Carnegie Mellon University

UNIVERSITY LIBRARIES SPECIAL COLLECTIONS

PROSPECTUS & *desiderata*

DESIDERATA & RECENT ACQUISITIONS

This list of *desiderata*—a Latin term meaning 'things desired'—offers a virtual exhibit of the kinds of objects and books Carnegie Mellon University's Special Collections acquires and curates. Each entry offers a short description and a price estimating the cost to acquire the object at auction or in the antiquarian book market. The first section, on the other hand, lists books and objects obtained: long-held high points and recent acquisitions bought or donated that fit with our current collecting priorities and themes.

To learn more about Special Collections' acquisition and donation strategy, visit: **library.cmu.edu/special-collections**

ABOUT SPECIAL COLLECTIONS

Special Collections is Carnegie Mellon's repository for rare books, art, manuscripts, and early scientific instruments and calculating machines. It is envisioned as an interdisciplinary workshop, where humanistic modes of inquiry combine with innovative tools to study historical technologies, books, and artifacts.

Special Collections curates the long history of four kindred fields—computing, robotics, cryptology, and information technology—from the Renaissance to the twentieth century. Few institutions have collected methodically in these areas, leaving a gap in the cultural record. Carnegie Mellon University's reputation for innovation in these and adjacent fields makes it the ideal institutional home for a collection that fills this gap. It is this collection we aim to build.

Your support helps us advance this objective by funding acquisitions that make possible transformative exhibitions, research, and other programs that bring students, scholars, and members of the public into Special Collections and CMU's Libraries.

Special Collections is open to the CMU community and to the public. Curator of Special Collections, Sam Lemley, administers access, acquisitions, and interpretation.

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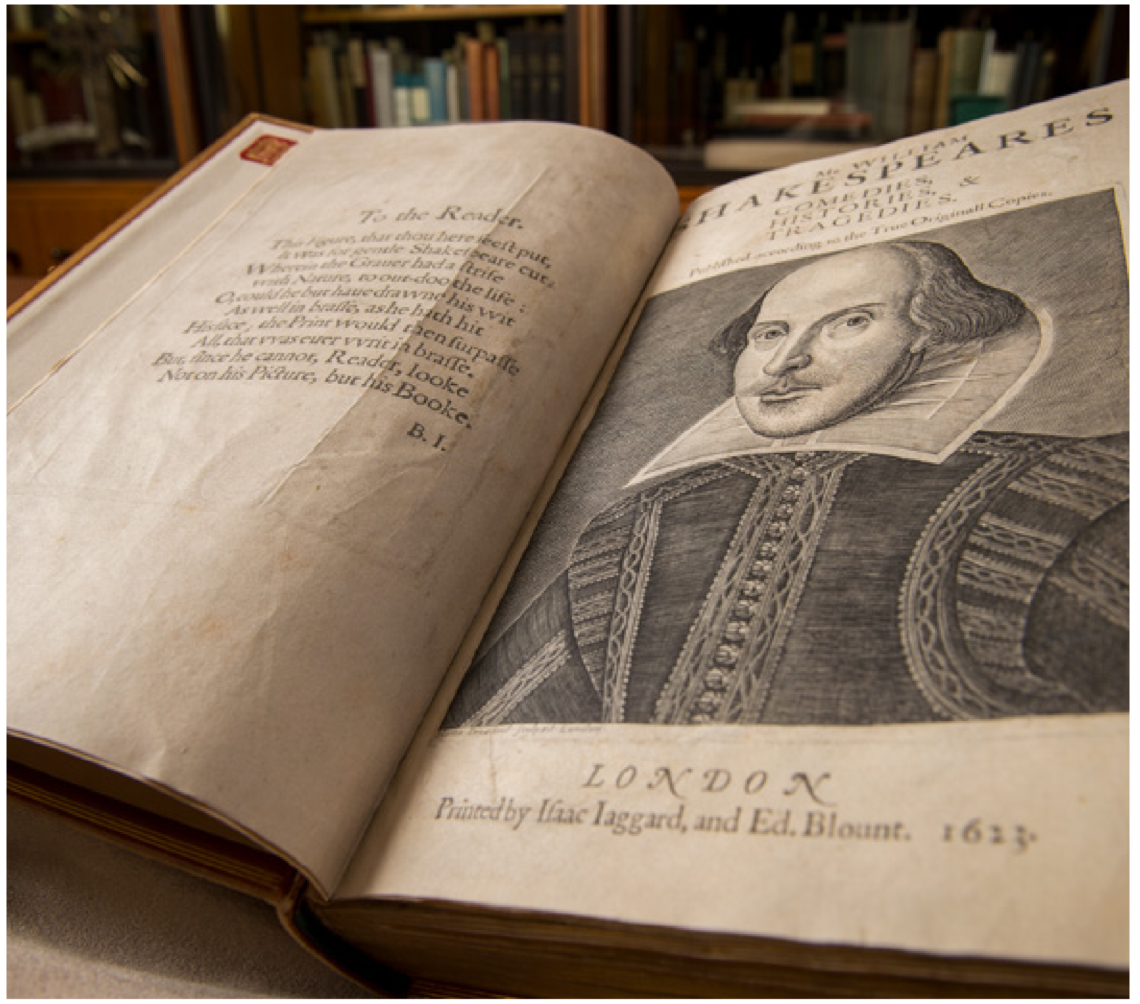
PART 1

high points & recent acquisitions

A selection of treasures held in Special Collections along with some recent purchases and donations.



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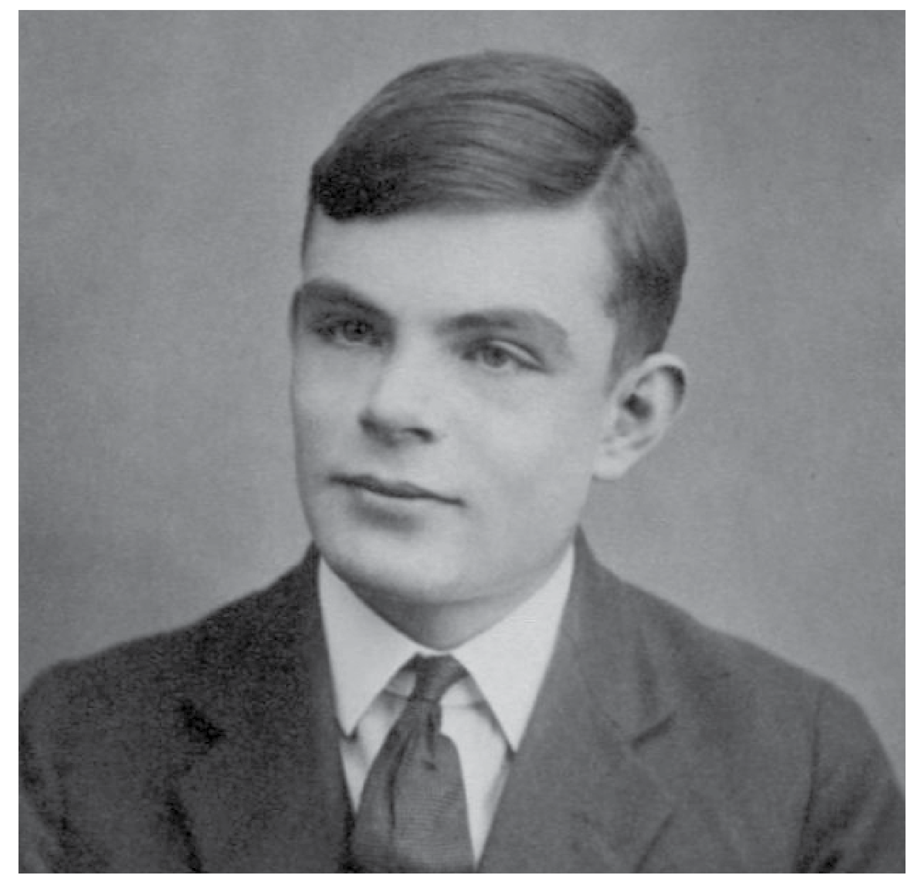

