Gadesby, Richard

A treatise of decimal arithmetic; or, decimals applied to the common rules of arithmetic; the computation and arbitration of exchange; interest, simple and compound; annuities for years certain; also on lives. With the doctrine of circulating or repeating decimals.

Year: 1757
Place: London
Publisher: A. Millar
Edition: 1st
Language: English
Binding: contemporary leather; red leather label
Pagination: pp. xii, 266
Collation: A/a–2L–2M
Size: 209x127 mm

Gadesby is described, on the title page, as being a writing master and accountant.

This decimal arithmetic is designed for the businessman. The preface states that while there are very good decimal arithmetics available for mensuration and gauging, only a few have been devoted to the problems of trade. After an explanation of decimal arithmetic, the work consists of examples drawn mainly from such things as foreign exchange and rates of interest. An interesting comment on the times can be found in the introduction to several sections of foreign exchange. In dealing with exchanges from London to Dublin, he indicates:

Accounts are kept here in Pounds, Shillings and Pence, Irish money, which is imaginary.

In the section to do with America, he indicates:

… they have very few coins of any sort circulating among them, so that they are obliged to give Notes of Hand, (which they call Paper Money) for very small Sums, and the Paper Money being subject to many Casualties, it causes a great Undervaluation of their Currency, it being sometimes at 6, 7, or 800 per Cent. Discount for Sterling. (or for good Silver or Gold.)

Illustrations available:
Title page
Peter Apian was a renowned mathematician and instrument maker. His son, Phillip, who was also a mathematician, had a promising student, Georg Galgemair. Galgemair eventually published a number of works on mathematical instruments. One of Galgemair’s first efforts was to reprint this description of Peter Apian’s universal instrument (first published by Phillip Apian in his 1580 work, Astrolabii).

The instrument, which is useful for various kinds of astronomical sightings, is very similar to one that appears as a volvelle in 1564 edition of Peter Apian’s Cosmographia. A large folding diagram of the instrument is included in this issue, printed on the back of sheets of paper that the printer evidently had left over from another book.

Illustrations available:
- Title page
- Reduction compass instrument
- Colophon

This work is bound separately, but it is really part of a two-volume set, the other being Galgemair’s Pet. Apiani organon catholicum, 1626. The work is posthumous, and Daniel Schwenter, who wrote the preface, presumably saw the publication through the press.

This volume deals with a precursor to the sector and proportional compass that, today, is known as a reduction compass (see entry for DeNory, L’usage dt practique du compas a huict pointes, 1588). By the time this work was published, the reduction compass had become a curiosity rather than a commonly used device, but Schwenter is known for describing curious devices in his publications. Galgemair provides nearly one hundred examples of the use of the instrument. He starts with basic geometry problems and progresses to the more practical—such as the one that calculates how much gold foil is needed to cover a round roof at the top of a tower.
Galgemair, Georg (1495–1552)
See entries for Galgemair, Georg in the Addenda.

See Brentel, Georg: Fundament der proportional-circkel Georgii Galgemairs, 1610.


See Remmelin, Johann; Organon logikon ...
Kurzer gründlicher warhaffter gebesserter unnd vermehrter Unterricht, zuberaitung und gebrauch, Dess Circels Schregmess, und Linial in wahrer proportion schöne Mathematische Kunststück, durch ung, 1655.

See Remmelin, Johann; Οργανον λογικον,
(Organon logikon) Herren Georgii Galgemayrs, Kurzer gründlicher warhaffter gebesserter und vermehrter Unterricht, zuberaiting und gebrauch, Dess Circels schregmess, und linial in wahrer proportion, 1654, 1655.

Galilei, Galileo (1564–1642) - [Matthias Bernegger (1582–1640), translator]

Dialogus de systemate mundi. [engraved title page]. [printed title page:] Systema cosmicum ... In quo quatuor dialogis, de duobus maximis mundi systematibus, Ptolemaico & Copernicano, utriusq; rationibus philosophicis naturalibus indefinite propositis disseritur. ex Italica lingua Latine conversum. Accessit appendix gemina, qua SS. scripturae dicta cum terræ mobilitate conciliantur.

b/w: Galilei, Galileo (Matthias Bernegger, translator); Tractatus de proportionum instrumento, quod merito compendium universæ geometriæ dixeris...

Year: 1635
Place: Strasbourg
Publisher: Augustae Treboc, Impensis Elzeviriorum, typis Davidis Hautti
Edition: 1st (Latin)
Language: Latin
Figures: engraved frontispiece; engraved portrait
Binding: contemporary vellum

Galileo Galilei, often referred to as Galileo, was the eldest of seven children. He was first privately tutored in Pisa but when the family moved to Florence, he attended school at the famous monastery of Santa Maria at Vallombrose. In 1581, he enrolled as a medical student at the University of Pisa. There he took mathematics instruction privately, and he soon abandoned medicine. One of his private tutors was Ostilio Ricci, who had earlier been a pupil of Tartaglia, which might help explain Galileo's early interest in military uses of mathematics (see Tartaglia, Nicolo; La nova scienta inventa, 1537). For four years Galileo gave private lessons and public lectures until, in 1589 he was appointed to the chair of mathematics in Pisa. Galileo’s father died in 1591, and because the salary at Pisa was not sufficient, Galileo left to take up the chair of mathematics in Padua.

Bernegger translated a number of works of Galileo as well as authoring his own publications.

This is the famous work in which Galileo, via a discussion among three individuals (one supporting Copernicus, one supporting Ptolemy and Aristotle, and the third an educated layman who is being wooed by the other two), describes the new Copernican system. Galileo elected to use this form in an effort to avoid being charged with violating the Church’s anti-Copernican edict of 1616. He carefully notes his agreement with the edict in the
preface. The engraved title page shows the conversation in progress between Aristotle, Ptolemy and Copernicus.

Illustrations available:
- Title page (engraved)
- Title page (typeset)
- Portrait of Galileo

**Galilei, Galileo**

*Difesa di Galileo Galilei ... Contro alle calunie & imposture di Baldessar Capra Milanesi, usatagli si nella considerazione astronomica sopra la nuova stella del MDCIII. Come (& assai più) nel publicare nuovamente come sua invenzione la fabrica, & gli usi del compasso geometrico, & militare, sotto il titolo di usus & fabrica circini cuiusdam proportionis, &c.*

- Year: 1607
- Place: Venice
- Publisher: Tomaso Baglioni
- Edition: 1st
- Language: Italian
- Binding: contemporary vellum
- Pagination: ff. 41, [2]
- Collation: A–K
- Size: 170x240 mm
- Reference: Drake *GMC*, p. 34

See also entry for **Capra, Baldassar; Usus et fabrica circuinii cuiusdam proportionis**, 1607.

Galileo and Capra are linked not only by their disputes over the sector, but also by a dispute regarding the nova of 1604 (Kepler’s nova). Capra had ridiculed Galileo’s statements about the nova being extremely distant because no parallax had been detected. Capra cited orthodox astronomy, which held that, in the realm of the fixed stars, change never took place; thus the nova had to be close to the earth. Uncharacteristically, Galileo did nothing about Capra’s charges until Capra’s plagiarism of Galileo’s sector.

Galileo obtained testimonials from prominent Venetians and then presented his case to the Riformatori, officials appointed to oversee the university and resolve such disputes. This book is both a refutation of Capra’s plagiarism and of his charges concerning the nova. When the Riformatori found for Galileo and ordered Capra expelled from the university, Galileo decided that he would publish this account to let the public know the outcome—he was particularly interested in the wider world being made aware of the result because Simon Mayr (who was Capra’s teacher and supporter) had already returned to his native Germany and was thus unreachable by the Riformatori. It is interesting that Galileo chose to put the defense of his astronomical ideas first. This was a direct challenge to the orthodoxy of the time and, of course, would eventually result in his being persecuted by the church authorities—a dispute, unlike this one with Capra, he would not easily win.
This copy is particularly interesting because it is inscribed by Galileo to Girolamo Cappello, one of the three Riformatori who ruled, on May 4 of 1607, in his favor. In October of 1607, Cappello took a new post in one of the Venetian colonies, and Galileo apparently presented him with this copy in appreciation of his support.

The book also contains a handwritten note in Italian on the verso of the first blank leaf, a translation of which is:

This edition was found with some difficulty. It is the first of the present pamphlets of Galileo. This copy is particularly prized because it contains the handwriting of the author addressed to the learned gentleman Cappello to whom he sent it as a gift. Amadeo Svajer, in whose library this belonged, was the younger brother of a rich Flemish merchant who had established himself at Venice where he was in commerce. With the monthly wages he received from this brother he formed a large library which very much annoyed the older brother who had no interest in books.

Illustrations available:
- Title page with dedication
- Italian note
- Judgment signed by the Riformatori (including Cappello)
- Colophon

Illustrations available:
- None
The second edition of this famous work. This was originally published as part of the second edition of the works of Capra (see Capra, Usus et fabrica, 1655) but here has been removed and bound separately, a situation that accounts for the strange pagination.

Illustrations available:
Title page

G 8
Galilei, Galileo (1564–1642)

Discorsi e Dimostrazione matematiche, intorno à due nuove scienze Attenenti alla mechanica & i movimenti locali.

Year: 1638
Place: Leiden
Publisher: Elsevier
Edition: 1st
Language: Italian
Binding: later half-leather over marbled boards; gilt spine
Pagination: pp. [8], 264, 285–292, 273–314 (misnumbered 282 as 382, 283 as 383, 302 as 300, 305 as 297, 308 as 300, 309 as 301, 312 as 304, 313 as 305, 314 as 306), [6]
Collation: *A–2R*
Size: 192x145 mm
Reference: Cin BG, #102, p. 208; Horb 100, #36

In 1636, when Galileo completed work on the manuscript for this publication, he was under arrest at his home in Arcetri, his books had been banned by the Inquisition, his daughter had recently died and he was losing his eyesight. Despite these many difficulties, Galileo managed to create this monumental work known today as the Discorsi. (Discourses and Mathematical Demonstrations Concerning Two New Sciences). It is generally considered to have laid the foundation for the field of modern physics, and it is his greatest scientific publication.

Because his writings were on the Index of prohibited works, Galileo gave the completed manuscript to the Comte de Noailles, the French ambassador to Italy (to whom the work is dedicated), with the request that it be delivered to the publishing house of Elsevier in Leiden. De Noailles complied with Galileo’s wishes by having the manuscript smuggled into France and from there into the Netherlands, where, as Galileo had requested, it was published.

The Discorsi is written as a dialogue between individuals in a form similar to his earlier Dialogo. In it, Galileo demonstrates the value and importance of applying both experimental and mathematical methods to problems in mechanics. It consists of two major parts covering
strength of materials and projectile motion. The dialogues themselves stretch over four days. The first two days are dedicated to the study of the conditions of equilibrium of forces and to the principle of action and reaction. The third day is devoted to uniform and accelerated motion and the free fall of objects. On the fourth day, Galileo considers the pendulum and the motion of projectiles. He postulates that the movement of the latter follows the shape of a parabola. He also includes the first artillery table for firing a cannon at various inclinations of the barrel.

Isaac Newton credited this work with suggesting to him his first two laws of motion.

Illustrations available:
- Title page
- Material illustrations (3)

This two-volume work contains the collected publications of Galileo. It is often referred to as the Dozza edition of Galileo’s work from the name of the publisher. Besides his published work, it contains several unpublished items (letters, experimental write-ups, etc.) that were provided by Galileo’s pupil Vincenzo Viviani. It was this collected edition, rather than the original publications, that served as the starting point for many later scholars’ contributions and expansion on Galileo’s work (e.g., Isaac Newton).
Galilei, Galileo (1564–1642)

*Opere del Galileo Galilei ... coll’ aggiunto di vari trattati dell’ istesso autore non piu dati alle stampe.*

(three volumes)

- **Year:** 1718
- **Place:** Florence
- **Publisher:** Giovanni Gaetano Tartini and Santi Franchi
- **Edition:** 2nd
- **Language:** Italian
- **Figures:** v.1 title in red and black with engraved vignette
- **Binding:** contemporary vellum; red and black lettering pieces
- **Pagination:** v.1: pp. cxii, 384, 369–628, [2]; v.2: pp. [8], 722, [2]; v.3: pp. [54], 484, [2]
- **Collation:** v.1: a–g4 h8 i2 Q A–2Q R4 (-R12); v.2: π'A–2Y'2Z2; v.3: π'(-π4)–3*π–2G2H1(-2H4)
- **Size:** 251x180 mm
- **Reference:** Cin BG, #170

This is a three-volume collection of the works of Galileo. It also contains a number of items (making up the third volume) that were not in the Dozza edition of the collected works. These include his work on probability, later notes on *Sidereus Nuncius*, *Macchie solari* and letters. The only major item missing is Galileo’s *Dialogo*, which was then on the index of prohibited books.

Illustrations available:
- Engraved title page (color)
- Title page for Volume 1
- Title page for Volume 2
- Title page for Volume 3
- Portrait

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Galilei, Galileo (1564–1642)

*Le operazioni del compasso geometrico et militare.*

- **Year:** 1606
- **Place:** Padua
- **Publisher:** Pietro Marinelli
- **Edition:** 1st
- **Language:** Italian
- **Figures:** several woodcuts
- **Binding:** modern leather
- **Pagination:** f. [2], 32 (mis# 31 as 33, 32 as 34)
- **Collation:** π'A–Q
- **Size:** 282x190 mm
- **Reference:** Cin BG, #16; Redi BMI, Vol. I, p. 506; Drake GMC, p. 34

This is Galileo’s initial published work. He appears to have invented his first version of the proportional compass (called a *sector* in English) about 1595—see the Appendix essay on the sector regarding its actual invention. He taught its use to private pupils and produced hand-written notes to accompany his instruction. In 1597, he hired an instrument maker and began to manufacture the device in the workshop at his home. The instrument was given increasing publicity by his students, one of whom, Baldassar Capra, plagiarized the notes and claimed the device as his own invention. All this inspired Galileo to hire a printer and to have him produce sixty copies of his notes—the work described here.

