi ui se salda le sopradette due lamette, ouer figure quadrangole in alto elleuate di tal altezza che sopra auanzano la altezza della scatolina del nostro bossolo, et talmente larghe che fazzãdoli uno busetino in mezzo di cadauna di quelle, cioe in quella parte che superchia di sopra deldetto bossolo, uno rettamente opposito à laltro, talmente che trasguardando per li detti dui busetini la nostra linea usuale transisca precisamente sopra al centro del cerchio del detto nostro istromento, & dapoi tal dioptra si debbe con diligẽtia incassare sopra al detto nostro bossolo, cioe sopra à quella armilla ouer scatolina che interchiude il detto bussolo, ilche facendo il detto nostro istromento stara precisamente come di sotto appare in figura, & la dioptra, ouer trasguardo, sara girabile, cioe che la se potra girare per ogni uerso a torno à torno, & per quelli dui busettini che saranno in quelle due lamette quadrãgole in alto elleuate, se potra trasguardar con uno occhio li segni, & termini che si uora uedere, come per lauenire p essempio se mostrara, uero è che in luogo de quelli dui busettini à mi me piace, et me pare anchora piu spediẽte, due



quello se fa comenzandolo dalla unita, cioe comenzando à far la ponta del cuneo, nelqual si ua cõtinuamente accrescendo le file per dui fanti piu, ma bisogna aduertire, che se nella fabricatione del primo cuneo ui auanzasse qualche fanti che non fussino à sofficientia de farui unaltra fila, quella medesima fila si debbe pur compire con li fanti de laltra mita de fanti perche uno di questi dui cunei congionti, uiene à esser de una fila piu de laltro. PRIORE. Datime uno essempio in figura, ma in picol numero. NICOLO. Poniamo essempi gratia che li fanti con li quali se desidera di uoler formar el rhombo siano. 320. dico che si debbono partire in due parti equali, che de tal partimẽto ne uenira fanti. 160. p parte et de luna di queste parti sene debbe far uno cuneo secondo lordine datto nel 5. quesito, el qual fatto si trouara auanzar fanti. 16. (p le ragioni adutte nel detto. 5. quesito) cioe ui mancara fanti. 9. à compire, la detta ultima fila de tal fronte



primo rhombo, hor dico che tal fila si debbe compire con li fanti de laltra mita, cioe pigliarne quelli fanti. 9. che ui manca, che nel detto primo rhombo uenira à esser fanti. 169. et nella altra pte uenira à restare solamẽte fanti. 151. con liquali formandone laltro rhombo, sopra la ultima fila del primo, laqual ultima fila sara de fanti. 25. onde bisognara sopra di quella assettarne unaltra fila de dui fanti mãco, cioe de fanti. 23. et di sopra à quella de detti fanti. 23 assettarune una altra de fanti. 21. et sopra à quella de fanti. 21. una altra de fanti. 19. et sopra à quella de fanti. 19 unaltra de fanti. 17. & cosi andar procedãdo sempre con dui fanti manco, per fina à tanto che se peruinira alla fila dunfante, solo, come di sopra appar in figura, nero è che si trouara in ultimo auanzar fanti. 7. liquali il facente sargente li assettara secondo il suo parere, & come si con tal modo & ordine se potra redure in una simel ordinanza ogni grande de essercito, & potrano uoltarse, & caminar facendo de spalle fronte, & similmẽte de qual si uoglia fianco. PRIORE. Io ue ho inteso ottimamẽte, & ebel sia el uero, uoi uoleti primamente che se aduertisca, come ebel primo cuneo uien à esser di una fila di fanti de piu del secondo, e pero essendo diuiso lo essercito in due parti equali, & ponendo poi quelli fanti. 169. che auanzano nella formation del primo cuneo, insieme con quelli fanti. 160. de laltra mita fariano poi fanti. 329. delliquali uolendone poi formar laltro cuneo sopra la ultima fila del detto primo cuneo laquale saria solamente de fanti. 23. & cominciando poi el secondo cuneo de fanti. 21. (cioe per dui fanti manco) & cosi andar procedendo (per doi fanti meno) per fin al compimento di questo secondo cuneo, ne uenira auanzar fanti. 55. & noi per far auanzar men fanti uoleti che quella ultima fila (imperfetta) del primo cuneo quala è solamẽte di fanti. 19. che la se compisca delli fanti dellaltre mita (cioe pigliando quelli fanti. 9. che ui manca) el che facendo, & procedendo poi come di sopra fu detto, in ultima ui uenira auanzar solamente fanti. 7. come di sopra fu detto, & dapoi sotto giongeti qualmente questa figura rhombica, ha quella potesta che se ritrouna nelle ordinanze quadre di gente, ouer di terreno, cioe ebella è atta à uoltarse & far de spalle fronte, & caminar etiam per quel uerso, & similmente è atta à far de qual si uoglia fianco, testa, uero è che ui occorre in tai uersi a douer restringer per un uerso, & allargarse per unaltro, come medemamente, occorre anchora nelle dette ordinanze quadre di gente, ouer di terreno. NICOLO. Non altro che questo uolemo inferire. PRIORE. Adunque ue ho inteso, e pero al presente non uoglio che procedamo piu oltra per questa sera.

