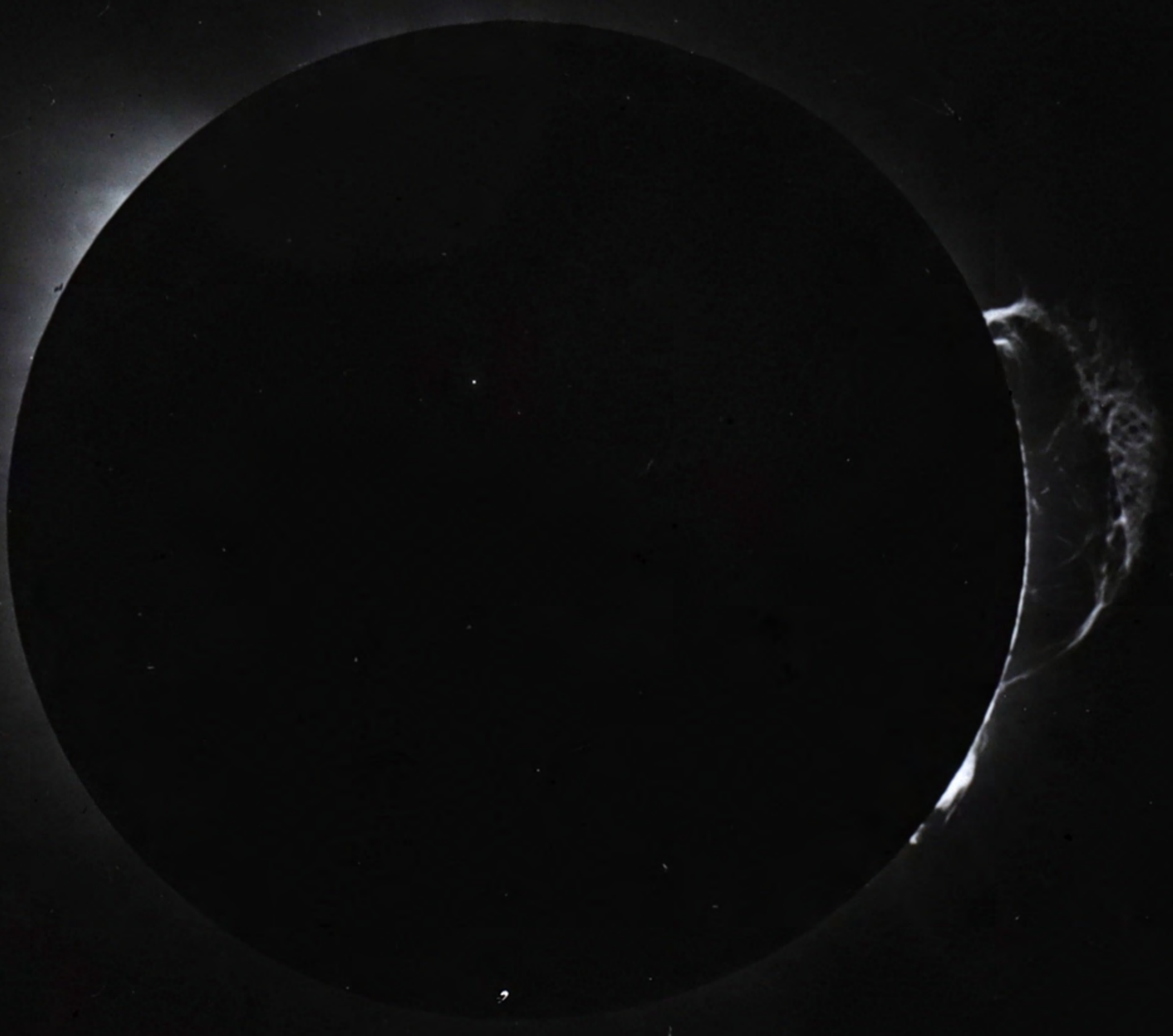
ILLUMINATING THE WORLD

FOUR CENTURIES OF SCIENTIFIC INNOVATION