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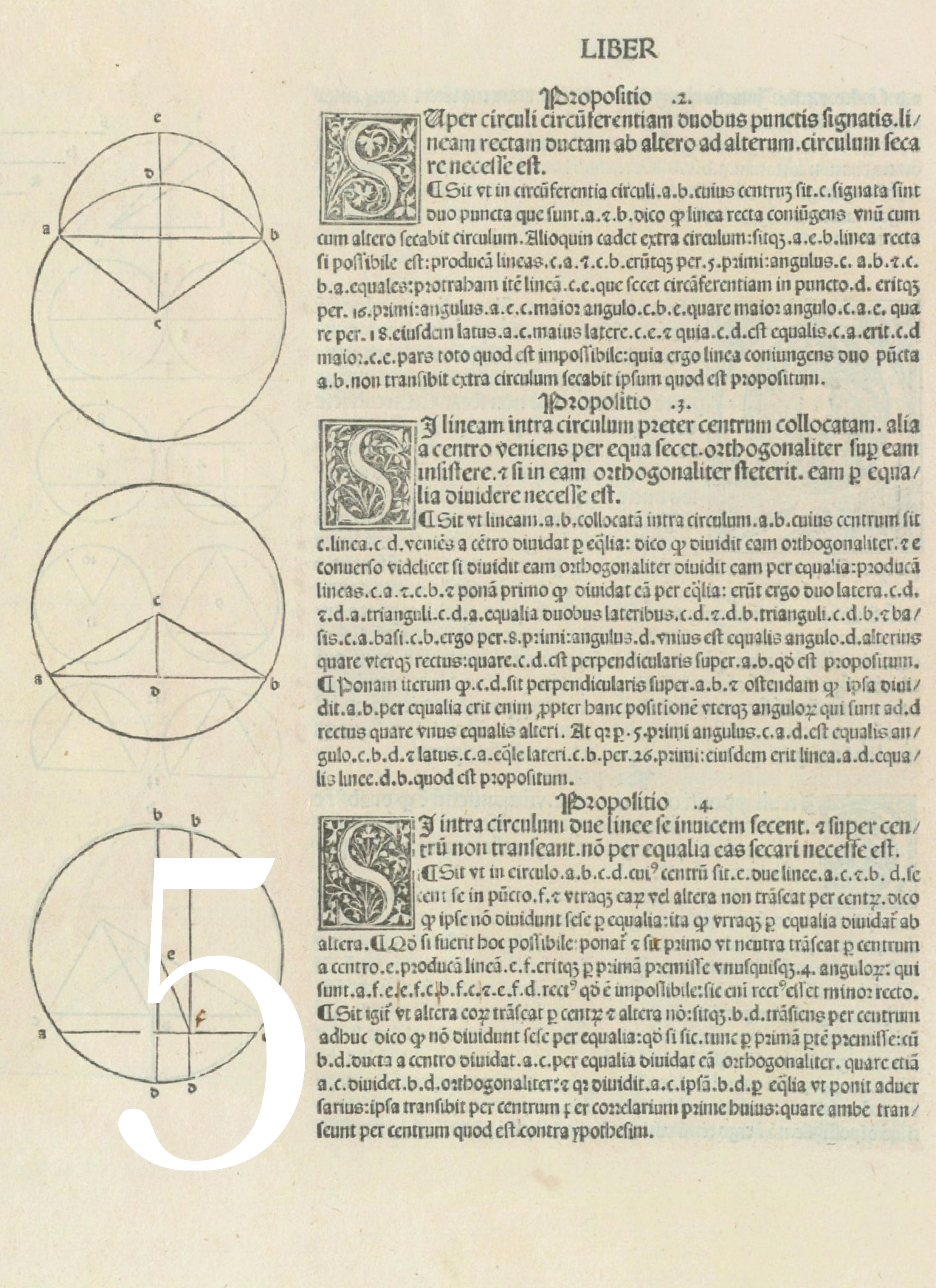

LIBER

Propositio .2.

Super circuli circũferentiam duobus punctis signatis.li/neam rectam ductam ab altero ad alterum.circulum seca re necesse est.

¶Sit vt in circũferentia circuli.a.b.cuius centrũ sit.c.signata sint duo puncta que sunt.a.⁊.b.dico q linea recta coniũgens vnũ cum cum altero secabit circulum. Alioquin cadet extra circulum:sitq3.a.e.b.linea recta si possibile est:producã lineas.c.a.⁊.c.b.erũtq3 per.5.primi:angulus.c.a.b.⁊.c.b.a.equales:protrabam itẽ lineã.c.e.que secet circũferentiam in puncto.d. eritq3 per.16.primi:angulus.a.e.c.maior angulo.c.b.e.quare maior angulo.c.a.e. qua re per.18.eiusdem latus.a.c.maius latere.c.e.⁊ quia.c.d.est equalis.c.a.erit.c.d maior.c.e.pars toto quod est impossibile:quia ergo linea coniungens duo pũcta a.b.non transibit extra circulum secabit ipsum quod est propositum.

Propositio .3.

Si lineam intra circulum preter centrum collocatam. alia a centro veniens per equa secet.orthogonaliter sup eam insistere.⁊ si in eam orthogonaliter steterit. eam p equa/lia diuidere necesse est.

¶Sit vt lineam.a.b.collocatã intra circulum.a.b.cuius centrum sit c.linea.c d.veniẽs a cẽtro diuidat p eq̃lia: dico q diuidit eam orthogonaliter.⁊ e conuerso videlicet si diuidit eam orthogonaliter diuidit eam per equalia:producã lineas.c.a.⁊.c.b.⁊ ponã primo q diuidat eã per eq̃lia: erũt ergo duo latera.c.d.⁊.d.a.trianguli.c.d.a.equalia duobus lateribus.c.d.⁊.d.b.trianguli.c.d.b.⁊ ba/sis.c.a.basi.c.b.ergo per.8.primi:angulus.d.vnius est equalis angulo.d.alterius quare vterq3 rectus:quare.c.d.est perpendicularis super.a.b.qđ est propositum. ¶Ponam iterum q.c.d.sit perpendicularis super.a.b.⁊ ostendam q ipsa diui/dit.a.b.per equalia erit enim ꝓpter hanc positionẽ vterq3 angulorum qui sunt ad.d rectus quare vnus equalis alteri. At q2 p.5.primi angulus.c.a.d.est equalis an/gulo.c.b.d.⁊ latus.c.a.eq̃le lateri.c.b.per.26.primi:eiusdem erit linea.a.d.equa/lis linee.d.b.quod est propositum.