QVESITO DECIMO FATTO DAL MEDEMO. S. Prior di Barletta.

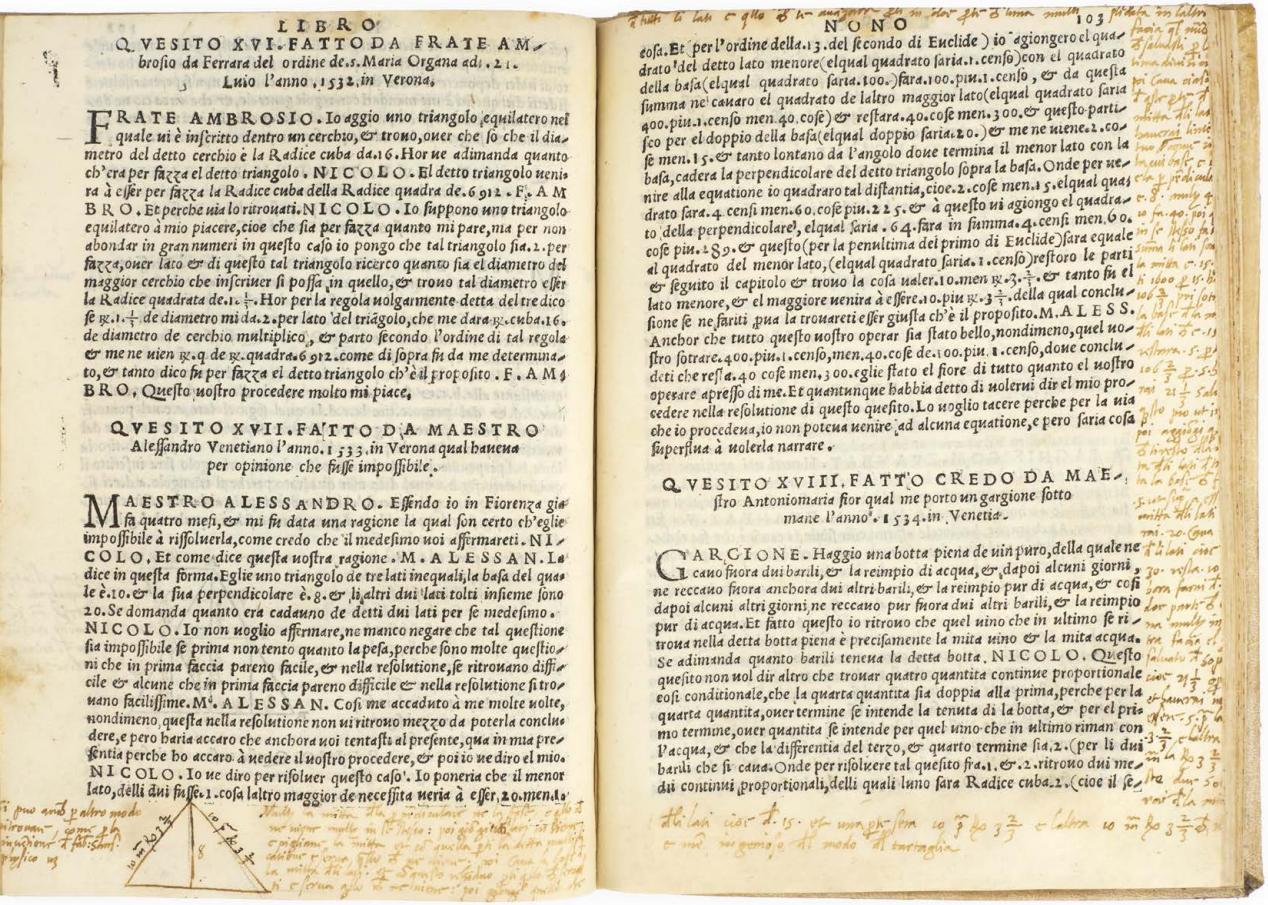
PRIORE. Come se potria ordinare una quãtita de fanti, ouer uno essercito in una battaglia cornata che fusse atta à potere caminare in tal ordine contra alli nemici, & chi fusse anchora atta occorrendo il bisogno à poter