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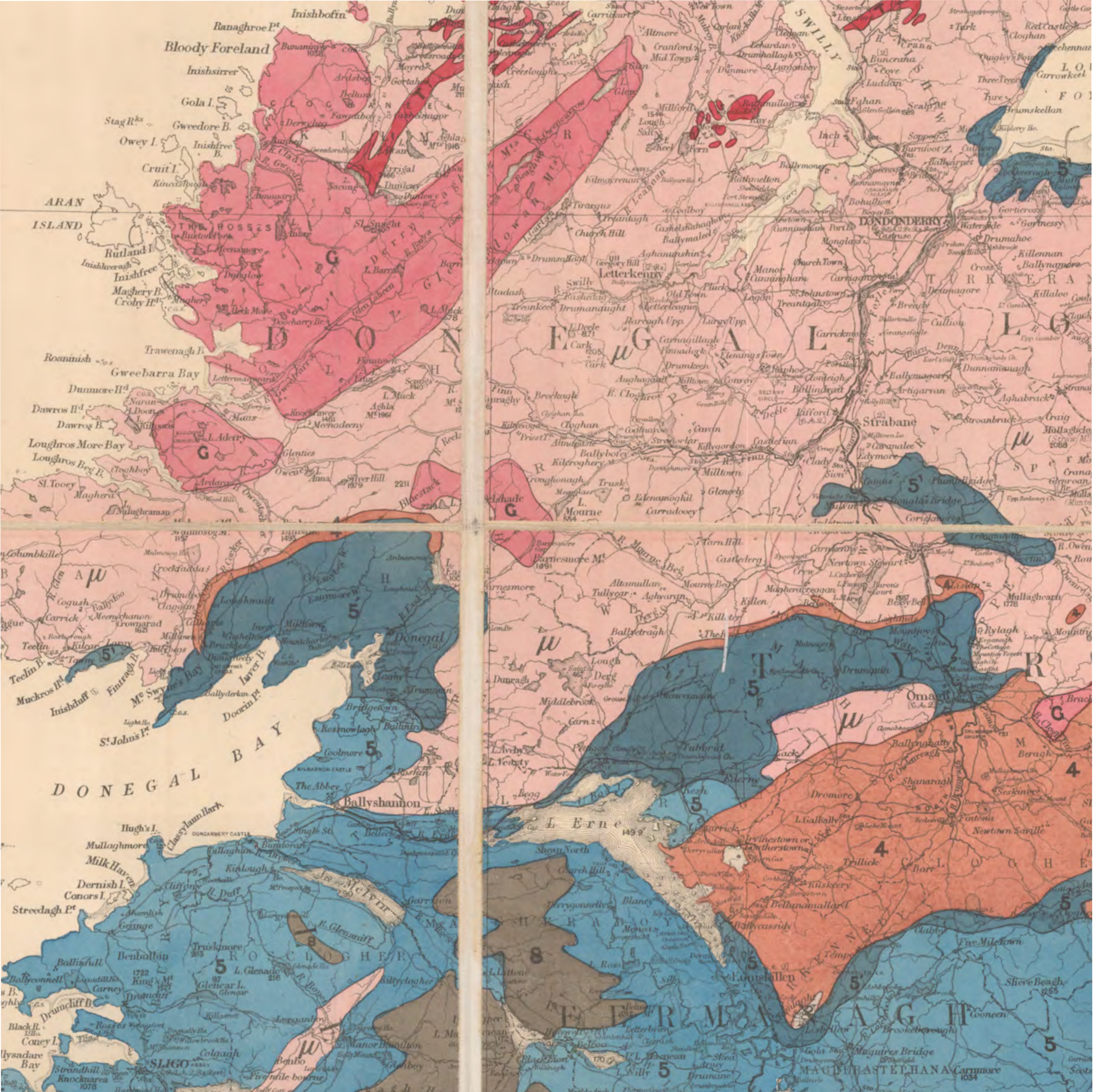
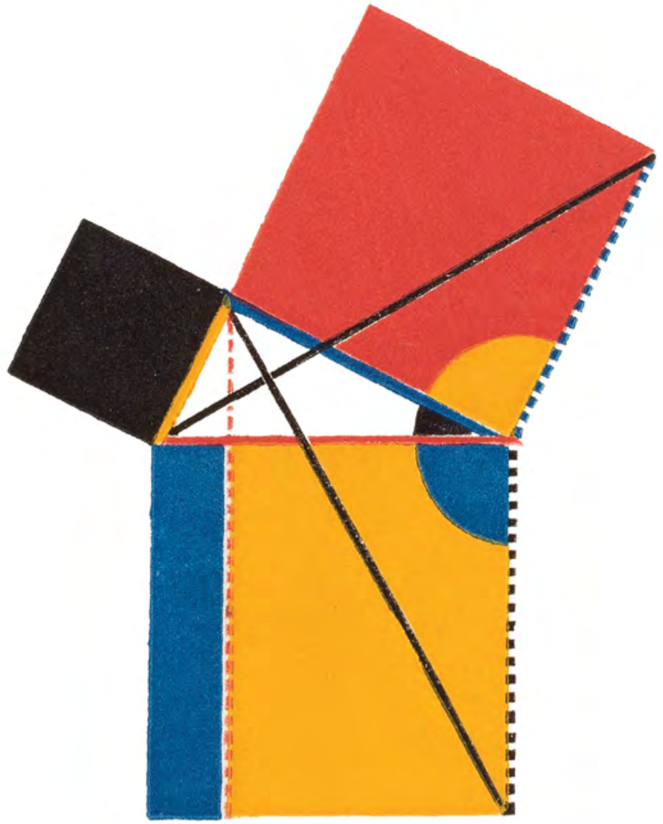