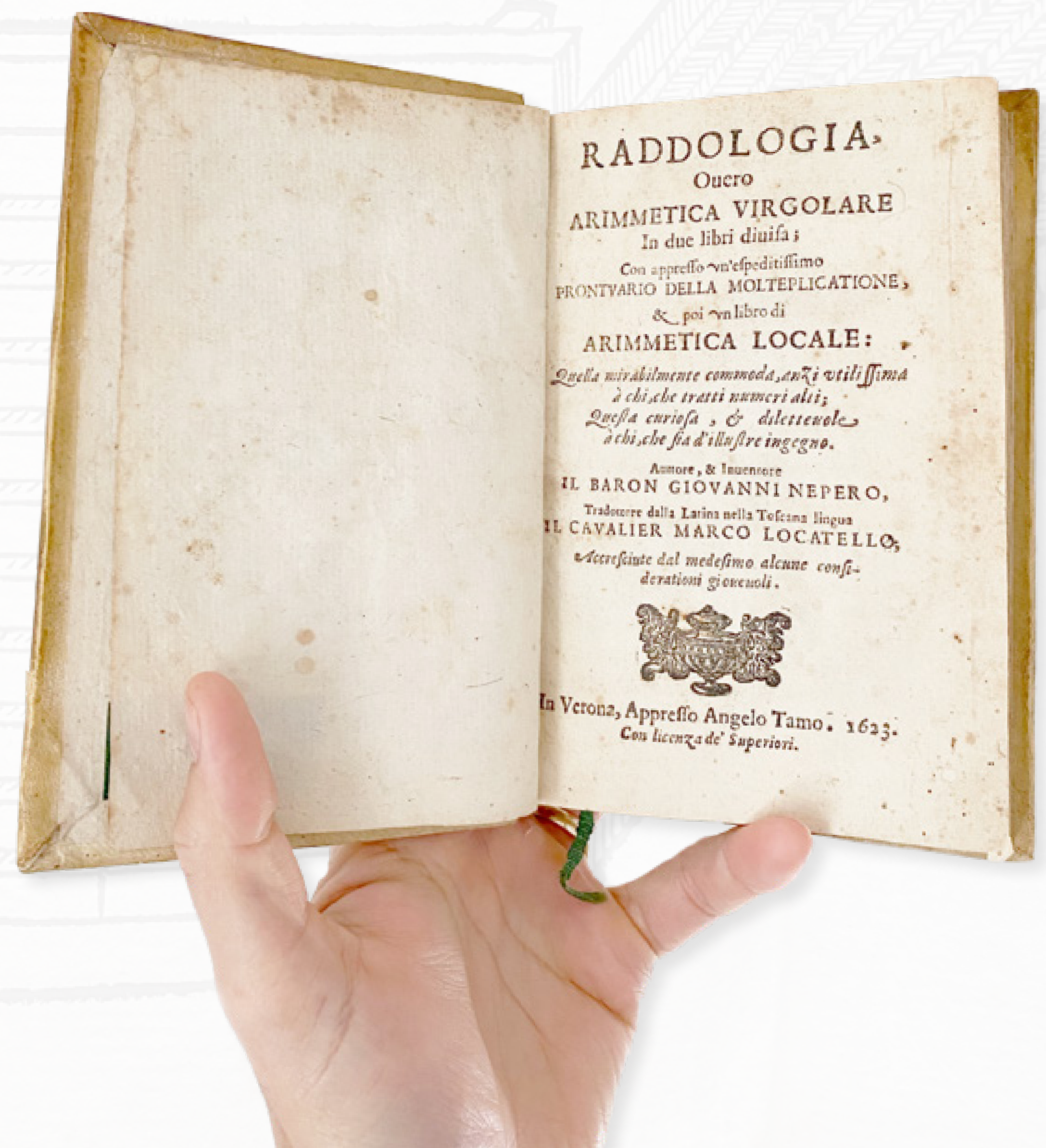
Propositio .4.

Si intra circulum due linee se inuicem secent. ⁊ super cen/trũ non transeant.nõ per equalia eas secari necesse est.

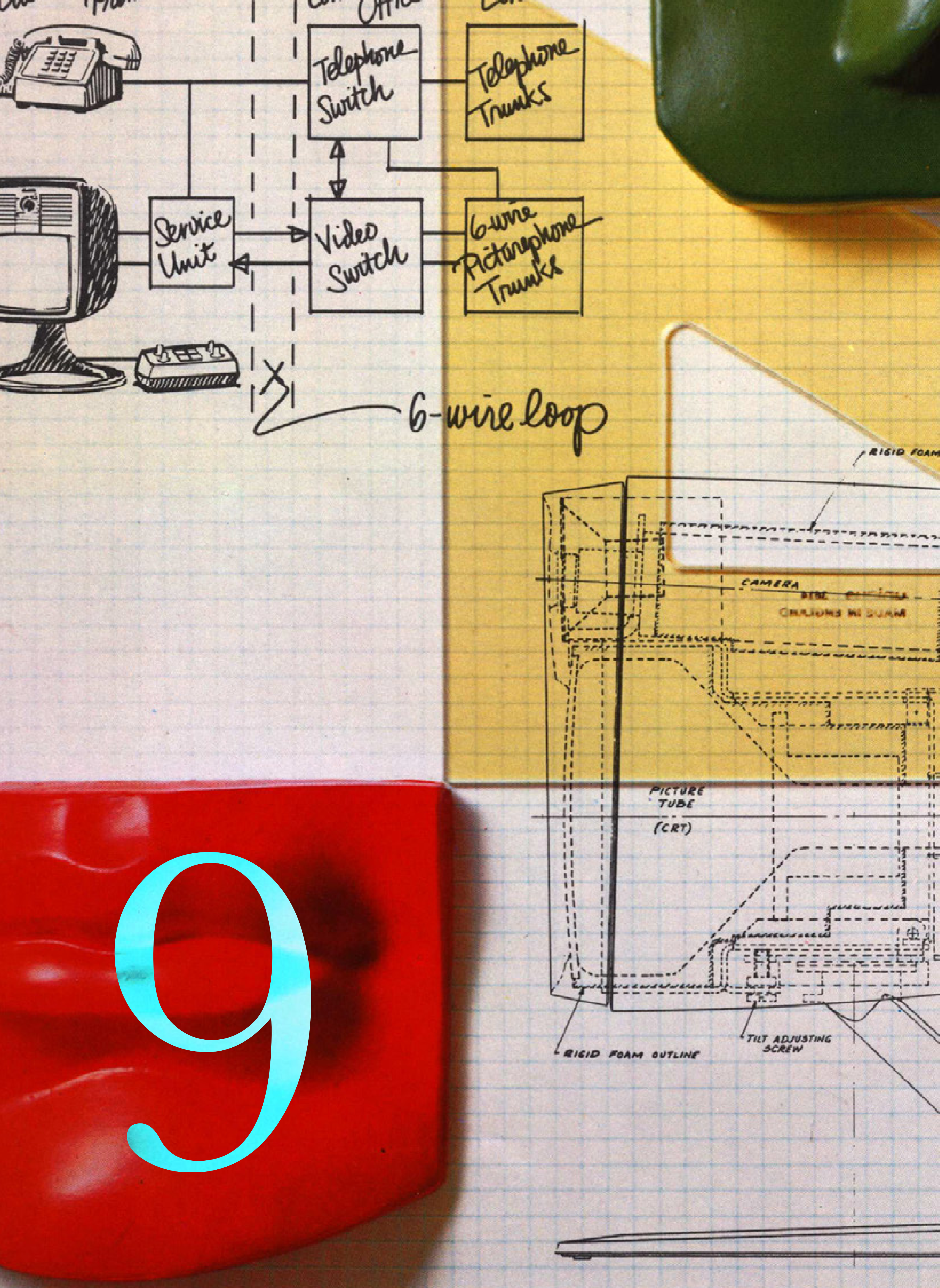
¶Sit vt in circulo.a.b.c.d.cuius centrũ sit.e.due linee.a.c.⁊.b.d.se cent se in pũcto.f.⁊ vtraq3 earum vel altera non trãseat per centrum.dico q ipse nõ diuidunt sese p equalia:ita q vtraq3 p equalia diuidatur ab altera. ¶Quod si fuerit hoc possibile ponatur ⁊ sit primo vt neutra trãseat p centrum a centro.e.producã lineã.e.f.eritq3 p primã premisse vnusquisq3.4.angulorum qui sunt.a.f.e.⁊.e.f.c.⁊.b.f.c.⁊.e.f.d.rectus qđ ẽ impossibile:sic eni rectus esset minor recto. ¶Sit igitur vt altera corum trãseat p centrum ⁊ altera nõ:sitq3.b.d.trãsiens per centrum adhuc dico q nõ diuidunt sese per equalia:qđ si sic.tunc p primã ptẽ premisse:cũ b.d.ducta a centro diuidat.a.c.per equalia diuidat eã orthogonaliter. quare etiã a.c.diuidet.b.d.orthogonaliter:⁊ q2 diuidit.a.c.ipsã.b.d.p eq̃lia vt ponit aduer sarius:ipsa transibit per centrum ꝑ correlarium prime huius:quare ambe tran/seunt per centrum quod est contra ypothesim.

7

8


RADDOLOGIA,
Ouero
ARIMMETICA VIRGOLARE
In due libri diuisa;
Con appresso vn'espeditissimo
PRONTVARIO DELLA MOLTEPLICATIONE,
& poi vn libro di
ARIMMETICA LOCALE:
Quella mirabilmente commoda, anzi vtilissima
à chi, che tratti numeri alti;
Questa curiosa, & dilettevole
à chi, che sia d'illustre ingegno.
Autore, & Inuentore
IL BARON GIOVANNI NEPERO,
Tradottore dalla Latina nella Toscana lingua
IL CAVALIER MARCO LOCATELLO,
Accresciute dal medesimo alcune considerationi giouevoli.
In Verona, Appresso Angelo Tamo. 1623.
Con licenza de' Superiori.