In the introduction Galileo indicates that he deliberately avoided describing the instrument or including any engraving of it in order to render the notes useless to anyone who did not already own one of his sectors. This
attempt at keeping the monopoly on the device seemed to work well for a few years, but examples soon spread to other countries. It was only with the second, 1640, edition that a full description and illustration were included. By that time the instrument was in common use in Europe and had been described by many others.

There are two issues of this work, one dated June 1606 and the other July 1606.

Illustrations available:
Title page

This second edition was issued long after Galileo had many competitors, mainly foreign, in the construction of sectors and instruction in their use. It had become obvious that Galileo could not maintain a monopoly on the sector, so there was no point in keeping it secret. This edition includes a large folding plate showing the different components.

Illustrations available:
Title page
Sector
In this, as in the second edition, the back of the quadrant arm is signed by Paolo Frambitti.

Illustrations available:
- Title page
- Sector
This fifth edition of Galileo’s work was doubled in size by the inclusion of the notes by Matthias Bernegger. Bernegger, a professor of history and rhetoric at the University of Strasbourg, translated Galileo’s original work from Italian into Latin and published it in 1635, together with his notes. The notes, here in Italian, discuss the construction of the sector and give additional examples of its use. The sector is illustrated by the same diagram used in the second, 1640, edition except that it no longer has the signature of Paolo Frambotti on the back of the quadrant arm.

Illustrations available:
- Title page
- Sector

G 16

[Galilei, Galileo (1564–1642)] Matthias Bernegger
(1582–1640), translator and editor

De proportionum instrumento a se invento, quod meritò compendium diceris universa geometriae, tractatus, rogatu philomathematicorum a Mathia Berneggero ex Italica in Latinam linguam nunc primùm translatus: adjectis etiam notis illustratus, quibus & artificiosa instrumenfa fabrica, & usus ulterior expositor.

b/w: Müller, Jacob; Praxis geometrica universalis,
Das ist: Wie man alle Lineen und Figuren in corporibus Physicis aussmessen soll, beneben volligem Bericht von der Proportion, und was Grund der Canon Trigonometricus erfunden. So wol auch, Wie man alle Triangula aufflösen soll, mit kurzen Regulis verfasset

Year: 1612
Place: Strasbourg
Publisher: Carol Kieffer and Johann Carol
Edition: 1st
Language: Latin
Binding: contemporary vellum boards
Pagination: pp. [12], 104
Collation: )4( )4( A–N
Size: 189x148 mm

Matthias Bernegger was a professor of mathematics and rhetoric at the University of Strasbourg. In 1612, he published an unauthorized translation of Galileo’s work on the sector (second edition in 1635), to which he added a set of notes that almost doubled the size of the text. The notes are a description of the lines inscribed on the sector plus many added examples of its use.

This manuscript is a complete copy of just the notes. Perhaps they were made to accompany a copy of Galileo’s original work. The scribe is unknown, although there is what might be an undecipherable signature just above the date at the end of the manuscript (see illustration).
This volume was perhaps included in the sale of parts of a Cardinal’s Library, sold at Sotheby’s March 27, 1868. It later passed into the celebrated library of Baldassare Boncompagni Ludovisi.

Illustrations available:
Title page 1
Title page 2
First few lines of the manuscript
Last few lines of the manuscript

This work is essentially a Latin translation of Galileo’s *Le operationi del compasso geometrico e militare* of 1606. It is, however, noteworthy that Bernegger included an engraving of Galileo’s sector when Galileo, in his own publications, was attempting to keep a monopoly on the production of the device by not including descriptions or diagrams.

See the entry for Galilei, Galileo - Matthias Bernegger; In tractatum de proportionum instrumento ab exmo Galileo emanato. Notationes Mathiae Berneggeri, 1640.

Illustrations available:
Title page
Sector

*Tractatus de proportionum instrumento, quod merito compendium universae geometriæ dixeris... Ex Italica lingua Latine conversus, adiectis notis, quibus & artificiosa Instrumenti fabrica, & usus ulterior exponitur.* [p. 55 - Half title:] In tractatum de proportionum instrumento, notationes Mathiae Berneggeri: quibus 1. Instrumenti artificiosa constructio atque divisio docetur & fundamentis geometricis: 2. Demonstrationes ac fundamenta singularum problematum Galileicorum traduntur: 3. Usus ulterior in resolvendis Euclideis & aliis problematibus compluribus ostenditur

Year: 1635
Place: Strasbourg
Publisher: Typis Davidis Hautti
Edition: 2nd (Latin)
Language: Latin
Figures: 1 large engraved folding plate of instrument
Binding: contemporary leather; rebacked
Pagination: pp. [8], 104
Collation: ș(̷‘A–N ̷‘)
Size: 206x150 mm

This work is essentially a Latin translation of Galileo’s *Le operationi del compasso geometrico e militare* of 1606. It is, however, noteworthy that Bernegger included an engraving of Galileo’s sector when Galileo, in his own publications, was attempting to keep a monopoly on the production of the device by not including descriptions or diagrams.

See the entry for Galilei, Galileo - Matthias Bernegger; In tractatum de proportionum instrumento ab exmo Galileo emanato. Notationes Mathiae Berneggeri, 1640.

Illustrations available:
Title page
Sector


b/w: Galilei, Galileo; Dialogus de systemate mundi. Systema cosmicum... In quo quatuor dialogis, de duobus maximis mundi systematibus, Ptolemaico & Copernicano, utriusq; rationibus philosophicis naturalibus indefinite propositis disseritur, 1635
This copy appears to be identical to the other copy of this same work (bound alone), with the exception that this copy does not contain the large folding plate of Galileo’s sector.

Illustrations available:
None

[Galilei, Galileo]
See Lusvergh, Domenico; Di Galileo Galilei il compasso geometrico adulto per opera di Giacomo Lusvergh, 1698.

See [Capra, Baldassar]; I due Capri gemelli ossia parallelo esattissimo tra il Dottore Baldessar Capra medico Milanese e il Dottore Ferdinando Giorgi medico Fiorentino, 1786.

This is a comprehensive survey of mathematical instruments and calculating machinery just before the start of World War I. It notes such things as Weiberg’s difference engine (with a nod to Babbage), all types of analog machines such as planimeters, harmonic analyzers and mechanical calculating machines like the Millionaire, etc. This work contains both the basic description of the machines and, for several, an explanation of their principles of operation and inner workings.

Illustrations available:
Title page

G 21
Galle, Jean (fl. ca. 1600)

Nouveau epitome d’arithmetique

The author, simply noted as “I. G.” on the title page, was Jean Galle, a military engineer and director of fortresses for Belgium. It is an elementary work that starts with basic operations, proceeds through square and cube roots, and ends with a brief discussion of arithmetic and geometric series. On the last two pages Galle presents an arithmetic series (difference 1) and a geometric series (product 2) typeset so as to imply a relation between them. The relation is obviously one of base 2 logarithms. But Galle does not seem to recognize this as the text only describes a few simple properties of the series.

We are indebted to David Bryden for pointing out that in his dedication to Prince Albert, Archduke of Austria, Duke of Burgundy and Sovereign of the Netherlands, (ff. *3r misnumbered A3r), Galle mentions dix petits bastons, i.e., 10 small rods that may be used to simplify and speed multiplication, division and the extraction of square and cube roots. This passage has led to claims of priority for Galle over Napier.

Illustrations available:
Title page
Series illustrations
This set of works contains both descriptions and engravings of all the inventions approved from the beginnings of the Academie in 1666 until 1735. Thus, it documents the increasing interest in technology during this period in France. The devices are simply described in chronological order. They cover all the areas then known in arts, sciences, engineering and manufacturing. Notable among the many descriptions is one for Pascal’s adding machine and others by Perrault, Lespine, De Mean (which was really only a table upon which products, etc. could be looked up), and three by De Hillerin. See also the entry for Perrault, Recueil de plusieurs Machines, 1700, and Perrault, Oeuvres diverses, 1721.

Illustrations available:
Title page – color (Vol. 1 only)
Pascal’s calculating machine and explanation
Perrault’s machine (Abaque Rhabdologique)
Lespine’s machine and explanation
De Hillerin’s first machine and explanations

Gallon was a colonel in the French army, and later the chief engineer for the port of Le Havre. The Academie Royal des Sciences asked him to edit all the descriptions of the machines the Academie had approved. Six volumes were produced in Gallon’s lifetime, and a seventh volume (not in this collection) appeared posthumously in 1777.
Giovanni Gallucci was an Italian astronomer from Salo. This work is an illustrated encyclopedia of astronomical and surveying instruments. It describes instruments designed by others (Fine, Apian, Gemma Frisius, etc.) and gives credit to the original inventors. The one exception to this is the Visorio, which Gallucci claims as his own, but an identical instrument by Waldseemüller can be found illustrated in the 1512 edition of *Margarita Philosophica* by Gregor Reisch. Other instruments, such as the Hemispherical Uranico (a complicated device used for computations dealing with the moon, sun and stars), appear to be of Gallucci’s invention. Besides the usual portable instruments, he also includes a simple quadrant and a two-ringed armillary built into the church of Santa Maria Novella in Florence. See entry for Danti, *Primo volume dell’uso et fabbrica dell’Astrolabio*, 1578.

There are also a number of elementary diagrams and volvelles that illustrate various astronomical phenomena such as why the sky looks different at different latitudes, etc. Five plates are repeated from Gallucci’s earlier work, *Theatrum mundi...*, 1588.

Illustrations available:
- Title page
- Quadrant with astrolabic markings
- Hemispherical instrument
- Visorio
- Nautical instrument

Giovanni Gallucci was an Italian astronomer from Salo. This work is an illustrated encyclopedia of astronomical and surveying instruments. It describes instruments designed by others (Fine, Apian, Gemma Frisius, etc.) and gives credit to the original inventors. The one exception to this is the Visorio, which Gallucci claims as his own, but an identical instrument by Waldseemüller can be found illustrated in the 1512 edition of *Margarita Philosophica* by Gregor Reisch. Other instruments, such as the Hemispherical Uranico (a complicated device used for computations dealing with the moon, sun and stars), appear to be of Gallucci’s invention. Besides the usual portable instruments, he also includes a simple quadrant and a two-ringed armillary built into the church of Santa Maria Novella in Florence. See entry for Danti, *Primo volume dell’uso et fabbrica dell’Astrolabio*, 1578.
Gallucci’s *Theater of the World* is the first star atlas to use Copernican coordinates, and indeed the first star atlas to provide any coordinates. It contains 144 full-page woodcuts (of which 50 have volvelles) and a most attractive set of 48 woodcuts of the Ptolemaic constellations. These latter were mapped using the trapezoidal system of projection current at the time. Accompanying the star maps are a catalog of the included stars giving a mixture of astronomical and astrological data such as latitude, longitude, position, magnitude, radiation, influence, signs of the zodiac, etc.

The work is divided into six books. In the first Gallucci presents the elementary cosmos of Aristotle and the planets according to Ptolemy. Books two through four are descriptions of astronomical phenomena using volvelles. Books five and six present the maps and tables of the major stars in the various constellations. The work closes with a large folding woodcut table titled *Canon Sexagenarius* for the observation of the Sun, Moon, Saturn, Jupiter, Mars, Venus and Mercury. In 1589, a second issue was published. It is identical to the first except for redating of the title page. In 1605, a reissue was again published, this time under the title *Coelestium corporum*… In this latter issue, the first gathering has been replaced by two leaves containing a new title page, two blank pages and the first page of the 1588 address to the reader, *Ad lectores*…

The Whipple Museum of the History of Science states that one of the volvelles in its copy of this work contains: *no fewer than 7 disks and an index arm stitched to the page*. No such intricate volvelle exists in this copy, the most complex being of three disks; however, all appear to be present and in original condition.

Illustrations available:
- Title page
- Heavenly spheres
- Earthly spheres
- Volvelle
The author evidently wrote at least five, and possibly six, books on arithmetic. In a preface to this volume, he is identified as a well-known accountant.

This is a commercial arithmetic that was designed, as the preface indicates, to allow it to be taken to the plaza markets and fairs. It begins with a multiplication table (with products up to 10 times 40) and, most uncommon, a division table showing quotient and remainder. The rest of the work contains illustrations of commercial problems, and there is a table of exchange rates at the end.

Illustrations available:
- Title page
- Division table page
- Exchange rate table page

This is essentially the same arithmetic as Garatti’s 1711 work. It contains the same tables, but as might be expected, the exchange rates have fluctuated—some have increased and others have decreased.

Illustrations available:
- Title page
- Division table page
- Exchange rate table page

Garatti, Francesco

Il divertimento aritmetico con diverse nottie di monete, pesi, misure, et curiose prattichette di conteggiare per arithmetica ordinaria, & per algebra che introduce principianti computisti alla cognizione di far conticon brevità, e facilità.
Andrés García de Cespedes was astronomer, instrument maker and royal cosmographer to Phillip III of Spain. He was also a lecturer at the naval college in Seville and a prolific writer. A list following the title page gives eleven other works authored by him, most of which are no longer extant.

This work deals with elementary surveying and describes several instruments, including the Jacob’s staff and a device much like a plane table. Cespedes also discusses military problems, the most significant of which is the path of flight of a canon ball, during which he repeats Tartaglia’s assertion that the path of flight is a straight line followed by a segment of a circle. Tartaglia had proposed this concept in his Scientia Nova of 1550, but Cespedes seems unaware that in the intervening fifty-six years this theory had been disputed by a number of authors of works on military science.