ILLUMINATING THE WORLD

FOUR CENTURIES OF SCIENTIFIC INNOVATION



BORIS JARDINE | RARE BOOKS *with* JULIAN WILSON RARE BOOKS

Welcome to our first collaborative catalogue, showcasing four centuries of scientific innovation, featuring 36 landmark texts, maps, and artefacts that illuminate the remarkable creativity and ingenuity of modern science.

This catalogue offers a rare opportunity to acquire important items such as Charles Darwin discussing the classification of barnacles in a letter to marine biologist Henry Lee, Marie Tharp's groundbreaking contributions to Plate Tectonics, James Hutton's foundational 'Theory of the Earth', Srinivasa Ramanujan's elegant number theory papers, and Andrew Wiles' celebrated solution to Fermat's Last Theorem.

If there is a leitmotif to the collection, it is the 'art of science': highlights include three masterpieces of nineteenth-century graphic design, namely Byrne's Euclid, Youmans' *Chemical Atlas*, and Quin's *Historical Atlas*, alongside which sit Émile Blanchard's exquisite botanical and entomological illustrations. We are also offering four wonderful geological maps, their beautiful colours revealing the hidden structures of our world, while Hooke's paper on the micrometer features some ingenious 'paper engineering'.

Other pivotal scientific documents offered here include Babbage's original Difference Engine proposal, the earliest discussion of Gregor Mendel's Laws of Inheritance, Max Born's classic work on atomic structure annotated by Douglas Hartree, Cantor's first publication on the 'Continuum Hypothesis', and the landmark 1953 *Nature* issue containing papers by Crick, Watson, Franklin, and Wilkins unveiling the structure of DNA.

Each item in this collection not only represents a milestone in scientific thought but also exemplifies the art and craft of scientific communication. We invite you to explore and acquire these rare and inspiring pieces that have shaped our understanding of the natural world and the universe beyond.

Boris Jardine & Julian Wilson
May 2025

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BABBAGE, Charles (1791–1871)

Mr. Babbage's Invention. Copies of the Correspondence Between the Lords Commissioners of His Majesty's Treasury and the President and Council of the Royal Society, relative to an Invention of Mr. Babbage [including:] Letter to Sir Humphry Davy, Bart. […] on the Application of Machinery to the Purpose of Calculating and Printing Mathematical Tables

London: House of Commons, 1823

Folio (309 x 202mm); pp. [1]–6, docket title to leaf B2 verso; Sig: A–B^2

Stab-stitched; spine reinforced with archival grade Japanese paper; near fine condition, housed in a custom made drop-leaf folder