cortina. Li parapetti de detti cauallieri se fanno di grossezza de pie. Et cosi con tal ordine, e misura se fanno quasi tutti li cauallieri ouer piatte. El fosso poi nel fondo si fa di larghezza passa. 14. & in boca. 16 & di altezza passa. 4. & cosi con tal ordine, & misura si fa cõtente tutte le fosse. La contramina poi se fa di larghezza piedi. 3 ½. & za piedi. 7. & ha li suoi soratori & ui si fanno anchora due porte p fanti, & questa contramina li fanno sotto terra, per non indebelir il Et cosi con tal ordine, e misura se procede generalmente quasi in tutmoderne fortificationi. NICOLO. Quanti pezzi di artegliaria si à mettere per ogni baluardo. PRIORE. Nella prima piazza ue se ne mette dui pezzi, per banda & questi tali ui se pongono sole per guardia delle cortine. Et simelmente nella piazza di sopra ui se

Fosso

Contramina

Quanti pezzi



LIBRO

QVESITO XVI. FATTO DA FRATE AMbrosio da Ferrara del ordine de.s.Maria Organa adi.21. Luio l'anno.1532.in Verona.

FRATE AMBROSIO. Io aggio uno triangolo equilatero nel quale ui è inscritto dentro un cerchio, & trouo, ouer che so che il diametro del detto cerchio è la Radice cuba da.16. Hor ne adimanda quanto ch'era per fazza el detto triangolo. NICOLO. El detto triangolo uenira à esser per fazza la Radice cuba della Radice quadra de.6912. F. AMBRO. Et perche nia lo ritrouati. NICOLO. Io suppono uno triangolo equilatero à mio piacere, cioe che sia per fazza quanto mi pare, ma per non abondar in gran numeri in questo caso io pongo che tal triangolo sia.2. per fazza, ouer lato & di questo tal triangolo ricerco quanto sia el diametro del maggior cerchio che inscriuer si possa in quello, & trouo tal diametro esser la Radice quadrata de.1.½. Hor per la regola volgarmente detta del tre dico se g.1.½. de diametro mi da.2. per lato del triagolo, che me dara g.cuba.16. de diametro de cerchio multiplico, & parto secondo l'ordine di tal regola & me ne uien g.q de g.quadra.6912. come di sopra fu da me determinato, & tanto dico fu per fazza el detto triangolo ch'è il proposito. F. AMBRO. Questo uostro procedere molto mi piace.

QVESITO XVII. FATTO DA MAESTRO Alessandro Venetiano l'anno.1533.in Verona qual haueua per opinione che fusse impossibile.

MAESTRO ALESSANDRO. Essendo io in Fiorenza gia fa quatro mesi, & mi fu data una ragione la qual son certo ch'eglie impossibile à rissoluerla, come credo che il medesimo uoi affermareti. NICOLO. Et come dice questa uostra ragione. M. ALESSAN. Le dice in questa forma. Eglie uno triangolo de tre lati inequali, la basa del quale è.10. & la sua perpendicolare è.8. & li altri dui lati tolti insieme sono 20. Se domanda quanto era cadauno de detti dui lati per se medesimo. NICOLO. Io non uoglio affermare, ne manco negare che tal questione sia impossibile se prima non tento quanto la pesa, perche sono molte questioni che in prima faccia pareno facile, & nella resolutione, se ritrouano difficile & alcune che in prima faccia pareno difficile & nella resolutione si trouano facilissime. M. ALESSAN. Cosi me accaduto à me molte uolte, nondimeno questa nella resolutione non ui ritrouo mezzo da poterla concludere, e pero baria accaro che anchora uoi tentasti al presente, qua in mia presentia perche ho accaro à uedere il uostro procedere, & poi io ne diro el mio. NICOLO. Io ne diro per risoluer questo caso'. Io poneria che il menor lato, delli dui fusse.1. cosa laltro maggior de necessita uenia à esser.20. men.1.