Cespedes closes the work with a discussion of a military problem that in hindsight may seem more trivial than crucial but that certainly provides an insight into the nature of warfare in the early seventeenth century. He begins with the observations that in time of war men are unlikely to think like accountants and that the excitement of battle is likely to cause confusion. Hence, he provides a table showing how to arrange a group of soldiers of a given size in a rectangular pattern. The table starts with a squadron of 32 men (8 men wide by 4 rows deep). Each step in the table increments the width of the row by 7 men and the number of rows by 3. The second step in the table is thus 15x7 or a total of 105 men. The size rises from a squadron of 32 men to an army of 39,260 men. The table shows the number of men in a row, the number of rows and the depth of the field occupied (21 feet to 903 feet in increments of 21 feet). A table of squares (from 2 to 200) completes the work, presumably to assist those who desire to arrange the soldiers in a square configuration.

Illustrations available:
- Title page
- Survey table
- Ballistic curves
- Table of squad size

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**Gardiner, William (1710–a.1769)**

*Tables of logarithms, for all numbers from 1 to 102100, and for the sines and tangents to every ten seconds of each degree in the quadrant; as also, for the sines of the first 72 minutes to every single second: with other useful and necessary tables.*

Year: 1742
Place: London
Publisher: Printed for the author by G. Smith
Edition: 1st
Language: English
Binding: contemporary calf; gilt spine; arms of La Rochefoucauld family
Pagination: pp. [vi], 14, [74], [152]
Collation: π/ιA–D'/α–s'–2A/
Size: 288x228 mm
Reference: Tay *MP II*, #176; Hend BMT, #71, p. 79
William Gardiner was a land surveyor in the East Midlands and London area. Although he used a London address, it seems that he spent his summers in the country as a surveyor and his winters in London as a teacher of mathematics.

Gardiner’s tables were noted for their accuracy and were highly regarded in their time. Although they contained some errors, they were used as the basis of many other tables—those of Callet being the most famous. Gardiner himself found several errors and offered to correct them by hand if the owners would send him their copies. He also offered a £50 reward for the discovery of any additional errors.

There are no obvious corrections to this copy. The layout, particularly in the trigonometric tables where differences are placed between the lines, seems quite awkward and error prone.

Some copies, as does this one, have a slip giving proportional parts bound between pages 4 and 5 of the tables. Gardiner signed the preface on this copy. A second copy is available in the collection; this one, while not signed by the author, does have the bound in proportional parts slip. See the entry for Hutton (Mathematical tables) for a list of errors.

Illustrations available:
- Title page
- Gardiner’s signature
- Sample table page

This French edition of Gardiner’s tables was edited by three French priests. Lalande (Bibliographie Astronomique, p. 516) indicates they were named Esprit Pézénas, Jean Dumas and Jean Baptiste Blanchard, translators.

The tables are sometimes referred to as Tables de Pézénas in France. The editors corrected the known errors and added several short tables.

Some copies of this work contain an errata sheet at the end, which evidently was produced some time after the publication date of 1770. It is suspected that these tables were reissued with the errata sheet and the old title page some time after 1775. This appears to be an original issue with no errata sheet present. See the entry for Hutton (Mathematical tables) for a list of errors.

Illustrations available:
- Title page

Gardiner, William (fl. 1725–1742) [Esprit Pézénas (1692–1776), Jean Dumas and Jean Baptiste Blanchard, translators]
Gellibrand, Henry (1597–1636)

An institution trigonometrical. Wherein demonstratively and perspicuously is exhibited the doctrine of the dimension of plane and sphericall triangles after the most exact and compendious way by tables both of sines, tangents, secants, and logarithmes.

Gellibrand had been a student at Trinity College, Oxford, when he was introduced to mathematics and became acquainted with Henry Briggs. After graduation he was ordained and took a job as curate in a small town in Kent. When Edmund Gunter died in 1626, Gellibrand applied for his post as professor of astronomy at Gresham College and was elected to it in early 1627. One of his sponsors was Henry Briggs, and Gellibrand repaid the debt by completing the second volume of Briggs' Trigonometria Britannica and seeing it through the press after Briggs died in 1630. He is also known for his discovery of magnetic declination and for application of mathematics and astronomy to practical problems of navigation.

This book contains two brief expositions on plane and sphericall triangles followed by a major section consisting of trigonometric functions, logarithms and navigational and astronomical tables.

Illustrations available:
- Title page

Year: 1635
Place: London
Publisher: Printed by William Jones
Edition: 1st
Language: English
Binding: later panelled leather; clasps gone
Pagination: pp. [2], 78, [332]
Collation: A–E⁸; A–R⁸; S⁶; T–X⁸
Size: 151x92 mm
Gellibrand, Henry (1597–1636/7)

An institution trigonometrical. Wherein demonstratively and perspicuously is exhibited the doctrine of the dimension of plain and spherical triangles: After the most exact and compendious way, by tables both of sines, tangents, secants, and logarithms. With the application thereof in questions of astronomie and navigation.

Year: 1652
Place: London
Publisher: printed by R. and W. Leybourn for W. Lugger
Edition: 2nd
Language: English
Binding: contemporary reversed sheep rebacked; original spine
Pagination: pp. [94], [336, tables]
Collation: π 1 B–F 8 G 6 A–X 8
Size: 140x90 mm

This second edition is slightly enlarged from the first. It appears to have had revisions to the explanation of spherical triangles and a few additional astronomical and navigational tables.

This copy is annotated on the first and last blank leaves. There is a hand-written index on the last leaf dated June 1676. The work was printed by the Leybourn brothers, one of whom, William Leybourn, was a respected mathematician in his own right.

Gellibrand, Henry

Arithmetica practicae methodus facilis

Year: 1548
Place: Wittenberg
Publisher: George Rhau
Edition: 8th
Language: Latin
Binding: contemporary blind-stamped leather
Pagination: pp. [176]
Collation: A–L 8
Size: 149x96 mm
Reference: Van O BBGF, #57, p. 241

Gemma Frisius was born in Friesland, a coastal province of the Netherlands, which explains the adoption of Frisius as part of his name. He was a professor and physician in Louvain (now in Belgium) and taught medicine at the university there most of his life.

Today, he is best remembered for his broad interest in mathematics, geography and astronomy. He also made highly regarded globes, maps and mathematical instruments. Gerardus Mercator attended lectures that Gemma Frisius gave at his home and later completed some of Gemma’s globes. Gemma Frisius was the first to suggest that triangulation be used by map makers to improve accuracy. He also suggested the use of a clock to determine longitude—a suggestion that was to wait centuries for the development of sufficiently accurate marine clocks before it could be put into practice.
This work was the most popular arithmetic textbook of the sixteenth century and was used widely in church schools. Smith lists fifty-nine editions in the sixteenth century alone but cautions that his list is probably incomplete. In addition, the work was translated into French, Italian and German in the latter part of the sixteenth century.

This is the eighth edition of Gemma Frisius’ arithmetic (first edition, Antwerp, 1540). The early editions seem to differ little from each other. For example, this edition and that of 1550 are so much alike that, despite being reset, they contain the same errata list on the last page. One would have thought that the printer of the 1550 edition could have at least corrected the earlier mistakes. The title page illustration shows the same strange use of figures written on a table as the 1550 edition.

The title page illustration, which was used on several editions about this time, is curious in that it depicts a typical table abacus but with written notations or tally marks rather than counters.

Other copies exist in this collection. The edition of 1562 is essentially identical to this one, but the 1567 edition is an Italian translation.

Illustrations available:
Title page

G 33

Gemma Frisius, Reiner (1508–1555)

Arithmeticae practicae methodus facilis

b/w: [Sacrobosco, Johannes de] Erasmus Reinhold; Libellus ..., de anni ratione, seu ut vocatur, vulgo computus ecclesiasticus. Cum præfatione Philippi Melanthonis

b/w: [Sacrobosco, Johannes de] Erasmus Reinhold; Libellus de sphæra. Accessit eiusdem computus ecclesiasticus, et alia quædam in studiosorum gratiam edita. Cum præfatione Philippi Melanthonis

Year: 1550 (1551)
Place: Wittenberg
Publisher: Petrus Seitz
Edition: 10th
Language: Latin
Figures: Woodcut of counting board on title page
Binding: contemporary blind-stamped pigskin; “I R H” and “1515” stamped on front cover; 1 clasp broken
Pagination: ff. [88]
Collation: A–L*
Size: 157x100 mm

Reference: Van OBBGF, #77, p. 265

See also the entry for the 1548 edition of this work. This is a simple arithmetic that begins with numeration, follows with the four operations (with a very short mention of mediation and duplation), arithmetic and geometric progressions, and squares and cubes. The last part has a brief discussion of business arithmetic and proportion. This was a very popular arithmetic text, and Smith (Rara) lists fifty-nine editions (mostly identical to this one), which he thinks is likely an incomplete accounting.

G 34

Gemma Frisius, Reiner (1508–1555)

Arithmeticae practicae methodus facilis

b/w: Faber, Basil; Libellus de synonymia Terentii, et copiosa phrasium ac locutionum commutatione, ex ipso autore nata & collecta. Nunc denuo recognita & aucta.

b/w: Lemnius, Levinus; Occulta naturae miracula

Year: 1562
Place: Leipzig
Publisher: Johannes Rhamba
Edition: 30th
Language: Latin
Figures: engraved title page showing counting board
Binding: contemporary blind-stamped pigskin; dated “1562” on front cover
Pagination: ff. [88]
Collation: A–L*
Size: 147x94 mm
Reference: Van OBBGF, #77, p. 265
This edition is essentially identical to that of 1550. In this case the title page shows a different illustration of a table abacus (actually two: one using lines marked on a table and another using them on a cloth), but this time it shows jettons in use rather than the curious markings from the 1548 and 1550 editions.

Illustrations available:
- Title page
- Illustration of a cube
- Colophon and register
- Printer’s mark (see end of section “I”)

This is an Italian translation of the Gemma Frisius arithmetic. The textual material is almost identical to the original; however, it does not include some of the more advanced subjects at the end. The illustrations are uniformly of higher quality, with, for example, a die being shown as an illustration of a cube.

G 35

**Gemma Frisius, Reiner** (1508–1555)

*Arithmetica practica facilissima ... Con l’aggiunta dell’abbreviamento de’ rotti astronomici di Giacomo Pelletario; & del conoscereamene le calende, gli’idi, le none, le feste mobili, il luoco del sole, & della luna nel zodiaco; & la dimonstratione della radice cubica: lequali tutte cose dal latino, ha in questa lingua ridotte Oratio Toscanella della famiglia di Maestro Luca Fiorentino; & halle dedicate ...*

- Year: 1567
- Place: Venice
- Publisher: Giovanni Bariletto
- Edition: 1st (Italian)
- Language: Italian
- Binding: 18th-century vellum boards
- Pagination: ff. [4], 49, [1] (mis# 41 as 45, 43 as 47, 44 as 45, 45 as 39, 46 as 41, 49 as 51)
- Collation: +A–L‘M+
- Size: 195x134 mm

G 36

**Gemma Frisius, Reiner** (1508–1555)

*Arithmeticae practicae methodus facilis ... iam recèns ab ipso authore emendata & multis in locis insigniter aucta. Huc accesserunt Jacobi Peletarij Cenomani annotationes. Eiusdem item de fractionibus astronomicos compendium et de cognoscendis per memoriam calendis, idibus, nonis, festis mobilibus & loco solis & lunae in zodiaco.*

- Year: 1571
- Place: Cologne
- Publisher: M. Cholinus
Gemma Frisius, Reiner (1508–1555)

De astrolabo catholico liber quo latissime patentis instrumenti multiplex usus explicatur, & quicquid uspiam rerum mathematicarum tradi possit continetur.

Year: 1556
Place: Antwerp
Publisher: Joan. Steelsius & Joan. Grapheus
Edition: 1st
Language: Latin
Figures: 2 folding plates
Binding: contemporary limp vellum
 Pagination: ff. [16], 184
Collation: §§§A–Z
Size: 162x99 mm
Reference: H&L, #3276, p. 646; Van O BBGF, #129, p. 329; Cro CL, #60, p. 75

When Gemma Frisius died in 1555, he left this manuscript unfinished. It was completed by his son Cornelius Gemma and published the year after the father’s death. This work is often described as a book on the catholic or universal astrolabe, but it is also a primer on astronomy with sections on eclipses and their observation, sundials, horoscopes, etc. The work begins by describing the universal projection (essentially from the side rather than from the south pole—see essay on astrolabes). Although it shows diagrams of the projection, it does not illustrate the device itself. Near the end are a number of horoscopes, one of which is noted as Natus est Gemma Phrysius Anno 1508 Octaua Decemb Hora undecima & 20 scru elapsis postmeridie. It is not clear if these were cast by Gemma or his son.

Illustrations available:
Title page
Astrolabe projections
Eclipse
Survey
Horoscope
G 38

[Gemma Frisius, Reiner (1561–1638)] Johann Paul Resenius, translator, and Peter Nicolas Gastrupius, editor

Scholia succincta et facilia, in arithmetam Gemmæ Frisii, tradita et conscripta olim, in schola privata ... Et nunc tandem edita, in usum scholarum puerilium & c. per Petr. Nicol. Galstrupium

Year: 1611
Place: Wittenberg
Publisher: Andreas Rüdinger for Zacharias Schurer
Edition: 1st
Language: Latin
Binding: later leather
Pagination: pp. [12], 64, 69–251, [3]
Collation: A–Q^R^3
Size: 158x92 mm

Resenius was a professor in Copenhagen. This arithmetic is from his lectures, which were based on the popular Arithmetica practica of Gemma Frisius. According to the title page, it was prepared for student use by Gastrupius, who was presumably associated with the same university. It provides a very clear explanation of table abacus arithmetic, even explaining the direction (up, down, left to right or right to left) of movements during operations. Sadly, the book is error laden, e.g., the illustrations of operations on the abacus often show one number printed in the text and another on the abacus. This must have been a source of difficulty for the students!