9


Telephone Switch
Telephone Trunks
Service Unit
Video Switch
6-wire Picturephone Trunks
6-wire loop
RIGID FOAM
CAMERA
PICTURE TUBE
(CRT)
RIGID FOAM OUTLINE
TILT ADJUSTING SCREW


Western Electric

SHAKESPEARE Item No: 1

William (1584-1616). The Four Folios. London, 1623/1632/1663/1685.

An exceptional collection of literary rarities including "the book that reified Shakespeare's posthumous reputation" - Emma Smith

Printed in 1623—seven years after Shakespeare's death—the First Folio was the earliest comprehensive gathering of Shakespeare's plays in print; it established the version of Shakespeare that is read and performed today. The First Folio contains 36 plays, including eighteen that are otherwise unrecorded. These plays were reprinted in 1632 (the so-called Second Folio), 1663 (the Third Folio), and again in 1685 (the Fourth Folio). Carnegie Mellon holds two copies of the second, third, and fourth folios in addition to a copy of the First Folio, donated by Pittsburgh entrepreneur and book collector Charles J. Rosenbloom in 1974. CMU boasts one of the best collections of Shakespeare folios in the United States.

SHELLEY Item No: 2

Mary (1797-1851). Frankenstein; Or, The Modern Prometheus. London, 1818.

One of the earliest literary depictions of artificial intelligence; a pristine copy of the first edition

Mary Shelley's *Frankenstein* remains one of the most influential works of literature in the English canon. A pivotal work in the genre of Gothic fiction, it takes on added relevance at CMU, where it is shelved alongside works by Alan Turing and other pioneers of artificial intelligence. Shelley's monster evoked the idea that intelligence can be made, though with the potential for unforeseeable and unnerving results. Shelley's book is far more than a chilling tale of reanimated flesh, then: it examines anxieties about artificial life and sentience that still linger, two centuries after its publication.

CMU's copy was donated by Charles J. Rosenbloom in 1974. It is in preternaturally unspoiled condition in its original paper-board binding. Laid inside the front cover of the first volume (of three) is an autograph letter from Mary Shelley.

LEIBNIZ Item No: 3

Gottfried Wilhelm (1646-1716). "Brevis descriptio machinae arithmeticae, cum figura," in Miscellanea Berolinensia ad incrementum scientiarum. Berlin, 1710.

A rare illustrated description of the first general purpose mechanical computer and a twentieth-century replica

Leibniz—widely known for inventing calculus independently of Isaac Newton—was also a pioneer of computer design. His *Brief Description of an Arithmetic Machine,* published in 1710, announced the invention of the stepped-reckoner, a complex mechanical calculator capable of addition, subtraction, multiplication, and division—the first of its kind. The advantage of mechanical computers, or "arithmetic machines," Leibniz wrote, was their ability to render calculation "leicht, geschwind, gewiß"—easy, fast, and reliable. Leibniz's paper includes an engraved figure showing the device with its hinged lid opened. CMU is unique in holding both Leibniz's printed description of his calculating device and a replica (pictured), fabricated by modelmaker Roberto Guatelli (1904-1993) between 1940 and 1960. Only one of Leibniz's original machines survives today.

TURING Item No: 4

Alan (1912-1954). "Computing Machinery and Intelligence," in Mind: A Quarterly Review of Psychology and Philosophy, Vol. 59, No. 236. October, 1950.

The conceptual basis of modern artificial intelligence

Written during a period of breathtaking inventiveness while at the University of Manchester, Turing's paper laid out a thought experiment known today as the Turing Test, but called "the imitation game" by its inventor. The game was simple: a human participant would exchange a series of typed interactions with two respondents, a computer and a human being. Each respondent—one of flesh, the other circuit-bound—remained hidden behind a partition. After a set period of time, if the interrogator failed to distinguish one from the other, the computer would, in effect, win; such a machine could be said to think. This became the guiding idea behind modern artificial intelligence. CMU's copy was in circulation at Hunt Library until last year, when it was transferred to Special Collections.

EUCLID Item No: 5

(4th century BCE). Elementa geometriae. Venice, 1482.

The first printed book to contain mathematical diagrams, and Euclid's first appearance in print; part of the Posner Memorial Collection

Euclid's treatise on the elements of geometry is of profound importance in the history of mathematics and the mathematical sciences. Printed only thirty years after the invention of the printing press, this is one of the earliest printed books held in Special Collections. Purchased by Henry Posner Sr. (1888-1976) in 1954 from bookseller H.P. Kraus, CMU's copy was deposited with the Libraries as part of the Posner Memorial Collection in 1978. The Posner Collection contains many important works in the history of science and technology, including a first edition of Nicolaus Copernicus's *De revolutionibus orbium coelestium* (1543)—the first work since antiquity to propose a heliocentric model to account for planetary motion—and first editions of works by Isaac Newton, Marie Curie, Charles Darwin, Johannes Kepler, Galileo Galilei, Andreas Vesalius, and others.

DELLA PORTA Item No: 6

Giambattista (1625-1695). De Furtivis Literarum. London, 1591.

A paper cipher machine

Giambattista della Porta's *De Furtivis Literarum (On Secret Writing)* contains a number of paper cipher discs, or volvelles (from the Latin, *volvere,* 'to turn'). These carefully mounted semimechanical dials rotate on an axial piece of thread to encrypt or decrypt any message. Pictured here is one such cipher disc in a copy of the 1591 edition of Porta's book held in CMU's Special Collections and acquired last year.

The pages of Porta's book are themselves instruments capable of veiling any text under the thousands of character combinations supplied by their polyalphabetic ciphers. The underlying mechanics of the Enigma machine—two of which are held in Special Collections—are more advanced, but no different: rotating discs establish fleeting links between plaintext and ciphertext.

Della Porta was a Renaissance polymath, a founding member of the elite Accademia dei Lincei and a friend of Galileo.

ENIGMA M3 Item No: 7

An object of incredible electro-mechanical complexity with a dark history

The Enigma M3 (serial no. A5005 pictured) encrypted and decrypted dispatches for the Nazi armed forces during World War II. The story of its decipherment—accomplished in two phases, first by Marian Rejewski of Polish intelligence and then by Alan Turing and a team of cryptanalysts at Bletchley Park—is well known. The battery-operated Enigma M3 encrypts messages using an array of three stepped wheels that advance with each stroke of its typewriter-like keys. The resulting jumble of ciphertext is nearly unbreakable, but proved susceptible to the common code-breaking techniques of frequency analysis and crib matching. These long standing deciphering techniques were made more effective with the help of early computers.

CMU's Enigma M3 came to Special Collections with the Traub-McCorduck Collection in 2018. The M3 is the most common model of the Enigma, with approximately 300 extant. Special Collections also holds a far rarer Enigma M4 (series M), used by the Nazi Kriegsmarine to encrypt sensitive communications regarding its U-boat fleet.

NAPIER Item No: 8

John (1550-1617). Raddologia. Verona, 1623.