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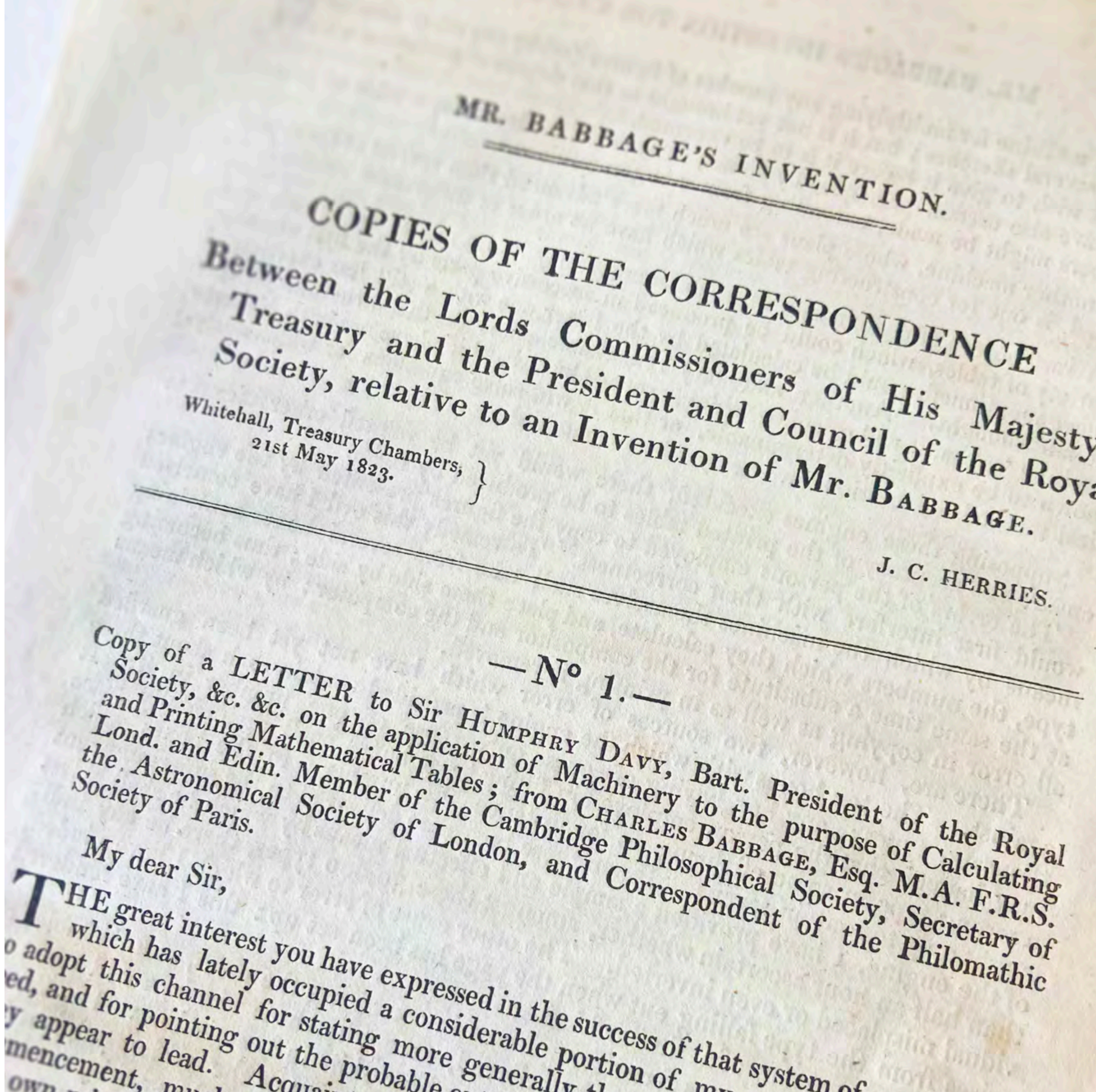
References: Origins of Cyberspace 29 (for the separate printing of the *Letter to Sir Humphry Davy*)

The birth of automatic computing. The presentation to the British government of Charles Babbage's case for funding for his 'Difference Engine', with the Royal Society's assent and the government's favourable response. This elegant, separately paginated and stab-stitched production, with the docket title to the final leaf (see image, below), contains Babbage's celebrated letter to Humphry Davy, as well as supplementary material that resulted in the government's remarkable grant of £1,500 (a fraction of the eventual cost). Only one other copy is recorded worldwide, at the University of Illinois.