Illustrations available:
- Title page
- Direction of operations
- Table abacus
- Table abacus errors
G 39

Gemma Frisius, Reiner (1508–1555)

Usus annuli astronomici

Year: 1558
Place: Paris
Publisher: G. Cavellat
Edition: 1st (Collected, 2nd issue)
Language: Latin
Binding: modern vellum
Pagination: ff. 8, 159, [1] (i.e. ff. 103v–117)
Collation: A'–a–v
Size: 162x106 mm
Reference: H&L, #2589, p. 588; Zin GBAL, #2663

This work is bound, along with six others, in the volume Beausard, Anuli astronomici, 1558. Although the title page shows a set of Astronomer’s Rings (see Dryander, Annulorum trium, 1558), this work is really an elementary treatment of surveying with the shadow scales on an astrolabe. Like all surveying books of this era, it deals with the case of surveying based upon right-angle triangles. It considers the usual problems of finding the heights of towers both when the base is accessible and when not, etc. The most complex problem is one to find the height of a tower sitting on a rock when the base of each is inaccessible.

Illustrations available:
- Title page
- Height of tower problem

Gerard of Cremona, translator

See Jabir ibn Afflā; Accedunt iis Gebri filii Affla Hispalensis astronomi uetustissimi pariter & peritissimi, libri IX de astronomia, ante aliquot secula Arabice scripti, & per Girardum Cremonensem latinitate donati, nunc vero omniu(m) primum in lucem editi.

G 40

Gersten, Christian Ludwig (1701–1762)

The description and use of an arithmetical machine ... extract from: Philosophical Transactions #438 for the months of July, August, and September 1735

Year: 1735
Place: London
Publisher: Royal Society of London
Edition: 1st
Language: English
Figures: 1 folding plate
Binding: disbound
Pagination: pp. [2], 79–97
Size: 214x163 mm
Reference: Ran ODC, p. 418

Gersten was a professor of mathematics in the University of Giessen. While on a trip to England, he was elected a fellow of the Royal Society.

Prior to leaving England, Gersten presented a calculating machine to the Royal Society. He had invented it about twelve or thirteen Years ago. The machine is elementary but might have been applicable in certain limited circumstances. The plate shows three digits (more were possible) with the mechanism for the first digit exposed.
As this machine has not been described in any of the standard calculator reference works, the entire text is included in the illustrations.

Illustrations available:
- Plate
- Text (10)

G 41

Gesualdo, Filippo

Plutosifia ... nella quale si spiega l’arte della memoria con altre cose notabili pertinenti. Tanto alla memoria naturale, quanto all’artificiale.

Year: 1592
Place: Padua
Publisher: Paulo Megietti
Edition: 1st
Language: Italian
Binding: 18th-century half-bound illuminated vellum with colored decorated paper
Pagination: ff. [6], 64
Collation: ¶4 ¶2 ¶A–Q4
Size: 190x133 mm
Reference: Not in Redi BMI

This is an early work on mnemonics by a member of the Franciscan order. While it may appear to have only a tangential connection with the subject of this collection, Gesualdo describes human memory functions in terms of the concept of branching, which is, of course, analogous to its use in computer software. He also recommends the mnemonic technique of associating parts of the human body with numbers, and a woodcut illustration of this scheme is the most striking in the book.

Illustrations available:
- Title page
- Body parts

G 42

Giarratana, Joseph

Scale-of-eight counting unit. In The Review of Scientific Instruments. Volume 8, new series, October 1937

Year: 1937
Place: New York
Publisher: American Institute of Physics
Edition: 1st
Language: English
Binding: library buckram
Pagination: pp. 390–393
Size: 259x192 mm

Giarratana was a physicist at Princeton University.

In 1931, Charles Wynn-Williams, of Cambridge University, was the first to use electronic counters in detectors in radiation experiments. This paper reports on a similar application in which Giarratana used an electronic thyratron circuit for counting alpha particles from a linear accelerator. These radiation counter applications represent the departure point for the design of digital circuits in electronic computers.

Illustrations available:
- None
William Gilbert was a prominent London physician who held several significant medical posts connected with the Royal Navy. He became physician to Elizabeth I in 1600, the same year he published this work, and was appointed physician to James I after Elizabeth's death. Little is known of his early life and education other than that he was born into a well-to-do middle-class family. He studied at Cambridge from 1561 to 1569, where he received the M.D. degree. He seems to have settled in London sometime about 1575.

This first edition of the first scientific study of electricity and magnetism is a seminal work in the history of science. It is composed of six books. The first is a history of everything known about the lodestone. It is in the last chapter of Book I that Gilbert introduces his revolutionary concept that explained all terrestrial magnetic phenomena—that the earth is a huge magnet—or as Gilbert might have put it, 'a giant lodestone.'

In the second book Gilbert differentiates between electric attraction and magnetic coition—he used this term because he believed that magnetism was a mutual force between two bodies rather than an attractive force from one body to another. Gilbert was the first to distinguish the effects of the magnet from the attractive properties of rubbed amber—an effect he called electric, coining the modern usage.

The remaining four books were each devoted to one or another aspect of magnetic movements: direction (the compass), variation, declination and revolution.

In the book, Gilbert identified his new discoveries with large and small asterisks in the margin. There are 21 larger and 178 smaller asterisks in the work.

This is the only work Gilbert published during his lifetime. His half brother collected, edited and published Gilbert's papers in 1651, nearly fifty years after his death. Gilbert died suddenly, likely of the plague, and his scientific estate, his library and instruments, were left to the Royal College of Physicians. Unfortunately, these were destroyed in the great London fire of 1666.

The importance of magnetic phenomena in the development of modern computing machinery, particularly storage media, can hardly be overstated. Magnetic tape, magnetic drums, magnetic cores and magnetic discs have served as essential memory elements in both early and recently developed computer systems.

Illustrations available:
- Title page
- Asterisk page example
- Illustration of a blacksmith working on a magnet
- Declination instrument

Blacksmith working on a magnet, G 43
G 44

Gilbert, William (1544–1603)

On the magnet

Year: 1900
Place: London
Publisher: Gilbert Club
Edition: 2nd (English)
Language: English
Figures: 1 engraved folding plate (p. 200); Gilbert Club insert
Binding: contemporary vellum
Pagination: pp. [16], 246, [2], iv, 68
Collation: *B–2I* A–2I
Size: 296x196 mm

This is #96 of 250 printed copies of an English translation of Gilbert’s De Magnete. The work has been augmented by an index, a bibliography and extensive notes that were not in the original. Although an earlier English translation by Fleury Mottelay in 1893 was available, the Gilbert Club was formed as an organization specifically interested in producing this volume using the finest printing then available. Silvanus Thompson (1851–1916), the Principal and professor of physics at Finsbury Technical College in London, was the organizing force behind this project. He was a collector of books and organized the translation, although he extensively revised the complete text and added the extra notes himself.

Illustrations available:
- Title page
- Explanation of trigonometric functions
- Sample table page

G 45

Girard, Albert (1595–1632)

Tables des sinus, tangentes, & secantes selon le raid de 100000 parties.

Year: 1629
Place: The Hague
Publisher: Jacob Elsevier
Edition: 2nd
Language: French
Binding: contemporary vellum
Pagination: ff. [132]
Collation: A–L
Size: 120x70 mm

Girard was born in Lorraine but spent most of his life working as an engineer and mathematician in the Netherlands. He is known for his work on algebra, particularly on the existence of negative roots of equations. In 1626, he published a treatise on trigonometry containing the first use of the abbreviations sin, cos, and tan. Like many of his contemporaries, Girard studied and wrote on fortifications. He also edited and translated the works of Stevin. These were published, posthumously, in 1634—a fact that some have used to mistakenly date Girard’s death in that year.

This volume is a set of tables. It begins with a very brief explanation of the functions, and this is followed by the tables themselves. The last part of the work is a short treatise on plane and spherical trigonometry.

Illustrations available:
- Title page
- Explanation of trigonometric functions
- Sample table page

515
Girard, Albert (1595–1632)

Tables des sinus, tangentes, & secantes selon le raid de 100000 parties.

Year: 1629
Place: s’Gravenhage
Publisher: Jacob Elsevir
Edition: 1st (Dutch)
Language: Dutch
Binding: contemporary leather; gilt spine
Pagination: ff. [1126]
Collation: AK
Size: 114x67 mm

These tables were first published in French in 1626, then reprinted in 1627 and 1629 in different language editions. See entry for the 1629 French edition.

Illustrations available:
None

Glaisher, James Whitbread Lee (1848–1928)

On the early history of the signs + and - and on the early German arithmeticians.

Year: 1921–1922
Place: London
Publisher: Messenger of Mathematics
Edition: 1st
Language: English
Binding: original paper wrappers
Pagination: pp. 144
Collation: B–K
Size: 212x139 mm

James Glaisher, the son of an astronomer, graduated in 1871 as Second Wrangler from Cambridge. He was immediately appointed as a lecturer at Trinity College and remained there for the rest of his life. His contentment at Cambridge was emphasized by his refusal of an invitation to become Astronomer Royal in 1881 on the retirement of George Airy. A prolific author, who published over 400 papers in mathematics and astronomy, he was elected a Fellow of the Royal Society in 1877 at the age of twenty-seven. He is perhaps best remembered as an educator and editor of journals, including the Messenger of Mathematics. He was an active member of scientific societies, particularly the London Mathematical Society (president 1884–1886) and the Royal Astronomical Society (president 1886–1888) and was a member of the Committee on Mathematical Tables of the British Association for the Advancement of Science.

This work was extracted from the Messenger of Mathematics, No. 601, Vol. li, 1921–1922, and issued and bound into this version. It is a comprehensive examination of the history of the words plus and minus (or their equivalents in other languages) and the signs used for them. Glaisher had noted that DeMorgan speculated that the signs (+ and -) had originally been used in
commerce and had been borrowed for use in arithmetic and algebra. Glaisher’s history of plus and minus is divided into three parts. The first is an examination of their use in Widman’s *Behend und hüpsch rechnung auff allen kauffmanschaften* of 1489. The second is based on an examination of a number of German arithmetic works up to 1550. The third is a summary of what other, more modern mathematicians and historians had reported about early usage.

Illustrations available:
- Front paper cover

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**Glaisher, James Whitbread Lee**

Report of the committee on mathematical tables.

- **Year:** 1873
- **Place:** London
- **Publisher:** Taylor and Francis
- **Edition:** 1st
- **Language:** English
- **Binding:** Original three-quarter bound leather over buckram; gilt stamped cover and spine
- **Pagination:** pp. [2], 175, [1]
- **Collation:** πβ–mε
- **Size:** 210x136 mm

The British Association for the Advancement of Science appointed a Mathematical Tables Committee to perform two distinct missions: 1/ prepare a catalog of all the mathematical tables available in various books, journals, scientific reports, etc. and 2/ reprint or compute any additional tables the committee felt were required. The committee consisted of the cream of British mathematicians of the day: A. Cayley, G. Stokes, W. Thomson—better known as Lord Kelvin, H. Smith and J. Glaisher. Every member, except Glaisher, was a Fellow of the Royal Society at the time. Apparently, it was Glaisher who did most of the work, and it soon became known as the Glaisher report. This committee report was the best reference work in the area until it was superseded by Fletcher, Miller and Rosenhead, *An index of mathematical tables*, New York, 1946.

Illustrations available:
- Title page

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**Glareanus, Henricus Loritus** (1488–1563)

*De VI. arithmeticae practicae speciebus*

- **Year:** 1539
- **Place:** Freiberg im Breisgau
- **Publisher:** Joannes Faber
- **Edition:** 1st
- **Language:** Latin
- **Binding:** later vellum
- **Pagination:** pp. 76, [2]
- **Collation:** A–D8
- **Size:** 157x99 mm
- **Reference:** Smi Rara, p. 191; Sab DBA, 27544

Glareanus was a well-known Swiss mathematician. His surname probably came from Glarus, the Canton of his birth. He was a professor at Basel (1515–1521) and the Collège de France (1521–1524) as well as later holding posts at both Freiburg and Basel again.

Smith (Rara) has characterized this book as an arithmetic with *nothing in the little book to commend it*. However, it does have one redeeming feature in that it devotes the first fourteen pages to the Latin names of the numbers complete with their various grammatical forms. It also illustrates the section on numeration with Roman, Greek and Arabic forms of the numbers. The date on the preface is 1538, but the colophon indicates 1539.

Illustrations available:
- Title page
- Latin forms
- Numeration
- Colophon
The “Levey” interest reckoner for bankers, brokers, merchants and manufacturers. Showing the interest on any amount from $1.00 to $10,000 at 3%, 4%, 5%, 6%, 7%, 8%, 10%, and 12% from one day to five years. Also days of grace: 33, 63 and 93 days.

Year: 1917
Place: Indianapolis, IN
Publisher: United States Bank Note Company
Edition: 3rd
Language: English
Binding: original cloth boards
Pagination: pp. [136]
Size: 222x141 mm

This is a ready reckoner for amounts up to $10,000 and interest rates from 3% to 12%.

Illustrations available:
- Title page

Glossbrenner, Alfred M.