An early book on mechanical computation

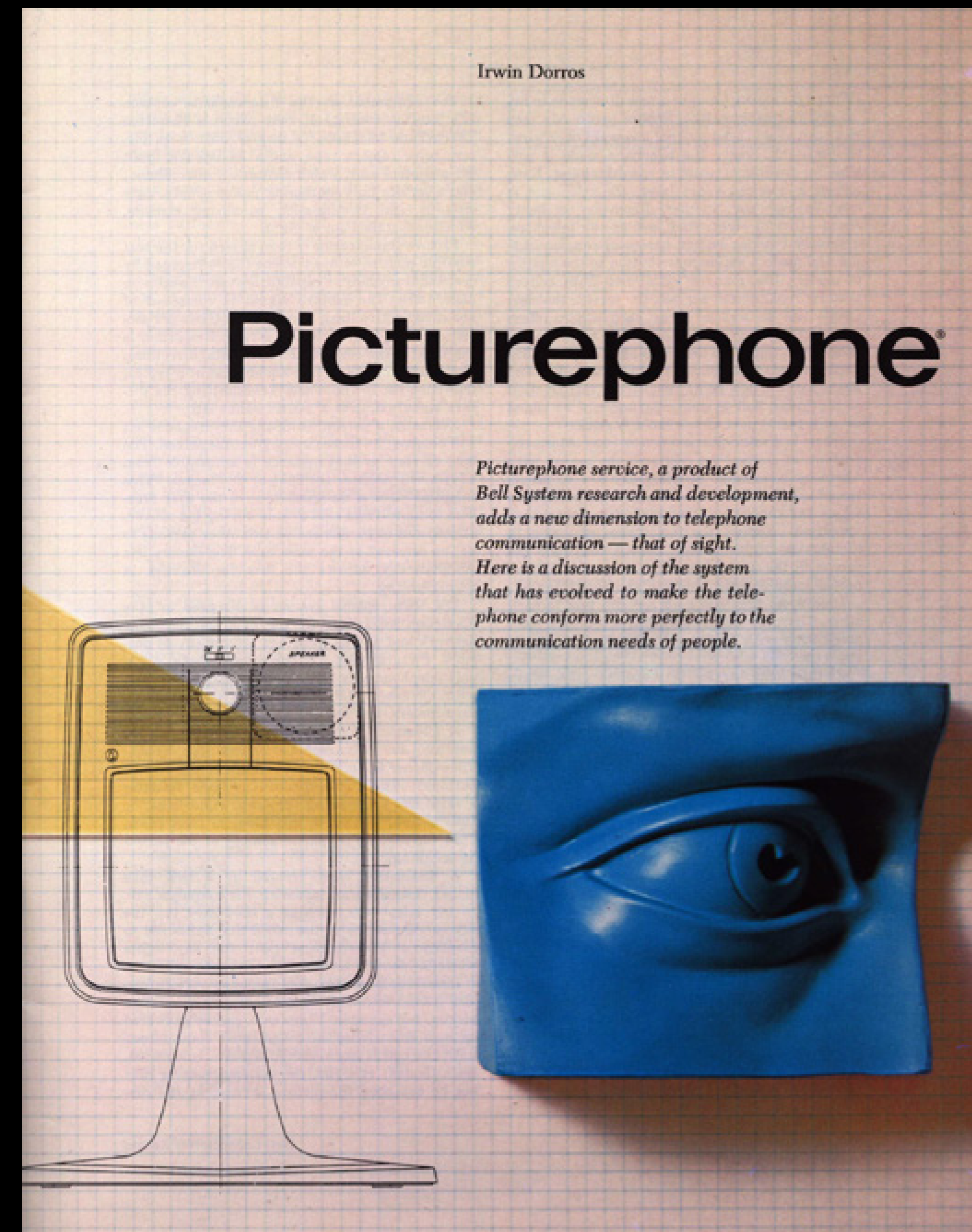
John Napier—best known for his invention of logarithms—coined the term rabdology to describe a method for calculating with wooden rods. These rods were carved or stamped with numbers that, when aligned, reduced complex mathematical operations to rudimentary arithmetic. Napier's book on rod-computing also contains an illustrated description of another calculating device, called the Promptuary. With a complex apparatus of labeled rods and shuttered panels mounted inside a box-like frame, the Promptuary could be programmed to convert multi-digit mathematical operations into basic lattice multiplication. Napier's depiction of the promptuary (pictured) bears an uncanny resemblance to early mainframe computers. Napier's work on rabdology, first published in 1617, is considered the first book on mechanical computation.

AT&T PICTUREPHONE Item No: 9

Mod II (set of 2)

The midcentury precursor to Zoom, Skype, and Facetime

The Picturephone Mod II was a technological marvel. Its 5.5 x 5 inch screen offered a full-motion black and white picture with 250 lines resolution at 30 interlaced frames per second. The device also contained an innovative silicon photodiode array camera with a resolution of 0.8 megapixels; a small integrated mirror could be flipped allowing it to transmit either the user or documents laid in front of the device. The picture tube and integrated circuits were made at the Western Electric plant in Reading, PA, and the first transmission using the Picturephone occurred in Pittsburgh. For transmission, the Picturephone required three twisted pairs of ordinary telephone cable, two pairs for video and one for audio and signaling. The Picturephone could also call mainframe computers and render rudimentary graphics, with user input provided via a phone's number keypad.



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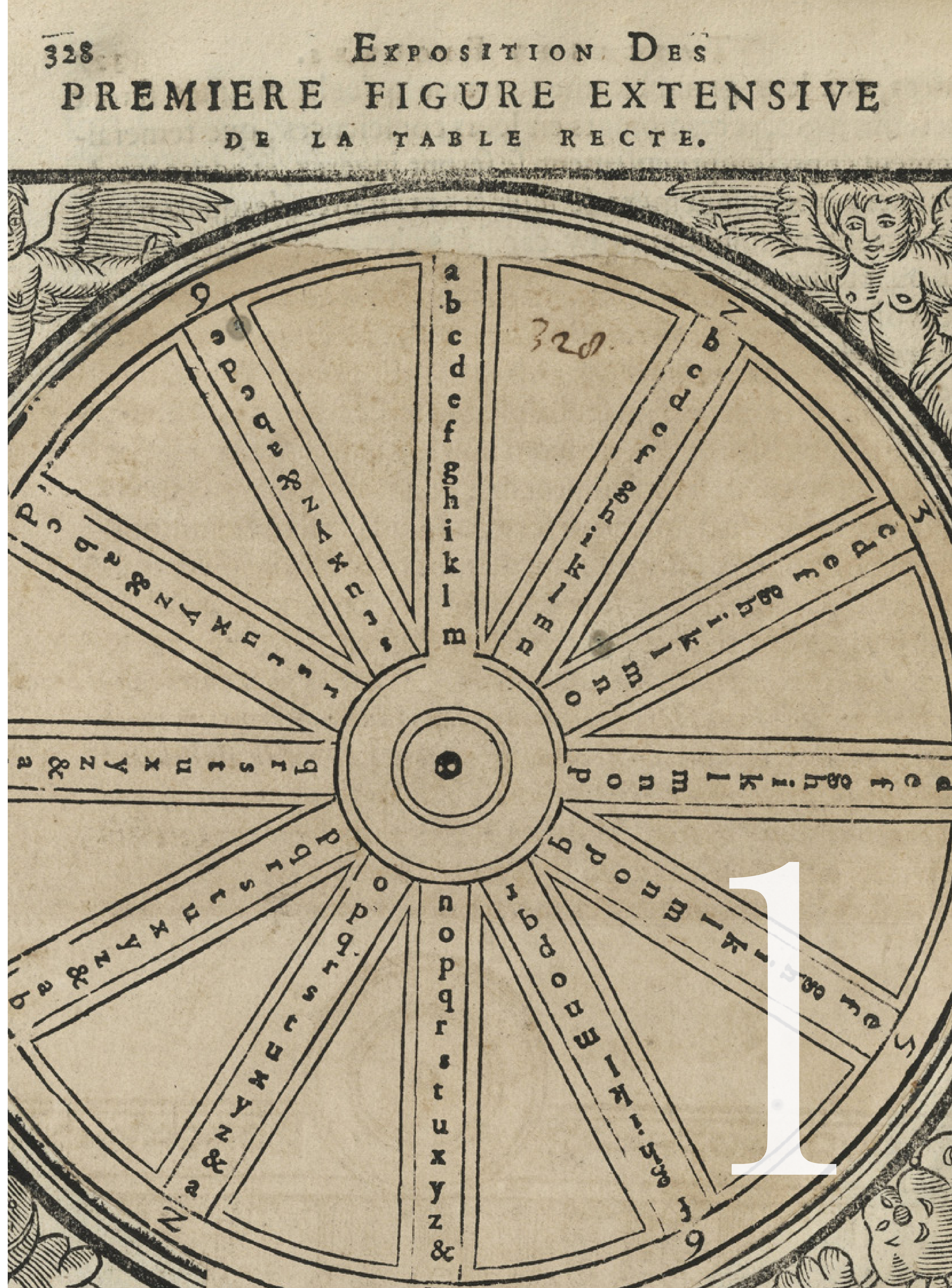
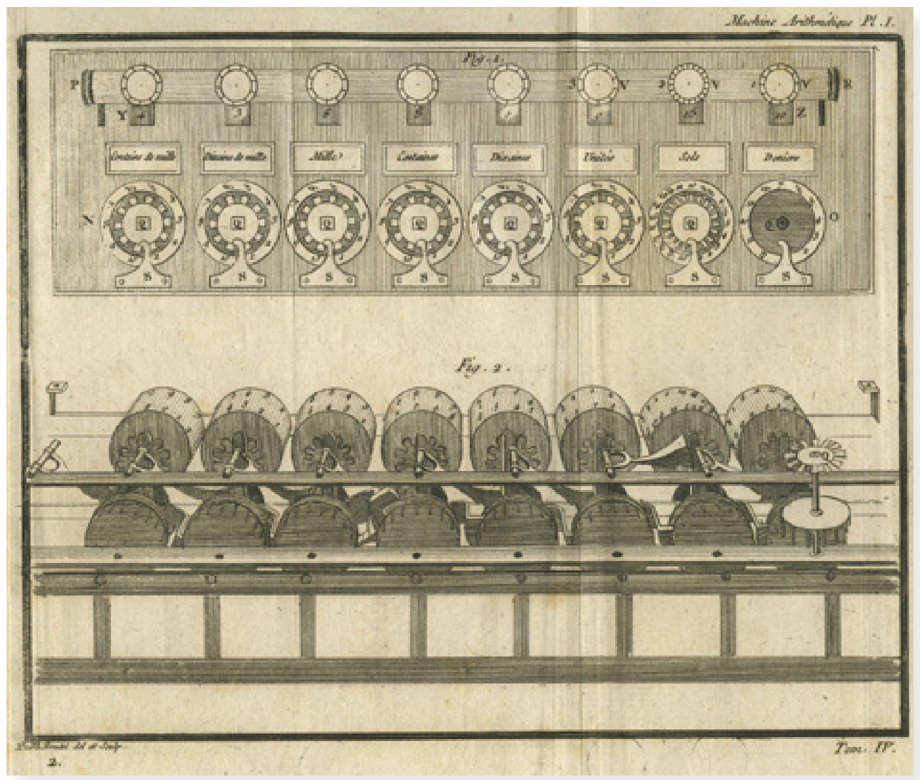
PART 2