NONO 103

cosa. Et per l'ordine della.13. del secondo di Euclide) io agiongero el quadrato del detto lato menore (elqual quadrato saria.1.censo) con el quadrato della basa (elqual quadrato saria.100.) fara.100. piu.1.censo, & da questa summa ne canaro el quadrato de laltro maggior lato (elqual quadrato saria 400. piu.1.censo men.40. cose) & restara.40. cose men.300. & questo partisco per el doppio della basa (elqual doppio saria.20.) & me ne uiene.2. cose men.15. & tanto lontano da l'angolo done termina il menor lato con la basa, cadera la perpendicolare del detto triangolo sopra la basa. Onde per uenire alla equatione io quadraro tal distantia, cioe.2. cose men.15. elqual quadrato sara.4. censi men.60. cose piu.225. & à questo ui agiongo el quadrato della perpendicolare, elqual saria.64. fara in summa.4. censi men.60. cose piu.289. & questo (per la penultima del primo di Euclide) sara equale al quadrato del menor lato, (elqual quadrato saria.1.censo) restoro le parti & seguito il capitolo & trouo la cosa ualer.10. men g.3.½. & tanto fu el lato menore, & el maggiore uenira à essere.10. piu g.3.½. della qual conclusione se ne fariti pua la trouareti el esser giusta ch'è il proposito. M. ALESS. Anchor che tutto questo uostro operar sia stato bello, nondimeno, quel uostro sotrare.400. piu.1.censo, men.40. cose de.100. piu.1.censo, done concludeti che resta.40 cose men.300. eglie stato el fiore di tutto quanto el uostro opesare apresso di me. Et quantunque habbia detto di uolerui dir el mio procedere nella resolutione di questo quesito. Lo uoglio tacere perche per la uia che io procedena, io non poteua uenire ad alcuna equatione, e pero saria cosa superflua à uolerla narrare.

QVESITO XVIII. FATTO CREDO DA MAEstro Antoniomaria fior qual me porto un gargione sotto mane l'anno.1534.in Venetia.

GARGIONE. Haggio una botta piena de uin puro, della quale ne cauo fuora dui barili, & la reimpio di acqua, & dapoi alcuni giorni, ne reccauo fuora anchora dui altri barili, & la reimpio pur di acqua, & cosi dapoi alcuni altri giorni, ne reccauo pur fuora dui altri barili, & la reimpio pur di acqua. Et fatto questo io ritrouo che quel uino che in ultimo se ritroua nella detta botta piena è precisamente la mita uino & la mita acqua. Se adimanda quanto barili teneua la detta botta. NICOLO. Questo quesito non uol dir altro che trouar quatro quantita continue proportionale eosi conditionale, che la quarta quantita sia doppia alla prima, perche per la quarta quantita, ouer termine se intende la tenuta di la botta, & per el primo termine, ouer quantita se intende per quel uino che in ultimo riman con l'acqua, & che la differentia del terzo, & quarto termine sia.2. (per li dui barili che si cana. Onde per risoluere tal quesito fra.1. & .2. ritrouo dui medii continui proportionali, delli quali luno sara Radice cuba.2. (cioe il se-

'The most important mathematical subject with which Tartaglia's name is linked is the solution of third-degree equations. The rule for solving them had been obtained by Scipione Ferro in the first or second decade of the sixteenth century but was not published at the time. It was rediscovered by Tartaglia in 1535, on the occasion of a mathematical contest with Antonio Maria Fiore … On 25 March 1539, Tartaglia told Girolamo Cardano about it at the latter's house in Milan. Although Cardano had persistently requested the rule and swore not to divulge it, he included it in his *Ars magna* (1545)' (*DSB*). Tartaglia retaliated by publishing their correspondence within his *quesiti*, including Cardano's solemn vows not to publish on cubic equations until Tartaglia did.

Our copy, containing the often-lacking table of contents, has been annotated in a single hand: this early reader takes particular interest in the manufacture of explosives and fortification, numbering the steps for making gunpowder and noting the names of key ingredients. **Most copiously annotated, however, is the ninth and final book**, in which the annotator, *inter alia*, visualises and checks Tartaglia's equations through diagrams and calculations and provides an alternative method to the author's 'ingenioso modo' of finding the side lengths of a scalene triangle.