The arithmachinist. A practical self-instructor in mechanical arithmetic

Year: 1898
Place: Chicago
Publisher: Office Mens’s Record Co.
Edition: 1st
Language: English
Figures: engraved portrait frontispiece and figures in text
Binding: original paper boards
Pagination: pp. 158
Size: 145x101 mm

Henry Goldman of Chicago created a small adding machine of the type generally known as chain setting because it has a number of chain loops (one for each digit) that can be moved with a stylus. The chains are wrapped around a register, so any movement of the chain will rotate (add to) the result register.

Goldman’s device, which he called Contostyle or Arithstyle in Europe and Arithmachine in America, was only able to add; subtraction was done by adding complementary digits. The machine was reset to zero by turning the large wheel seen in the illustration. This book was intended to both publicize the adding machine and act as a self-instructing manual. It is also interesting in that it contains a short, comprehensive history of calculation as an introduction.

Illustrations available:
- Title page
- Arithmachine
- Arithmachine for English currency
- Frontispiece Goldman portrait

Gluck, Simon E. (1921–); Harry J. Gray Jr. (1924–); C. T. Leondes and Morris Rubinoff (1917–)

Goldman, Stanford

Information theory

Year: 1954
Place: New York
Publisher: Prentice-Hall
Edition: 1st
Language: English
Binding: original cloth boards
Pagination: pp. xiii, [1], 385
Size: 212x140 mm

Goldman was a professor of electrical engineering at Syracuse University.

This textbook is based on the work of Claude Shannon and Norbert Wiener. It is highly technical and assumes that the reader has a familiarity with mathematics equivalent to that of a B.Sc. in electrical engineering.

Illustrations available:
- Title page

Goldman, Nicolaus (1623–1665)

Tractatus de usu proportionatorii sive circini proportionalis cum tabulis constructionum et usu linee munitionum, vulgo, fortificatoriae pro delineandis figuris regularibus et irregularibus. Nec non operibus campestribus et externis cum figuris aeneis ex conatu. [Title also in German] Eine ahnleitung Vom gebrauch des ebenpassers, Oder proportionalcirckels. Mit beygefügten Taflen zu dehr Theilung dehr Linien. Auch eingeleibtem gebrauche dehr Befestigungs oder
Goldmann, Nicolaus

This is a book on the sector. The text is unusual in that it is in both Latin and German in two parallel columns on each page. It describes the usual instrument of the day, attributing its invention to Galileo, with the exception that Goldmann added a *fortifica* (line of fortifications) scale for use in the design of defensive walls. The book is unusual in that it not only describes the instrument and gives examples of its use but also provides sixteen engraved plates that contain, besides the illustrations for the problems, complete tables for all the scales on this sector. This is such a scarce source of information that most of the plates have been captured in the illustrations for this volume. Those not scanned were just simple line drawings usually illustrating an elementary proportionality problem. Plate 1 shows the instrument.

Illustrations available:
- Title page
- Sample parallel text page
- Engraved plates

Goldstine, Herman Heine (1913–2004) and Adele Katz Goldstine (–1964)

*The electronic numerical integrator and computer (ENIAC).* In *MTAC, July 1946, vol. II, no. 15*

Year: 1946
Place: Lancaster, PA
Publisher: National Research Council
Edition: 1st
Language: English
Figures: photograph of ENIAC
Binding: library buckram
Pagination: pp. 97–110
Size: 226x146 mm
Reference: Ran ODC, p. 419
Herman Goldstine received his Ph.D. from the University of Chicago and was a key participant in the development of the ENIAC at the University of Pennsylvania, Moore School of Engineering. While serving as an officer in the U.S. Army from 1941 to 1945, Goldstine represented the U.S. Army sponsor of the ENIAC project, the Ballistic Research Laboratory at Aberdeen Proving Ground. Adele was Herman’s wife.

This paper was one of the earliest and best descriptions of the ENIAC and its operation.

Illustrations available:
- Photo of ENIAC
- Diagram of ENIAC units

G 55

**Goldstine, Herman Heine** (1913–2004) and **John Louis von Neumann** (1903–1957)

*Planning and coding of problems for an electronic computing instrument. Report on the mathematical and logical aspects of an electronic computing instrument Part II, Volume I*

- Year: 1947
- Place: Princeton
- Publisher: Institute for Advanced Study
- Edition: 1st
- Language: English
- Binding: original printed paper wrappers reinforced
- Pagination: pp. [2], ii, 69
- Size: 280x216 mm
- Reference: Ran ODC, p. 419

John von Neumann was one of the most gifted, creative and versatile mathematicians of modern times. He was educated in Budapest and Zurich and was a founding member of the Institute for Advanced Study at Princeton. During World War II, he was a leading consultant to the Manhattan Project at Los Alamos. He learned of the ENIAC project through Herman Goldstine when the machine was nearing completion. Indeed, as soon as the ENIAC was functioning, the first problem run on the machine was a highly classified non-linear flow problem from Los Alamos. Von Neumann quickly recognized the revolutionary implications inherent in the electronic computer and found time to become actively engaged in planning of future developments.
These reports, issued during the construction of the IAS computer at the Institute for Advanced Study, were very influential in establishing the discipline known today as computer science. As more experience was gained in actually using a stored program computer, these reports, that were written prior to there being a stored program computer anywhere, were archived in favor of the more practical experience of others. They were, however, for a few years, among the most widely circulated and read computer-related documents. They were essentially a report on the experiments in writing programs to ensure that the resultant machine would have a usable instruction set.

Illustrations available:
Title page

G 56
Gomes, Isaac

Nouvelle arithmétique ou moyen d’opérer toute espèce de calculs par une simple addition de quelques parties aliquotes, sans jamais recourir à la multiplication ni à la division ordinaires.

Year: 1817
Place: Bayonne
Publisher: M. Cluzeau
Edition: 1st
Language: French
Binding: modern half-leather over marbled boards, red leather label
Pagination: pp. 180
Collation: 1–11*12
Size: 195x120 mm

Gomes was, according to the title page, a wholesale merchant (négociant) in Bayonne.

This is an effort to popularize a simplified method of arithmetic in which numbers are broken up into pieces (i.e., 6,432 would be 6,000, 400, 30, 2) and the arithmetic done on the individual aliquot parts. He illustrates the method with examples from simple multiplication and division, the rule of three, interest and exchange calculations, etc. He compares his method with others that were popular at the time (Delile, Soulet and Guéheneuc, none of which are in this collection). He reproduces two letters at the end of the text, one a letter of support for the method from the Bayonne chamber of commerce and the other an order of twenty copies of the book from the same group.

The title page contains a presentation inscription from the author to Monsieur Faure.

Illustrations available:
Title page

Gonnella was obviously interested in calculating machines (see entry for Gonnella, Opuscoli mathematici nei quali si tratta ..., 1841), and this is his description of two adding machines. It is unopened, so it is difficult to know exactly how they operated, but one of them operated by entering the numbers via nine push-down levers. Each lever had an attachment on the end with one to nine teeth, and pushing lever \( n \) would cause \( n \) teeth to rotate a result register. The devices were more sophisticated than this short description implies.

Illustrations available:
Title page

G 58
Gonnella, Tito

Opuscoli mathematici nei quali si tratta ...
This volume is of interest primarily for the presentation note from Charles Babbage on the title page. Babbage was a frequent visitor to Italy and might well have obtained a copy of the work while there. Most of the work is concerned with a theoretical treatment of optics, but the final section describes an integrating machine—a form of planimeter. Two different approaches for the integrating device are shown, one using a cone with a pick-up wheel and the other a disk and wheel arrangement similar to that adopted by Vannevar Bush almost 100 years later (and others before him). Starting about 1825, a number of others had attempted to devise mechanical methods for performing integration of plane figures, but none of them proved sufficiently accurate until about the end of the nineteenth century. Not until the development of Bush’s torque amplifier in the 1930s could integrators be incorporated into more complex machines.

Illustrations available:
- Title page
- Diagram of the integrating mechanism
This is a comprehensive treatment on the design of sundials. It is specific for the latitude of London, England, but does provide a table of the latitudes of the other major cities and towns in Britain and Ireland. It gives careful instructions on creating the usual horizontal dial and then expands on this to show how dials at all other orientations may be created both arithmetically and by instruments. It contains the usual instructions for the creation of a reflective dial on the ceiling of a room but also goes into detail on how many other lines may be transferred onto the ceiling once a dial had been constructed on a wall or table. A typical apprentice (or even master) project was to inscribe dials on a regular solid cut from either wood or stone. Many books on dialing, including this one, explain how to create the dials, but this one is unique in containing a chapter on how to cut, from a solid block, the basic cube, tetrahedron, octahedron, dodecahedron, icosahedron and two other figures, one of twelve and the other of thirty faces. He also explains how to draw several different types of geometrical constructions (e.g., a line perpendicular to another, parallel lines, etc.), something most other books on dialing simply take for granted. A linear scale giving various lines that would be useful in dialing is pasted to the inside of the back cover, while in the other edition of this work in the collection it is bound in before the introduction.

Illustrations available:
- Title page
- Linear scale
- Sample dials

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**The art of shadows: or universal dialling; with tables exactly calculated for the Lat. of 51 deg. 30 min. viz. London. Teaching any person, tho’ of an ordinary capacity, and unlearned in the mathematicks, to draw a true sun-dial, upon any given plan, however situated, in respect of declination and declination. And a table shewing the distance of each hour-line from the meridian, upon all horizontal-dials. Likewise, arithmetical, spot, concave, convex, instrumental, reflex, cylindrical dialling. With the manner of ornamenting these several sorts of dialling with all useful furniture; and how to cut the five regular bodies, and two others, one of twelve rhombs, and the other of thirty.**

- Year: 1721
- Place: London
- Publisher: Richard Mount and Thomas Page
- Edition: 3rd
- Language: English
- Figures: 11 folding plates
- Binding: contemporary leather; rebacked; black leather label
- Pagination: pp. [8], 184
- Collation: A–B–M⁴ N⁴
- Size: 163x95 mm

See the entry for the 1711 edition of this work. This edition appears to be identical with the exception that the linear scale is bound in before the introduction rather than being glued to the back cover.

Illustrations available:
- Title page
Measuring made easy: or the description and use of Coggeshall's sliding-rule containing instructions for measuring all manner of timber, both by the common way, and the true way: with directions for taking the dimensions of trees, and the allowance for bark, &c. performed both by the rule, and by arithmetick. By which may be measured all manner of superficies, as board, glass, plastering, painting, wainscoting, tyleing, paving, land, both by the rule and arithmetick. Carefully corrected, and much enlarged by J. Atkinson, Sen.

Year: 1751
Place: London
Publisher: Printed for W. and F. Mount and T. Page
Edition: 4th
Language: English
Figures: 2 folding plates (instrument after A2)
Binding: contemporary panelled leather; rebacked
Pagination: pp. 96
Collation: A–F
Size: 161x102 mm

Both authors were teachers of mathematics in London. Good was also a land surveyor and dial maker, and Atkinson is known to have been an instrument maker.

This later edition of Good’s work does contain an illustration of Coggeshall’s sliding rule. For discussion of Scamozzi’s lines, see the entry for Coggeshall, Henry; The art of practical measuring, 1767.

Illustrations available:
Title page
Ruler illustration
G 64

**Goodykoontz, Jasper**


- **Year:** 1892
- **Place:** New York
- **Publisher:** J. Goodykoontz
- **Edition:** 1st
- **Language:** English
- **Figures:** engraved portrait frontispiece
- **Binding:** original paper boards
- **Pagination:** pp. 88
- **Size:** 186x146 mm

This is both a ready reckoner and reference work. It was, according to the title page, done by reproducing the author’s own hand written-notes. It begins with an extensive set of calendar tables, including the Jewish and Islamic calendars, and then contains everything from interest tables, suitable verses to inscribe in cards or on tombstones, a dictionary of arithmetic terms, a large table of weights and measures (including type sizes and heights of waterfalls), to maps of the heavens and various velocities (a sparrow can fly at 150 mph, and a spot on the sun’s equator revolves at over 6,000 feet per second). The frontispiece shows an impressive portrait of the author.

Illustrations available:
- Title page and frontispiece
- Jewish and Islamic calendars

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G 63

**Good, John** (1690–a.1750); **James Atkinson, Senior** (1660–a.1724)

*Measuring made easy: or, the description and use of Coggeshall’s sliding-rule. Containing instructions for measuring all manner of timber, both by the common way, and the true way: with directions for taking the dimensions of trees, and the allowance for bark, &c. perform’d both by the rule, and by arithmetick. By which may be measured all manner of superficies: as, board, glass, plastering, painting, wainscotting, tyling, paving, land, &c. both by the rule and arithmetick. To which is now added, the description of Scamozzi’s lines, with their use in finding the length and angles of rafters, hips, collar-beams &c. Carefully corrected, and much enlarg’d by J. Atkinson, Sen.*

- **Year:** 1760
- **Place:** London
- **Publisher:** W. & J. Mount, T. Page, and Son
- **Edition:** 5th
- **Language:** English
- **Figures:** 2 folding plates
- **Binding:** modern panelled leather; gilt spine
- **Pagination:** pp. 96
- **Collation:** A–F³
- **Size:** 166x105 mm

This edition appears identical to the fourth of 1751.

Illustrations available:
- Title page

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G 65

**Gordon, William** (1717–1793)

*Institutes of arithmetic, elementary and practical: The mensuration of surfaces and solids, and the use of logarithms in all parts of arithmetic: To which are added, tables of annuities, lives, &c. The whole designed as a directory of text-book for the use of schools.*
Gordon was a teacher of arithmetic at the Mercantile Academy in Edinburgh.