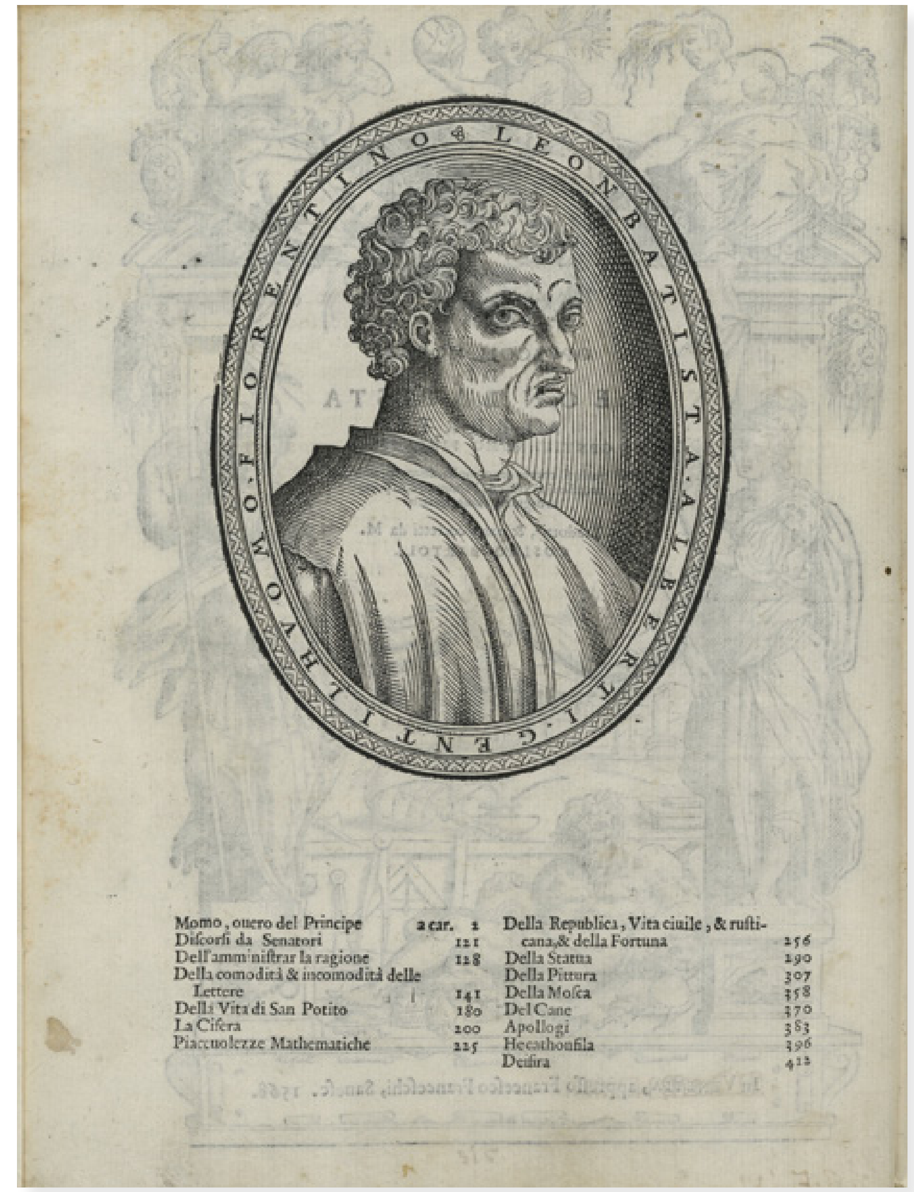
desiderata

Desiderata, n. Latin. *Things desired.*

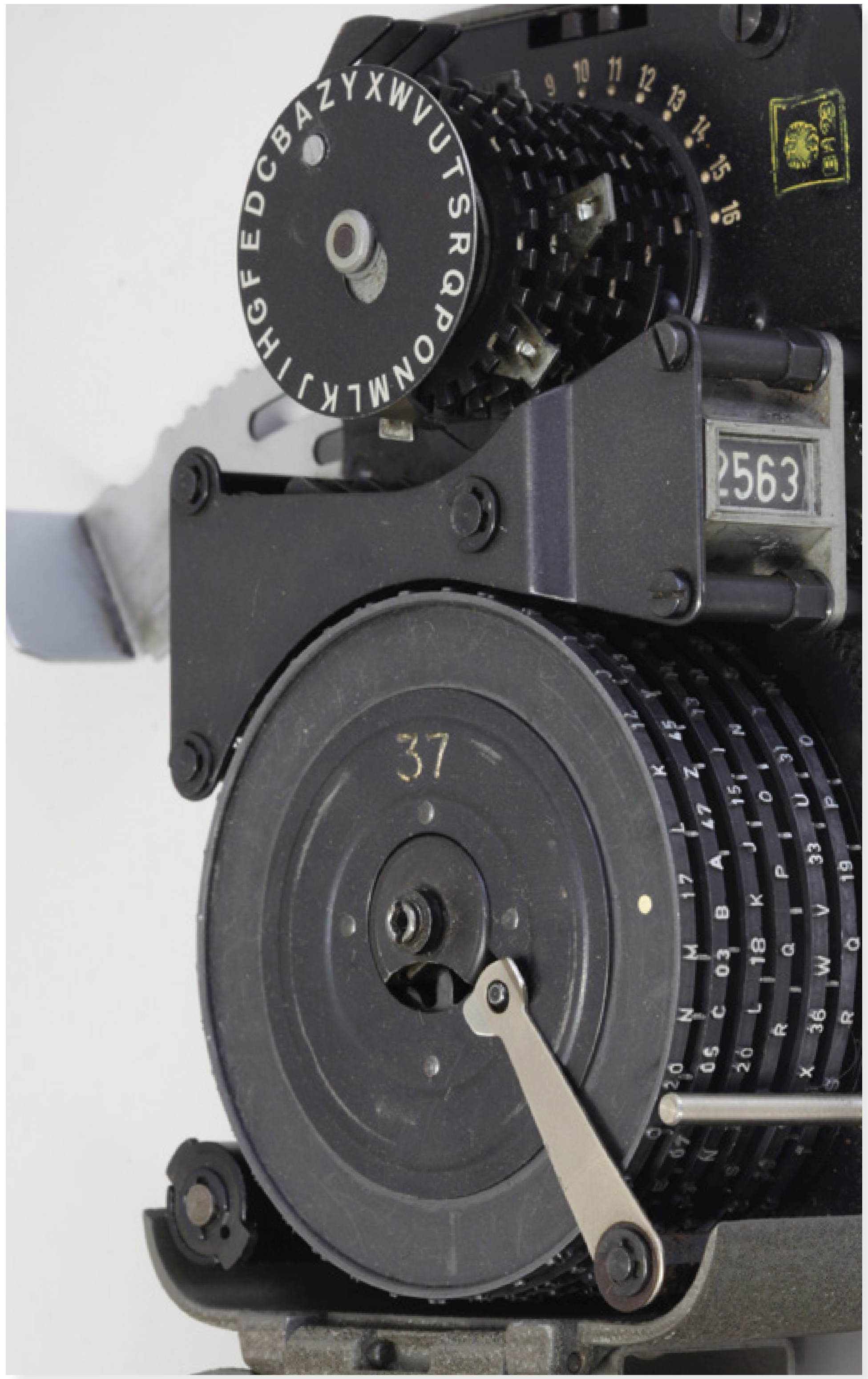



Machine Arithmétique Pl. I.
Fig. 2.
Tom. IV.