BM STC Italian, p. 658; Adams T 183; Cockle, Foreign 660; Marini, pp. 11–12; Norman II 2054; Riccardi II I:11; Wellcome I 6225. See DSB XIII, pp. 258–262.

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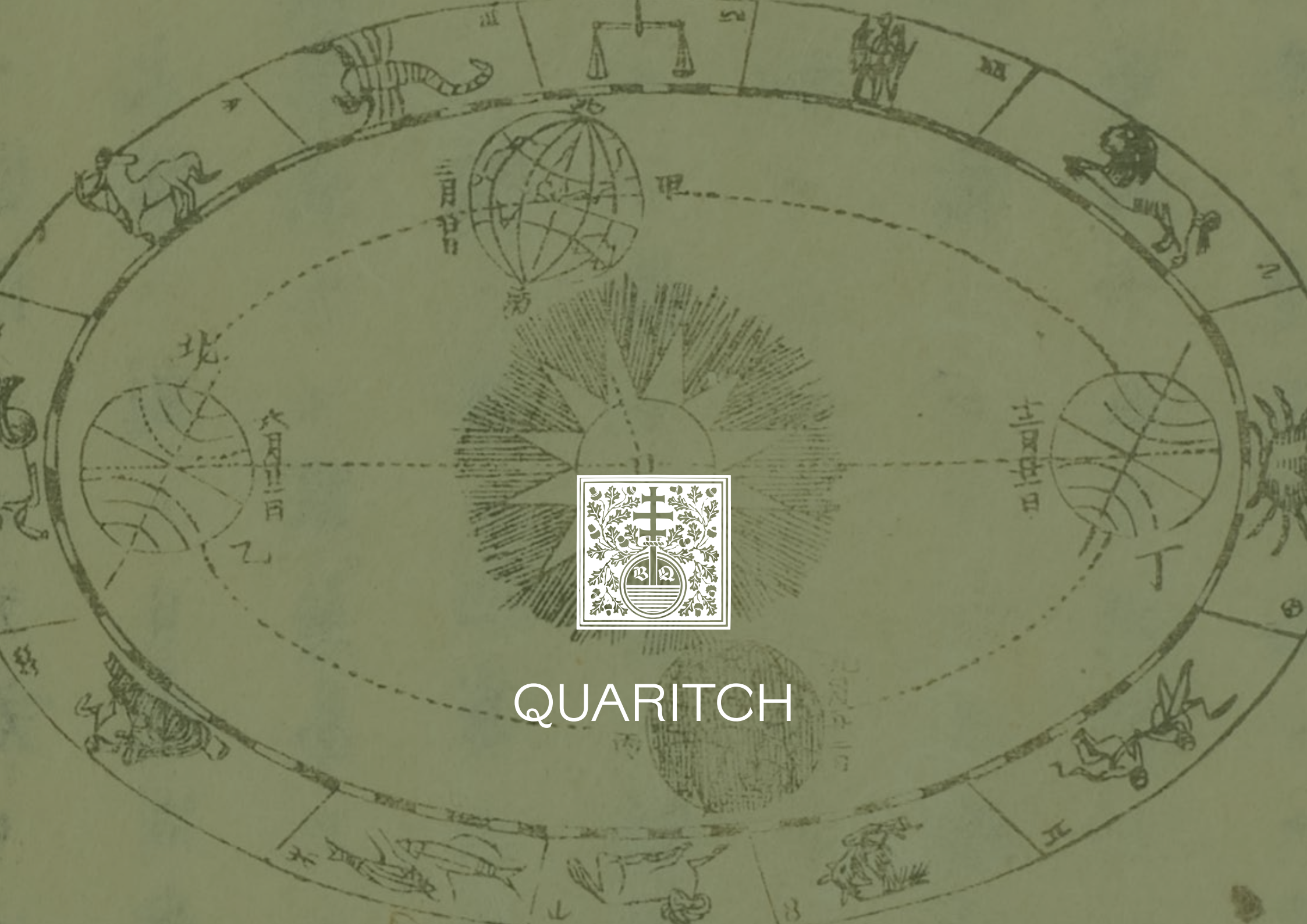

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