This arithmetic is notable for its thoroughness of treatment of each subject. For example, the tables showing conversion factors between various European systems of weights and measures often contain forty entries or more, and the problems involving interest and bank charges require the student to work through almost a hundred deposits and withdrawals in order to calculate the amounts owed on a particular day. While the title implies that logarithms are a major portion of the text, they are relegated to a few pages in an appendix. There is no table of logarithms, but students are advised:

For an easy method of constructing a table of logarithms, see the Universal Accountant.

Illustrations available:
Title page
Table of corn measure
Gourrich, George, editor

Proceedings of the electronic computer symposium, April 30–May 1, 1952 at University of California Los Angeles. Sponsored by the Los Angeles IRE Professional Group on Electronic Computers in cooperation with the Department of Engineering, University of California, Los Angeles

Year: 1952
Place: Los Angeles
Publisher: Los Angeles IRE Professional Group on Electronic Computers
Edition: 1st
Language: English
Binding: ring bound
Size: 280x213 mm

Gourrich was an employee of Northrop Aircraft, Inc.

These are the proceedings from an IRE (later known as the IEEE Computer Society) symposium. It contains the papers, panel discussions and comments made during the meeting. Of historical interest is a five-page Los Angeles area computer industry directory as of May 1952. One of the most interesting papers was The human computer's dreams of the future by the computer pioneer Ida Rhodes of the National Bureau of Standards. In it, she predicts the development of portable computers (still at least thirty years away) and indicates:

I like to think of the day when one of those precious toys would be sitting on my desk, so that I would not have to go down on my knees begging for a few minutes’ use of the computer.

This copy was owned by the computer pioneer Grace Hopper.

Illustrations available:
Title page
Front cover with ownership stamp of Grace Hopper
Computer power chart by Harry Huskey

Graffigny, François d’Issembourg d’Happoncourt de (1695–1758)

Lettres d’une Peruvienne

Year: 1747
Place: Paris
Publisher: A Peine
Edition: 1st
Language: French
Binding: contemporary half marbled calf; decorated gilt spine
Pagination: pp. [2], viii, 337, [1]
Collation: πa’A’B’–2D’2E’2F’(-2F4)
Size: 139x75 mm
Reference: Loc Aq, p. 37

Graffigny, a French author and friend of Voltaire, became famous for this work, which helped popularize the epistolary novel on the continent.

This is a novel about an Inca princess brought to France against her will. The story of her faithfulness to her Peruvian lover is blended with social satire, feminist protest and romance. To enhance the plot, it was claimed...
to have been translated from a series of Peruvian quipus. It was not properly understood at the time that the quipu was a numerical recording device and not a form of writing.

Illustrations available:
- Title page

Graffigny, François d’Issembourg d’Happoncourt (1695–1758)

_Lettres d’une Peruvienne_

- Year: 1761
- Place: Paris
- Publisher: Duchesne
- Edition: 2nd
- Language: French
- Figures: v.1 & v.2: engraved frontispiece & engraved title
- Binding: contemporary marbled calf; gilt spine chipped
- Pagination: v.1: pp. ix, [4], 4–336; v.2: pp. 372
- Collation: v.1: a(-a6)A–O 12; v.2: A–F 12 G 6 H–Q 12
- Size: 154x86 mm

This is the second edition of this French novel, this time in two volumes.

Illustrations available:
- Title page and frontispiece

Grammateus, Henricus

See Schreiber, Heinrich; _Ayn new kunstlich buech_...

See Schreiber, Heinrich; _Libellus de co(m)positone regularum pro vasor(um) mensuratione._

Grant was an industrialist who is regarded as the father of American gear cutting.

Joseph Wilson, who edited this work, was the associate engineer and architect for the design and construction of the main building and machinery hall for the 1876 Centennial Exhibition in Philadelphia.

The centennial exhibition of 1876 was the largest held up to that time in the United States. Grant, according to the text, had never heard of Babbage or Scheutz (incorrectly noted as Schentz in two places) when he began to investigate a difference engine. After the exhibition was closed, the question arose of exactly what to do with the exhibits. They were eventually given to the Smithsonian Institute and formed the basis of their now renowned collections. While the Smithsonian owns several of Grant’s more elementary calculating machines, no trace can be found of this difference engine. The engraving found in this work is the only illustration of it ever made. At least two serious attempts have been made to scour the Smithsonian warehouses, but no indication of what
happened to the machine has been found. One conjecture is that it was lent to the University of Pennsylvania. Another is that it was sent to the Smithsonian, and someone, not realizing what it was, disposed of it. A third, perhaps more likely, explanation is that Grant himself took it back to complete some minor finishing work. As his business was beginning to prosper, he likely put it aside and simply never got around to the final work. It later became obvious that difference engines were more trouble than they were worth, and thus Grant likely used the metal in his gear works.

Illustrations available:
Title page of volume 3 (color)
The difference engine
The text (5)

Grant, George Barnard (1849–1917)


Year: 1874
Place: New Haven
Publisher: American Journal of Science and Arts
Edition: 1st
Language: English
Binding: contemporary buckram
Pagination: pp. 277–284
Size: 226x134 mm
Reference: Ran ODC, p. 420

This article describes Grant’s machine, also known as the grasshopper adding machine, although that term is also applied to another of Grant’s experimental calculators. Several copies were built and are to be found in the Smithsonian and private collections, but the machine was never placed in commercial production. Grant was a skilled mechanic who understood the finer points of timing movements. This is the reason that the two major cylinders on the machine are of different sizes, although they rotate in unison. Grant was able to get this device to operate rapidly (… a poorly made apparatus has been worked at the rate of 10,000 operations per minute with perfect accuracy) and may well have used this as part of his experiments to produce other calculating machines. However, there does not appear to be any relation between this mechanism and the one used for his difference engine (see Grant, 1876). The photograph
In the illustrations is of a machine in the collection of Robert Otnes.

Illustrations available:
- Grant’s machine
- Explanation from article

G 72

Grant, George Barnard (1849–1917)


Year: 1871
Place: New Haven
Publisher: American Journal of Science and Arts
Edition: 1st
Language: French
Binding: original paper wrappers
Pagination: pp. 113–117
Size: 235x148mm
Reference: Ran ODC, p. 420

In this paper, Grant describes his thoughts on the construction of a difference engine. He had not yet built one but had experimented with various parts. He speculated that an engine with the same capacity as the one by Scheutz would be three feet long, twelve inches high, and eight inches wide, and the cost is estimated at from two to three thousand dollars. Grant eventually built his machine and exhibited it at the Centennial Exhibition in Philadelphia (see entry for [Grant]; Calculating machine. In The masterpieces of the centennial international exhibition illustrated. Volume III, pp. 27–32). The resulting machine was much larger than estimated!

Illustrations available:
- None

G 73

Grant, George Barnard (1849–1917)

A performance on the “ciphering hand-organ.”

Year: 1895
Place: Lexington, MA
Publisher: George B. Grant
Edition: 1st
Language: English
Binding: original paper wrappers
Pagination: pp. 40
Size: 190x148 mm

The ciphering hand-organ was a calculating machine invented and produced by Grant. While it went into production, it was not capable of competing with the Odhner-type machines and today is very rare. This is the advertising literature for the machine. It gives only limited technical information and contains a number of endorsements.

Illustrations available:
- Cover page (color)
- Machine (color)

G 74

Graunt, John (1620–1674)

Natural and political observations mentioned in a following index and made upon the bills of mortality. With reference to the government, religion, trade, growth, air, diseases, and the several changes of the said city.

Year: 1676
Place: London
Publisher: John Martyn
Edition: 5th
Language: English
John Graunt was the eldest son of a London draper (cloth merchant) who seems to have prospered in that occupation. He was a respected member of the Draper’s Company and active in City of London government. Encouraged by his friend, William Petty, he became interested in the patterns of mortality to be derived from the weekly reports produced by each parish in the city. With the publication of this, his only, work in 1662, he was nominated as one of the first Fellows of the Royal Society by Charles II. He fell on hard times after he suffered a major loss of property in the Great Fire of London and died a few years later of jaundice (a category he had made a part of his mortality tables).

This work, here in the fifth edition, may be considered one of the foundation stones of both the fields of statistics and demographics. It is the first to survey both medical and vital statistics. From his study of the weekly bills of mortality, Graunt produced the first life tables, one hundred years before the first commercial life insurance company was created.

Editions subsequent to Graunt’s death were edited by William Petty, that has led several bibliographers to consider that Petty wrote the entire work. Petty added a section on mortality statistics in Paris to this edition.

A clipping from the *London Times*, Nov. 16, 1962, is pasted in the front. It reports on a meeting of the Royal Society celebrating the tercentenary of the first edition of this work.

Illustrations available:
- Title page
- Mortality table
- Conclusions

### Natural and Political Observations

**Observations**

*Mentioned in a following INDEX, and made upon the Bills of Mortality.*

**By Capt. JOHN GRAUNT, Fellow of the Royal Society.**


----

*November at Tinturin, 1662*

*Contentious with Editor.*


**LONDON,**

*Printed by John Martyn, Printer to the Royal Society, at the Sign of the Bell in St. Paul’s Church-yard. MDCCLXVI.*
logarithms were not of sufficient accuracy, and tables containing more digits are often difficult to find, let alone to use. This book describes a method for obtaining the logarithm of any number to twelve digits by the use of a simple ten-page table. The method involves breaking the number down into factors, determining the logarithms of these factors, and then adding those logarithms together to arrive at the desired value. Gray describes the method, gives examples and briefly surveys the history of this and other similar algorithms.

A second edition was published in 1876.

Illustrations available:
Title page

G 76
Gray, Thomas Stretcher (1906–1992)


Year: 1931
Place: Philadelphia
Publisher: Franklin Institute
Edition: 1st
Language: English
Binding: contemporary black buckram
Pagination: pp. 77–102
Size: 234x150 mm

Gray was a research associate at MIT.

See entry for *Abdank-Abakanowicz*, 1886, for general information on integragraphs. In this machine a mask was constructed in the shape of the graph of the function, and a vertical (y direction) line of light was passed across (x direction) the mask. A photocell recorded the amount of light received on the far side of the mask, from which an approximation (accurate to 2–5 percent) of the integral of the function could be found. The mechanism was flexible in that two or more masks could be put in series, and the resulting output would be a combination of the functions.

Illustrations available:
Illustration of the principle of the machine

G 77
Greenleaf, Benjamin (1786–1864)

*A key to the national arithmetic, exhibiting the operation of the more difficult questions in that work; for the use of teachers only.*

Year: 1856
Place: Boston
Publisher: Robert S. Davis
Edition: unknown
Language: English
Binding: original cloth boards
Pagination: pp. 206, [10]
Collation: 1–186
Size: 187x115 mm

Greenleaf was the principal of the Bradford Teachers’ Seminary. He wrote many elementary textbooks on arithmetic, algebra, geometry and trigonometry, several of which are in this collection.

This is a teacher’s manual giving the answers to the problems in the student’s text.

Illustrations available:

Title page

A

KEY

to the

NATIONAL ARITHMETIC,

EXHIBITING THE OPERATION OF

THE MORE DIFFICULT QUESTIONS

IN THAT WORK,

FOR THE USE OF TEACHERS ONLY.

IN BRIEF, BRIEF, BRIEF, BRIEF.

BOSTON:

PUBLISHED BY ROBERT S. DAVIS & CO.

NEW YORK, N., ROCHESTER, A. R., ROCHESTER, ROCHESTER & &.

PHILADELPHIA, 1856. 1854.

G 78
Greenleaf, Benjamin (1786–1864)

*A mental arithmetic, on the inductive plan; being an advanced intellectual course, designed for common schools and academies.*

Year: 1879
Place: Boston
Publisher: Robert S. Davis
Edition: late
This is an elementary school arithmetic consisting of several hundred problems, including fractions.

Illustrations available:
Title page

This is an arithmetic that begins with numeration and ends with business arithmetic. It also contains short sections on geometry and physical problems with levers.

Illustrations available:
Title page

This arithmetic was designed for use in primary schools. It begins with simple tasks, such as counting the number of cups in a row, and proceeds slowly through many exercises to multiplication and division, occasionally with fractions.

Illustrations available:
Title page
This edition appears little changed from the one in 1849. An inscription at the front warns:

Steal not this Book my honest friend for fear the gallows be your end my friend.

Illustrations available:
- Title page
- Inscription

Greenwald, Sidney (1914–); Ruth C. Haueter (1921–); and Samuel Nathan Alexander (1910–1967)

Gregory was a brilliant Scottish mathematician whose role in British mathematics was not fully appreciated until the 1930s. He is now ranked as the second best mathematician of his day, after Newton. Among his contributions, Gregory anticipated Newton in discovering both the interpolation formula and the general binomial theorem. He discovered Taylor expansions more than forty years before Taylor, and he solved the Keplerian problem of how to divide a semi-circle by a straight line through a given point of the diameter in a given ratio.

Gregory attempted to establish an observatory at St. Andrews and traveled to London to purchase the necessary astronomical instruments. Several of these, including the world’s largest (two-foot diameter) astrolabe by Humphrey Cole, a smaller Leybourn quadrant, and a tiny Newtonian reflecting telescope, are still extant at St. Andrews. Soon after his return from London with the instruments, he lost his job due to internal conflicts within the university. Gregory then took the position of professor of mathematics at Edinburgh—a position he did not live to enjoy as he died a year later.

Gregory studied in Italy from 1664 to 1667 and while there wrote two works, *Vera circuli et hyperbolae quadratura*...
Gregory, James

Gregory XIII (Ugo Buoncompagni) was Pope from 1572 to 1585. He was originally a professor of law in Bologna and, in 1539, moved to Rome. He was one of the theologians of the Council of Trent and was made a cardinal in 1565. In 1582, after consultation with the leading scientists of the day, he issued the edict founding the calendar name after him.