2


LEONBATISTA.ALBERTI.GENTILHVOMO.FIORENTINO
Momo, ouero del Principe a car. 1
Discorsi da Senatori 121
Dell'amministrar la ragione 128
Della comodità & incomodità delle Lettere 141
Della Vita di San Potito 180
La Cifera 200
Piaceuolezze Mathematiche 225
Della Republica, Vita ciuile, & rustica, & della Fortuna 256
Della Statua 290
Della Pittura 307
Della Mosca 358
Del Cane 370
Apollogi 383
Hecathonfila 396
Deifira 412

3



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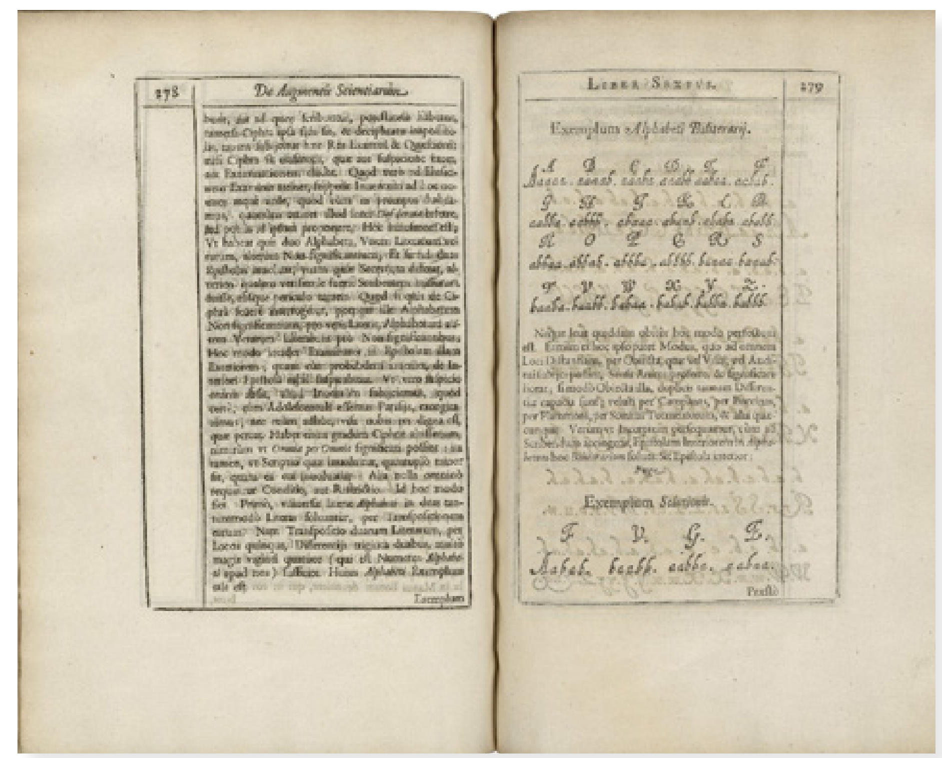
278 De Augmentis Scientiarum.

LIBER SEXTUS. 279

Exemplum Alphabeti Biliterarii.

6

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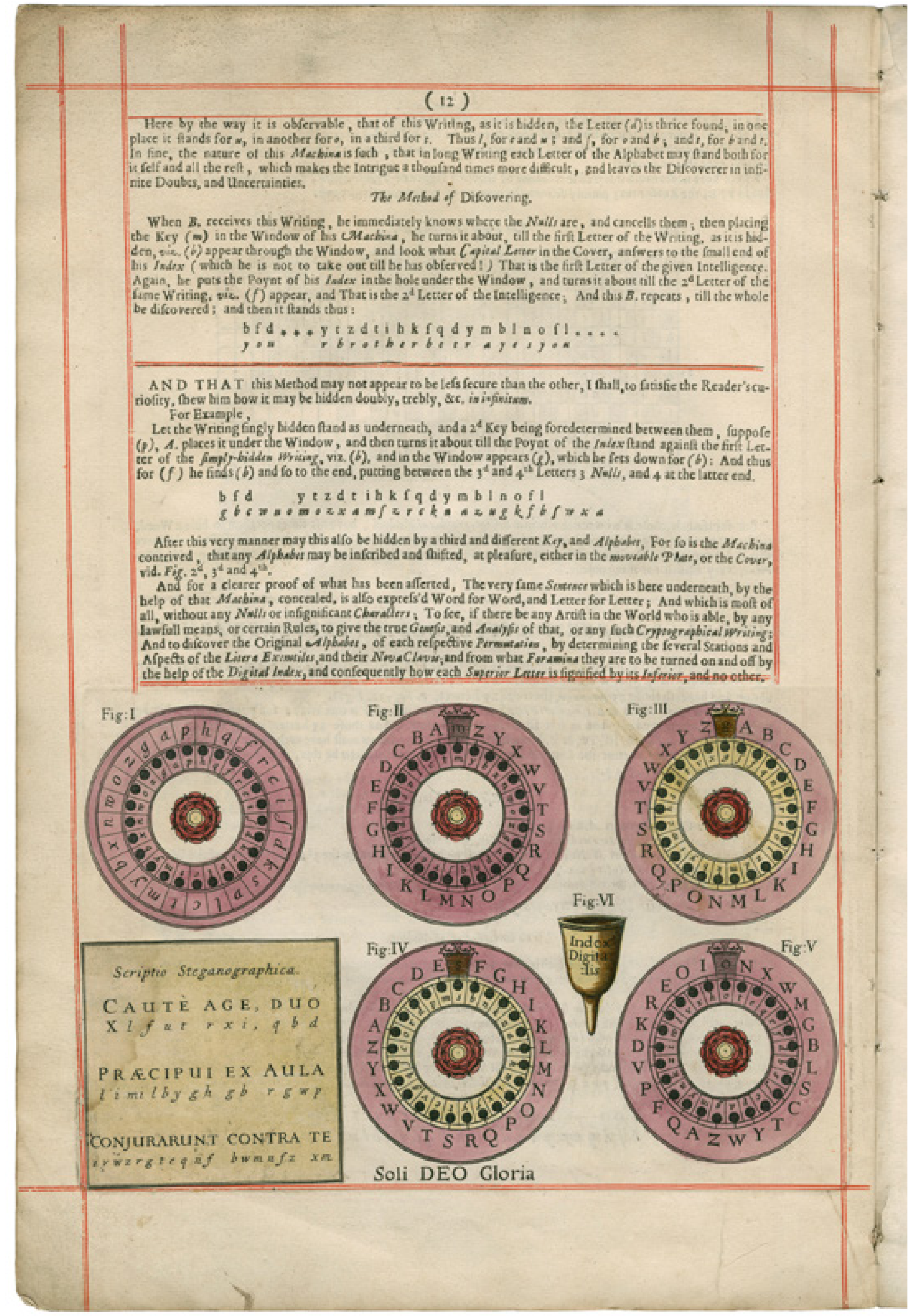

(12)

Here by the way it is observable, that of this Writing, as it is hidden, the Letter (d) is thrice found, in one place it stands for *w*, in another for *e*, in a third for *r*. Thus *l*, for *e* and *w*; and *f*, for *o* and *b*; and *t*, for *b* and *t*. In fine, the nature of this *Machina* is such, that in long Writing each Letter of the Alphabet may stand both for it self and all the rest, which makes the Intrigue a thousand times more difficult, and leaves the Discoverer in infinite Doubts, and Uncertainties.