This publication, from the year the new calendar was to be used, contains the Papal edicts, an explanation of the changes, tables for determining the golden number and epact for any given year (to calculate the date of Easter and other movable Christian feasts), explanations of the new rules for leap years, tables to show the dates of Easter and various other festivals for any given year, and a monthly calendar indicating saints days, etc. The tables are printed in red and black.

Illustrations available:
- Title page (color)
- Calendar page for February (color)
- Colophon (color)

Kalendarium Gregorianum perpetuum.

Year: 1582
Place: Rome
Publisher: Dominica Basa
Edition: 1st
Language: Latin
Binding: later marbled paper boards
Pagination: ff. [36]
Collation: A–D'E'
Size: 162x98 mm

(Gregory XIII (1502–1585)]

Kalendarium Gregorianum perpetuum.

February, G 83

Colophon, G 83
Rene (or René) Grillet was a clock maker to Louis XIV. The major reference for French clock makers (Tardy and Tardy, *Dictionnaire des Horlogers Francais*, 1971-1972, Paris) only notes his existence and that few details of his life or work are known. F.A.P. Barnard (*Report on the Processes of the Industrial Arts and Apparatus of the Exact Sciences*, 1869) states that Grillet took his machine on a tour of country fairs, charging a silver coin to see it operate.

This volume describes several different inventions, but the majority of it is devoted to his arithmetic machine. It consists of a simple box containing a set of Napier’s bones on cylinders similar to those created by Schott (*Organum mathematicum*, 1668). The lid of this box contained a number of dials that could be used in place of pen and ink to record, and then add up, the partial products. There are no connections between the dials; they acted simply as a register for recording a number.
Grisogono was a native of Zara in Dalmatia, which was at that time part of greater Venice.

The first major book on double-entry bookkeeping was the famous 1494 *Summa de arithmetica* by Pacioli—although there was a brief mention of the process in a book on commercial arithmetic by Cotrugli Raugeo some thirty-six years prior to Pacioli. After Pacioli, a number of small works were published but nothing major until Alvise Casanova produced *Specchio lucidissimo* in 1558. This work by Grisogono is described by Peragallo as a faithful reproduction of Casanova’s book. Although Grisogono indicates in his introduction that he intends to modernize Casanova’s work, the changes are minor, e.g., using the preposition *A* rather than *Per* in the samples of books he uses to illustrate the text.

Illustrations available:
- Title page
- Sample account

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**G 86**

**Grimme, Natalis & Co.**

*The Brunsviga calculating machine.*

- Year: n/d
- Place: n/p
- Publisher: Charles Bradbury
- Language: English
- Binding: original paper wrappers
- Pagination: [8]
- Size: 228x167 mm

This is advertising literature for the Brunsviga.

Illustrations available:
- Title page

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**G 87**

**Grisogono, Simon**

*Il mercante arricchito del perfetto quaderniere: overo, specchio lucidissimo, nel qual si scopre ogni questione, che desiderar si possa per imparare perfettamente a tenere libro doppio.*

- Year: 1609
- Place: Venice
- Publisher: Alessandro Vecchi
- Language: Italian
- Binding: contemporary leather
- Pagination: ff. [76], 54 (mismarked 2 as 1, 29 as 31), [4]
- Size: 170x122 mm
- Reference: Redi BMI

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Illustrations available:
- Title page
- Sample account

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**G 88**

**Groesbeck, John (1834–1884)**

*The Crittenden commercial arithmetic and business manual. Designed for the use of merchants, business men, academies, and commercial colleges.*

- Year: 1867
- Place: Philadelphia
- Publisher: E. C. & J. Biddle
- Language: English
- Binding: original cloth boards, gilt embossed
- Pagination: pp. 216
- Size: 190x124 mm

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Groesbeck was the principal of Crittenden’s Philadelphia Commercial College.

This work deals entirely with commercial applications of arithmetic and business arrangements such as the forms of stock certificates, powers of attorney, etc.

Illustrations available:
- Title page

G 89

**Groggnier, Louis Furcy**

*Notice sur C. M. Jacquard*

- Year: 1836
- Place: Lyon
- Publisher: J. M. Barret
- Edition: 1st
- Language: French
- Figures: engraved portrait frontispiece
- Binding: original printed paper wrappers
- Pagination: pp. 52
- Size: 214x138 mm

Jacquard died in 1834, and this was his éloge from La Société Royal d’Agriculture, Histoire Naturelle et Arts Utiles de Lyon. The frontispiece is an engraved portrait of Jacquard.

Illustrations available:
- Title page
- Frontispiece

**Recueil d’ouvrages curieux de mathematique et de mecanique, ou description du cabinet de Monsieur Grollier de Servière.**

- Year: 1719
- Place: Lyon
- Publisher: David Forey
- Edition: 1st
- Language: French
- Figures: 85 engraved plates (numbered as 88 plates because 39, 48 and 76 were never issued); title page in red and black
- Binding: contemporary mottled leather; gilt spine; red leather label; gilt border; embossed gilt arms
- Pagination: pp. [28], 102, [10]
- Collation: a<sup>e</sup>v<sup>e</sup>V<sup>e</sup>–O<sup>e</sup>
- Size: 242x185 mm

Nicholas Grollier de Serviere was born in Lyon in 1596 and, at the age of 14, joined the military. While serving in Italy, on his first tour of duty, he lost an eye. This misfortune did not seem to prevent him from continuing his military career. He eventually returned to France, where he became famous for his ingenuity in devising solutions (usually of some mechanical kind) to military problems. Upon retirement he returned to Lyon, and there devised many other mechanical devices, most notably clocks. He died, aged 93, in 1689. His grandson Gaspard, author of this work, collected together the various ornaments and models, many actually constructed by his grandfather, and published this book detailing the extent of his mechanical ingenuity. An article by Van Noorden in *The Strand Magazine*, XI, pp. 227, details the life of the elder Grollier.

The work begins with a number of ornaments, mostly some form of lathe turning, all very delicate. The second
and major section is on clocks, and the third consists of sixty-six machines of various types—water pumps, bridging devices, the famous revolving reading stand, etc.

Illustrations available:
- Title page (color)
- Turnings
- Clock (falling ball)
- Reading stand

**Recueil d’ouvrages curieux de mathématique et de mécanique, ou description du cabinet de Monsieur Grollier de Serviére.**

*Grollier De Servière, Gaspard (1677–1745)*

**Recueil d’ouvrages curieux de mathématique et de mécanique, ou description du cabinet de Monsieur Grollier de Serviére.**

Year: 1751
Place: Paris
Publisher: Charles Antoine Jombert
Edition: 3rd
Language: French
The second edition of this work, containing eight additional plates, was issued at Lyon in 1733. This third edition is often confused with the second because the title page carries the indication *seconde edition* (implying the augmented edition), but this third edition was actually issued in Paris in 1751.

Illustrations available:
- Title page

**Grosch, Herbert Reuben John, editor**

*See [IBM - International Business Machines Company]; Proceedings-scientific computation forum -1948, 1950.*

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**Transactions of the symposium on computing, mechanics, statistics and partial differential equations**

As in many conference proceedings from the mid-twentieth century, the papers were not always as presented but as modified, in light of comments, after the conference. The speakers often went on to make major advances in the field and, this factor gives the talks they gave in 1955 an interest that they would not otherwise possess.

Illustrations available:
- Title page (color)
This arithmetic begins with the four basic operations on the integers and continues to more advanced subjects such as fractions, ratios, proportions and progressions. The second major section deals with operations such as the rule of false position and the calculation of square and cube roots. It ends by considering some elementary algebra, which was at the time known as coss or, as here, Cossica seu Albegra.

Illustrations available:
Title page

This is a quite comprehensive collection of tables. Trigonometric and logarithmic tables occupy the first third of the work. The last part consists of uncommon tables of all types, mainly calendrical, military, horary, and geographical.

Illustrations available:
Title page

G 95

Gruner, Anton [Chas. Salter, translator]

Power-loom weaving and yarn numbering, according to various systems, with conversion tables

Year: 1900
Place: London
Publisher: Scott, Greenwood & Co.
Edition: 1st
Language: English
Binding: original cloth boards; gilt spine and covers
Pagination: pp. xii, 152, 16
Collation: a\textsuperscript{a}b\textsuperscript{c}–9\textsuperscript{a}10\textsuperscript{c}y\textsuperscript{a}
Size: 186x121 mm

Nothing is known of Gruner except that, according to the title page, he was of the Imperial Royal Weaving School at Asch (in southern Germany near Augsburg).

This book describes the use of power looms (including Jacquard looms) and the techniques that must be used to set up a weaving. It was translated from the
German original by Slater. The pattern diagrams are multicolored.

Illustrations available:
Title page
Patterns (color)

A coordinatograph is a frame that can be placed over a drawing or map and, by means of a movable carriage with a microscope, can accurately determine coordinates. This is a reprint of an article describing the device and some hints on its use.

Illustrations available:
Title page
Coordinatograph

Grünewarth, Artur (1882–)

Coradi's detail coordinatograph

Year: 1912
Place: Weimar
Publisher: Zeitschrift für Vermessungswesen
Edition: 1st

Language: English
Binding: original paper wrappers, frayed and loose
Pagination: pp. 8
Size: 242x168 mm
Grüson, Johann Philipp (1768–1857)

Grosses Einmaleins von Eins bis Hunderttausend.
Erstes Hefte von Eins bis Zehntausend.

Year: 1799
Place: Berlin
Publisher: F. T. Lagarde
Edition: 1st
Language: German
Binding: contemporary leather
Pagination: pp. [4], 40
Collation: π 2 1–10 π 2
Size: 467x301 mm
Reference: Pogg Vol. I, p. 963; Hend BTM, #1.0, p. 22

Grüson was a professor of mathematics at a military academy in Berlin and held several other similar teaching positions at various times. According to Poggendorff (Biographisch-literarisches handwörterbuch ...), Grüson invented a calculating machine, but no details are given.

This is a large format multiplication table containing the products of all integers from 1 to 999 by the digits 1 to 9. Because of the large format, the title page was captured in two images.

Illustrations available:
Title page (two images)
Sample of table page

Tavole gnomoniche per disegnare in diversi modi gli orologi solari sopra piani orizzontali, e verticale, che assegnano le ore esattissime, tanto all’uso Italiano, egualmente corrispondenti a quelle della campana, quanto all’uso spagnuolo, ed astronomicalo; così pure per gli orologi riflesi, e ne’ quadranti. Come anche si dimostra il modo di delineare la linea meridiana che assega in quanti gradi, e minuti dell’ ecclittica, si trova il sole in cadaun giorno dell’anno. Con diversi altri capitoli attinenti a questa scienza.

Year: 1762
Place: Milan
Publisher: Pietro Agnelli
Edition: 1st
Language: Italian
Figures: 1 folding plate; engraved portrait frontispiece
Binding: contemporary vellum, hinges split at top and bottom
Pagination: pp. [8], 9–229, [3], 229–257, [1]
Collation: *A 6 B 6 C–N 8 O 12 P 9 Q 6
Size: 365x244 mm
Reference: Redi, 638
Guerrino was a member of the Belle Arti Academy in Milan and is known to have written several works on mathematics and astronomy.

This work on dialing begins by explaining the basic facts about the sun casting shadows and how these depend on the orientation of the dial, etc. The majority of the work—from page 49 to the end—consists of tables that would allow even a novice to create a simple dial. The frontispiece is a large copper engraving of the author.

Illustrations available:
Title page
Table page
Frontispiece
Illustration of a quadrant

Edmund Gunter was born in Hertfordshire in 1581 and died in London on December 10, 1626. He enrolled in Christ Church College Oxford in 1599 and graduated with degrees in both arts and mathematics in 1603. He remained at Oxford until 1615 when he received a degree in divinity. Ordained, Gunter became rector of St. George’s church in Southwark, a position he held until his death. In addition to this post, he assumed the position of professor of astronomy at Gresham College, London, in 1619. By this time his mathematical skills were so well known that he was elected to the position only two days after the resignation of his predecessor.

Gunter was a leader in the movement to simplify computation by creating aids and instruments for all practical arithmetical and navigational needs of the day.

Through another professor at Gresham College, Henry Briggs, he was introduced to logarithms. He was one of the first to inscribe a logarithmic scale onto a strip of wood (known as Gunter’s line of numbers, or simply a Gunter), thus permitting multiplication and division by means of dividers. Gunter’s scale was an important step in the development of the slide rule. He is also credited with the invention of the surveyor’s chain (known as Gunter’s chain), which was 22 yards long and had 100 links, making an acre ten square chains. He also improved the scales on the sector, invented a form of the quadrant, and improved the surveyor’s table.

This table of the logarithms of sines and tangents was not the first published by Gunter. His first was issued in 1620, but this issue was certainly the first in a small portable format. Tables of logarithms of integers occupy the first twenty-two leaves of this volume, and the trigonometrical tables fill the rest. No explanation of the use of the tables is given, simply an English title page for each.

Illustrations available:
Title page
Sample table page
This volume is Gunter’s third publication. The previous two were his table of the logarithms of tangents (the first ever published) and a description of a major set of sundials he had produced for the royal family in Whitehall gardens. This latter volume was his only publication that was not republished many times—some long after his death.

While he is often credited with the invention of the sector (see, for example, John Ward, The lives of the professors of Gresham college), there is no doubt that both Galileo, in Italy, and Thomas Hood, in England, had published earlier. Indeed it was Hood who coined the name sector for this instrument. Sometime around 1606, Gunter discovered the existence of the sector and wrote a description of it in Latin. This was never published, but was well known to many from manuscript copies. In this published version, at the end of his description of the sector, Gunter states that this work is simply a translation of his earlier Latin manuscript version

…partly to satisfy their importunity, who not understanding the Latin, yet were at the charge to buy the instrument.

It is reasonable to assume that Gunter learned of the sector either while a student at the Westminster School (Hood was living, and occasionally giving public lectures, in London at the time) or while a student at Oxford. In none of his publications does he ever credit anyone else with the invention (he does, however, acknowledge being familiar with the works of Dr. Hood during his description of the cross-staff later in this volume).
Although he didn’t invent the sector, it is certainly a fact that Gunter was the person most responsible for its popularity in England. His clear explanations were usually oriented towards very practical problems in mathematics, dialing, astronomy and navigation. In addition, the sectors he describes were very well designed and had their scales much more clearly marked. They were far more capable of precise usage than many others of that era. The basic design of scales on Gunter’s sector (often referred to as an *English sector*) remained fixed until the instrument fell into disuse and was no longer included in the standard set of mathematical instruments about the beginning of the twentieth century. It is understandable why this book was reprinted so often. It not only deals with realistic problems but also offers several different ways of approaching them, either with the sector or by the inclusion of various tables. In the section dealing with the cross-staff, Gunter mentions (p. 61) … my tables of artificial sines and tangents (logarithms of sines and tangents), but they are not included in this edition. Later editions of this work (e.g., 1636) include these tables.

Sectors produced on the continent of Europe were often very decorative (e.g., see the illustration of Galileo’s sector in the entry for Galileo; *Le operazione del compasso geometrico et militare*, 1640) while, in contrast, the Gunter sector was utilitarian. The continental sectors usually had each scale represented as a single line, with major divisions numbered and minor divisions represented by small pin pricks. Gunter’s experience with mathematical and astronomical instruments led him to produce the scales with minor divisions clearly marked by lines in such a way that there could be no doubt as to the value being measured (compare the sector of this volume with that of any illustration of Galileo’s).

This work is actually composed of two independent works. The first, on the sector, and the second, on the cross-staff, are both divided into three *bookes*. The sector is first explained, then sections are devoted to each of the lines and the problems that are solvable by them. The second work details the cross-staff and the lines inscribed upon it. These were often quite similar to the single-line scales found on his sector and also included a scale of logarithms (which became known as Gunter’s line of numbers) and two scales of logarithmic sines and tangents. This part of the book contains the description of a few other instruments, almost as afterthoughts. The last of them was a small quadrant marked with calendrical and astrolabic scales, which later became known as *Gunter’s quadrant*.

All of these instruments are shown in use on the title page. This particular engraving was used for many of the reprints of Gunter’s work, the central title being changed and various inscriptions being added to the shield at the base.

Illustrations available:
- Title page
- Sector
- Cross staff
- Cross staff logarithmic scales
- Gunter’s quadrant.
This second edition of Gunter's famous work is considerably expanded from the first edition. The major additions are the table of artificial (logarithm) sines and tangents and a table of logarithms of the first 30,000 integers that had been calculated by his friend and colleague Henry Briggs. The artificial sines and tangents had been previously (1623) published as a separate volume. Although he has an extensive introduction to the tables, for this edition he has also added a small use of the canon, in which he simply indicates that logarithmic values are to be added and subtracted rather than multiplied and divided. He also adds in a diagram of a protractor that was omitted from the first edition.

The frontispiece announces a newe Treatise of Fortification not before Printed. This is a twenty-five page addition to the introduction to the tables.

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explaining the basic rules of fortification (e.g., lines of defense may not exceed the reach of a musket, which is said to bee xij score yards and those make 720 foot), Gunter provides a short description of how, once the basic size and shape (a square, pentagon, hexagon, etc.) of the fort are set, the angles of various flanques, bulwarkes, and gorges may be determined.

Illustrations available:
- Frontispiece
- Title page
- Protractor
- Page from log sines and tans
- Page from Briggs’ logs of integers
- Use of the canon

Gunter, Edmund (1581–1626) [William Leybourn (1627–1716), editor]

The works of Edmund Gunter: containing the description and use of his sector, cross-staffe, bow, quadrant; with a canon of artificial sines, tangents and logarithms, and the use thereof in, trigonometry and fortification. To which is added the description and use of another sector and quadrant invented by Sam Foster sometime Professor of Astronomy in Gresham College London ...

Year: 1662
Place: London
Publisher: Francis Eglesfield
Edition: 2nd
Language: English
Figures: engraved frontispiece title page; 2 plates (1 folding) (p. 1 & f.V); 1 volvelle (p. 64)
Binding: newer half leather over old boards; rebacked; original red morocco label
Pagination: pp. [10], 73, 72–86, 89–136, 139–152 (misnumbered 117 as 115, 137 as 139,
Size: 188x144 mm

Edmund Gunter died in 1626 at the early age of 45, just two years after publishing the volume upon which this work is based. This book was so popular that Samuel Foster and William Leybourn, both mathematicians in their own right, edited and reissued the work several times. Each added something to this work, but as John Ward (Lives) noted:

Mr. Leybourn has inserted, as he sais, divers necessary things and matters through the whole work. But it is to be wished, he had so printed them, that they might have been distinguished from what belongs to his authors.

This criticism seems unfounded, as a majority of the added material is relatively clearly identified. It is usually found in an appendix or in an extra section added to the main textual body. Other changes are little more than the editing of Gunter’s text and the provision of additional problems and illustrations.

Samuel Foster (ca.1600–1652) was, like Gunter before him, the professor of astronomy at Gresham College. He actually held the post twice (1636 and 1641–1652), resigning the first time after only ten months. He was given the post a second time when his successor left to marry (only single men could be professors). Although Foster published only two items during his lifetime, he left at least six works in manuscript. These Leybourn and others published posthumously. Two of these posthumous works appear here: a modification of Gunter’s sector and a quadrant with new scales.

Foster’s sector is of particular interest in that it does not have the usual pair of identical scales (one on each leg), but only a single version of each. Foster, in his introduction to this device, indicates that he believes this to be an advantage because he can put all the required scales on one side of the instrument. This single-scale scheme had been used before (see entry Bramer, Bericht und gebrauch Eines Proportional Linials: Neben kurzem Underricht Eines Parallel Instruments, 1617). However, it is not as accurate as the double scales. In this form, the user takes readings (using dividers) from the appropriate scale, then opens the sector (as in the usual method for performing operations such as multiplication and division) by placing one foot of the dividers in the

Foster’s sector, G 103
required scale and measuring the distance spanned by the dividers to the edge of the other leg. This was a very difficult operation to perform with precision. The illustration of Foster’s sector in this work is perhaps slightly misleading in that the scales shown at the top and bottom of the instrument (adjacent to the decorative scrollwork) were actually to be engraved on the side of the device, not on its face. Foster also called for ordinary inch measuring scales on the sides.

The illustration of Gunter’s original sector shows no change from the original instrument, but the text accompanying it was changed because the instrument maker (Elias Allen) had died in 1654. The new instrument makers mentioned are Walter Hayes and Anthony Thompson. Both of these makers were highly skilled, and Thompson had actually been employed by Foster and other professors at Gresham College as well as by Leybourn.

Illustrations available:
- Title page
- Frontispiece
- Gunter sector
- Foster title page for his sector
- Foster’s sector
- Foster’s quadrant

**The Works of EDMUND GUNTER:**
Casting
The Description and Use of the Sector, Cross-staff, Bow, Quadrant, and other Instruments
With a Canon of artificial Sines and Tangents, to a Radius of 10,00000 parts, and the Logarithms from an Unite to 10000: The uses whereof are illustrated in the practice of arithmetick, geometry, astronomy, navigation, dialling and fortification. And some questions in navigation added by Mr. Henry Bond to which is added, the description and use of another sector and quadrant, both of them invented by Mr. Sam Foster, late professor of astronomy in Gresham College, London, furnished with more lines, and differing from those of Mr. Gunter’s both in form and manner of working.

Year: 1673
Place: London
Publisher: A.C. for Francis Eglesfield
Edition: 2nd
Language: English
Figures: 2 folding plates (p. 1 & p. 74); 1 volvelle (unmounted p. 64)
Binding: contemporary paneled leather; rebacked; red leather label
Pagination: pp. [24], 248, 245–310, [6], 224, [168]
Collation: A(4)–(b)4 B–2S 4 3A–4E 4 5A–5X 4
Size: 200x155 mm
Reference: Win ESTC, G.2241; Soth/Zeit BCM, Vol. I, #1717, p. 86

The edition is given on the title page as the fifth (because it is the fifth of Gunter’s work on the sector), but it is actually only the second edition of Gunter’s works as edited and extended by William Leybourn. The editions were 1624, 1636, 165(?) (edited by Samuel Foster?), 1662, 1673, and 1680 (last three edited by William Leybourn).

This text is almost identical with the 1662 edition. The editor, William Leybourn, concerned that readers might conclude that he had altered Gunter’s (and Foster’s) original work, includes a preface in which he decries how others have published extracts from Gunter’s original work under their own names. He carefully identifies (by a pointing finger in the margin) items in the table of contents that had been added to the original text.

In this edition the illustrations of both Gunter’s original sector and Foster’s single-scale sector are shown on one plate at the beginning of the work. Following Leybourn’s preface is an advertisement for the “Arts and Sciences Mathematical Professed and Taught by William Leybourn.” It provides a good guide as to the
state and content of mathematical education of the time. He indicates that You may hear of him at Mr Hayes's at the Cross-daggers in Moor-fields because Leybourn actually lived several miles outside of London in a house in which he allowed students to board.

Illustrations available:
- Title page
- Frontispiece
- Gunter's and Foster's sectors
- Leybourn's advertisement

This, the sixth edition of Gunter’s work on the sector but the third edition of his expanded works, is little changed from the prior edition. It appears that William Leybourn
did not take the same care with this edition as he did with the fifth (1673) edition. The frontispiece from the earlier edition is used with little change (note the incorrect date of 1673 in the shield), and the advertised additions to the work (see the title page) are few and minor. It would appear that the criticisms of alterations to Gunter’s original and the plagiarism he had previously decried in the preface to the fifth edition had abated, for he not only removed the preface but also removed the entire table of contents that indicated his additions. The illustrations of the sectors and other instruments are identical to those in earlier editions.

Illustrations available:
Title page
Frontispiece

**THE WORKS OF EDMUND GUNTER:**

Containing the Description and Use of the Sector, Cross-staff, Bow, Quadrant, and other Instruments.

With a Canon of Artificial Sines and Tangents to a Radius of 100,000 parts, and the Logarithms from 0 to 100,000.

The Ulysses wherein are illustrated in the Practice of Astronomy, Navigation, and Gunnerie, and the Use of the Sector, Cross-staff, Bow, and Quadrant.

The complete contents of the fifth edition, with a few additions and corrections.

The Sixth Edition.

By William Leyburn, Plodonith.

LONDON:

Printed for Fournier & Fournier at the Manufactory in St. Paul’s Churchyard. 1650.

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**EARLY SCIENCE IN CAMBRIDGE**

**BY**

R. T. GUNTER, M.A., HON. LL.D.

Curator of the Oxford Museum of the History of Science

PRINTED FOR THE AUTHOR

AT THE UNIVERSITY PRESS, OXFORD

1937

**G 107**

**Gunther, Robert Theodore** (1869–1940)

*The great astrolabe and other scientific instruments of Humphrey Cole.* In *Archaeologia v. LXXIX*

Year: 1926
Place: Oxford
Edition: offprint
Language: English
Figures: 51 b/w figures including 14 full-page plates of instruments
Binding: paper wrappers
Pagination: pp. 273–317
Size: 287x231 mm
Reference: Bud IOS, p. 32–36

Gunther was the curator of the Oxford Museum of the History of Science and is well known for his books on the early history of science in Oxford and Cambridge. He was also an expert on astrolabes. In this work he provides a detailed description of the large (two-foot diameter) astrolabe created by Humphrey Cole. While the Cole astrolabe is the ostensible subject of the paper, the majority of it consists of a discussion of Cole’s other known instruments and a brief biography of his life.

The Cole astrolabe is currently housed in a museum in the Physics Department at the University of St. Andrews in Scotland.

Illustrations available:
Title page
Gunther, Robert Theodore, translator and editor
See Chaucer, Geoffrey; *Chaucer on the astrolabe*, 1931.

Gutierrez De Gualba, Juan

*Arte breva y muy provechosa de cue[n]ta castellana y arismetica do[n]de se muestran las cinco reglas de guarismo por la cue[n]ta castellana, y reglas de memoria empuesto ...*

- Year: 1539
- Place: Toledo
- Publisher: Fernando de Santa Catalina
- Edition: 1st
- Language: Spanish
- Binding: contemporary mottled leather, gilt framed and stamped
- Pagination: ff. [23]
- Collation: π"A–B'C"3
- Size: 195x144 mm
- Reference: Pal, 111616

Gutierrez was born in Toledo, but little else is known about him.

This commercial arithmetic uses both the Roman and Hindu-Arabic systems of notation. The author uses the old (non-subtractive) forms for some of the Roman numerals. There is no title page as such, and the first page is largely taken up with a coat of arms. Book dealers commenting on the second edition in 1555 imply that it is a much larger work containing tables of currency exchange, etc., that are not found in this edition.

Illustrations available:
- First page
- Colophon
- Numeration
- Non-subtractive Roman numerals
- Multiplication tables in both Roman and Arabic
John Napier’s famous book on logarithms had been published in 1614, and this was the text of a lecture given in Friedrichs-Universität, Halle-Wittenberg, as part of the 300th anniversary of that event.

Illustrations available:
Title page

This is an instruction booklet for a slide rule.
Illustrations available:
Title page