The Method of Discovering.

When *B.* receives this Writing, he immediately knows where the *Nulls* are, and cancells them; then placing the Key (*m*) in the Window of his *Machina*, he turns it about, till the first Letter of the Writing, as it is hidden, *viz.* (*b*) appear through the Window, and look what *Capital Letter* in the Cover, answers to the small end of his *Index* (which he is not to take out till he has observed!) That is the first Letter of the given Intelligence. Again, he puts the Poynt of his *Index* in the hole under the Window, and turns it about till the 2d Letter of the same Writing, *viz.* (*f*) appear, and That is the 2d Letter of the Intelligence; And this *B.* repeats, till the whole be discovered; and then it stands thus:

b f d . . . y t z d t i h k f q d y m b l n o f l . . . .
y o u r b r o t h e r b e t r a y e s y o u

AND THAT this Method may not appear to be less secure than the other, I shall, to satisfie the Reader's curiosity, shew him how it may be hidden doubly, trebly, &c. *in infinitum.*

For Example,

Let the Writing singly hidden stand as underneath, and a 2d Key being foredetermined between them, suppose (*p*), *A.* places it under the Window, and then turns it about till the Poynt of the *Index* stand against the first Letter of the *simply-hidden Writing*, viz. (*b*), and in the Window appears (*g*), which he sets down for (*b*): And thus for (*f*) he finds (*b*) and so to the end, putting between the 3d and 4th Letters 3 *Nulls*, and 4 at the latter end.

b f d y t z d t i h k f q d y m b l n o f l
g b e w n o m o z x a m f z r c k n a z n g k f b f w x a

After this very manner may this also be hidden by a third and different *Key*, and *Alphabet*, For so is the *Machina* contrived, that any *Alphabet* may be inscribed and shifted, at pleasure, either in the *moveable Plate*, or the *Cover*, vid. *Fig.* 2d, 3d and 4th.

And for a clearer proof of what has been asserted, The very same *Sentence* which is here underneath, by the help of that *Machina*, concealed, is also express'd Word for Word, and Letter for Letter; And which is most of all, without any *Nulls* or insignificant *Characters*; To see, if there be any Artist in the World who is able, by any lawfull means, or certain Rules, to give the true *Genesis*, and *Analysis* of that, or any such *Cryptographical Writing*; And to discover the Original *Alphabet*, of each respective *Permutation*, by determining the several Stations and Aspects of the *Litera Eximtiles*, and their *Nova Clavis*; and from what *Foramina* they are to be turned on and off by the help of the *Digital Index*, and consequently how each *Superior Letter* is signified by its *Inferior*, and no other.

8

TRITHEMIUS — Item No: 1

Johannes (1462-1516). Polygraphie et universelle escriture caballistique. Paris, 1624.

The first printed book on cryptographic communication, or "cabalistic writing"

This seventeenth-century edition of the first printed book on cryptographic communication contains movable volvelle cipher discs. The book is itself a cryptographic machine, its rotating dials the material ancestors of Enigma.

$6,000 - $10,000

PASCAL — Item No: 2

Blaise (1623-62). Oeuvres. The Hague, 1779.

An illustrated account of the first commercially produced mechanical calculator

This five-volume set of Pascal's complete works includes his treatise on an innovative calculating machine known eponymously as the Pascaline. A replica of this device is held in Special Collections in the Traub-McCorduck Collection. This is the first printed account of its design and operation.

$2,300 - $3,000

ALBERTI — Item No: 3

Leon Battista (1404-1474). Opusculi Morali. Venice, 1568.

The first western treatise on cryptography

This posthumous first edition of Alberti's works includes the first western treatise on cryptography and secret writing, *De cifris* (ca. 1466). Alberti embodied the Renaissance: an artist, poet, architect, mathematician, and student of the occult, he found in cryptography an untapped science and devised one of the first polyalphabetic substitution ciphers—one the most secure forms of alphabetic encryption.

$3,000 - $5,000

HAGELIN CD-57 — Item No: 4

A pocket-sized cipher machine

The CD-57 is a pocket-sized (14 x 8 x 4 cm) variant of master cryptographer Boris Hagelin's virtually unbreakable CX-52 cipher machine. First manufactured by the Swiss firm Crypto AG in 1957, the CD-57 was used in international spycraft until the 1970s and saw its most active use during the height of the Cold War. The CD-57 used a deck of six wheels for its polyalphabetic substitution cipher; it also could be converted to an undecipherable one-time tape (OTT) mechanism.

$900 - $1,200

FRIEDMAN — Item No: 5

Elizebeth (1892-1980); FRIEDMAN, William (1891-1969). The Riverbank Publications, No. 21: Methods for the Reconstruction of Primary Alphabets. Riverbank Laboratories, 1918.

America's "first female cryptologist," a leader of US decryption efforts during WWII

Elizebeth Friedman's first cryptanalytic assignment was with Elizabeth Wells Gallup, who sought to prove that Francis Bacon, not William Shakespeare, had written Shakespeare's plays. Gallup's theory rested on the belief that early printed copies of Shakespeare's works contained ciphered messages encoding clues to Bacon's authorship.

The work of Elizebeth Friedman is slowly regaining recognition. Friedman led the Coast Guard Cryptanalytic Unit (Unit 387) during World War II, where she played a leading role in the decryption of the Japanese Purple Code, and was in regular contact with the Bletchley Park Intelligence Service Knox (ISK).

$1,200 - $3,000

BACON — Item No: 6

Francis (1561-1626). The Tvvoo Bookes of Francis Bacon of the proficiency and advancement of Learning, diuine and humane. London, 1605.

The origin of binary code and the first English work on cryptography

In *The Advancement of Learning*, Bacon invented a biliteral (two-lettered) cipher, the principles of which laid the groundwork for digital computing and, more directly, binary code. With this cipher, Bacon demonstrated that "anything could signify anything." Bacon was the first to write systematically on ciphers and cryptology in English.

$15,000 - $18,000

NAPIER'S BONES — Item No: 7

ca. 1617

The earliest portable computer*
**besides the abacus*

John Napier (1550-1617)—best known for his invention of logarithms—coined the term rabdology to describe a method for calculating with wooden rods. These rods were carved or stamped with numbers that, when aligned, reduced complex mathematical operations to rudimentary arithmetic.

Sets of "Napier's Bones" were immediately popular and were manufactured into the nineteenth century. CMU Special Collections recently acquired a copy of the first Italian edition of Napier's treatise on rabdology (see "Recent Acquisitions," item 8). Special Collections also holds a copy of Napier's pioneering work on logarithms in the Traub-McCorduck Collection.

$10,000 - $20,000

MORLAND — Item No: 8

Samuel (1625-1695). A New Method of Cryptography. London, 1666.

A rare work on an early cryptographic machine

Among the rarest books on cryptology and clandestine communication, this treatise was informed by Morland's experience deciphering coded military dispatches during the English Civil War (1642-51). The final section depicts a "Cyclologic Cryptographic Machine" that held a series of minute cipher wheels set with a thimble-like stylus. Relying on the rotary alignment of plaintext- and corresponding cipher-text characters, this device is an analog precursor of the Enigma Machine. None of Morland's devices are known to survive, making this book the sole record of their design and operation.

$15,000 - $20,0000

IMAGES *of* **ITEMS 1, 2, 3, 6, 8**
Courtesy of the Folger Shakespeare Library

IMAGE *of* **ITEM 7**
Courtesy of the National Museum of Scotland

PROSPECTUS
desiderata

SUPPORT SPECIAL COLLECTIONS

Acquisitions Fund

Support the acquisition of rare books and artifacts, including the items listed in this pamphlet.

Fellowships & Research Grants

Contribute to a program of grants and fellowships that supports the research of CMU students and scholars using Special Collections.

Exhibitions & Facilities

Support immersive, groundbreaking exhibitions and improvements to facilities in Special Collections.

Preservation & Conservation

Support professional conservation work on Carnegie Mellon's rare artifacts and books, ensuring their accessibility for future generations of students and scholars.

For more information or to support Special Collections, please contact:

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