Although many calculating machines predate Babbage's Difference Engine (see Cat. No. 22), the Engine marks a decisive break: Babbage wanted not only to mechanize calculation, but to automate it. Specifically he wanted to automate the compilation and printing of astronomical and other mathematical tables. The present document marks the moment when Babbage's Difference Engine went from an inventor's dream to a reality – albeit one only ever partially completed.

Babbage had created a model of his Difference Engine in the early 1820s, but he knew that only with public support could he create a fully operational machine. To this end he wrote his famous open letter to Humphry Davy, then President of the Royal Society and probably the most renowned scientist in the land, giving extensive detail of the project. With Davy's backing, the Royal Society's response was given: a grant to Babbage was made, and production began in earnest.



MR. BABBAGE'S INVENTION.

COPIES OF THE CORRESPONDENCE
Between the Lords Commissioners of His Majesty
Treasury and the President and Council of the Roya
Society, relative to an Invention of Mr. Babbage.

Whitehall, Treasury Chambers, 21st May 1823.

J. C. HERRIES.

—No 1.—

Copy of a LETTER to Sir Humphry Davy, Bart. President of the Royal Society, &c. &c. on the application of Machinery to the purpose of Calculating and Printing Mathematical Tables; from Charles Babbage, Esq. M.A. F.R.S. Lond. and Edin. Member of the Cambridge Philosophical Society, Secretary of the Astronomical Society of London, and Correspondent of the Philomathic Society of Paris.

My dear Sir,

THE great interest you have expressed in the success of that system of
which has lately occupied a considerable portion of
o adopt this channel for stating more generally
ed, and for pointing out the probable
y appear to lead.

BLANCHARD, Émile (1819–1900)

La Zoologie agricole: ouvrage comprenant l'histoire entière des animaux nuisibles et des animaux utiles

Paris: Victor Masson, for the Bureau de la Zoologie agricole, 1854–56

Quarto (334 x 230mm); 15 fascicles in original wraps, continuously paginated to p. 192, with a total of 28 plates, (15)

Very good condition: the first wrap is age-darkened; all wraps somewhat chipped; internally near fine throughout

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References: d'Aguilar, *Les illustrations entomologiques*, p. 21

One of the 19th-century's great works of botanical and entomological illustration. Émile Blanchard (1819–1900) rose from the position of préparateur – begun at the age of 14 – to become, in the words of his *Nature* obituary, the 'doyen' of French zoologists and a Professor at the Muséum national d'Histoire naturelle. Blanchard's fame rested on an unusual fact: he possessed extraordinary powers of unaided visual perception – working on minute subjects that others would have examined with microscopes. Shortly after the completion of the present work his eyesight began to fail, lending extreme pathos to the last years of his career.

Zoologie agricole is Blanchard's study of the damage done by particular insects to crop plants and ornamental flowers, with plates after original illustrations by his father, the illustrator Émile-Théophile Blanchard (1795–1877). It is one of the finest works of nineteenth century scientific illustration – though from its complex bibliography we can surmise that the production was too ambitious ever to be completed. The plates (as always) are out of sequence; the text (as always) ends abruptly on p. 192; the final fascicle is almost entirely plates, two of which remain uncoloured. Moreover, no two copies are identical. The copy at the Bibliothèque nationale de France has only 20 plates. The UK Natural History Museum's catalogue states that only 21 plates were published. The present copy, however, has 28 plates, the same number as the copy at the Royal Danish Library. We can locate no other similar copies. The work is very scarce in any format, and in this condition, level of completeness and preserving the original fascicle format, we are confident that this is the finest surviving example.

BLOMBERG, Albert (1844–1922)

Om hybridbildning hos de fanerogama växterna

Stockholm: P. A. Nymans Tryckeri, 1872

Octavo (240 x 139mm); pp. 41

Academic thesis issued in self-wraps; bound with another shorter work on botany in later brick-red cloth with gilt title to the spine; ownership signature to the front free endpaper

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Provenance: Arne H. Holmqvist (20th-century Swedish botanist)

References: Orel, 'The enigma of hybrid constancy in Mendel's *Pisum* paper perceived by Albert Blomberg in 1872'

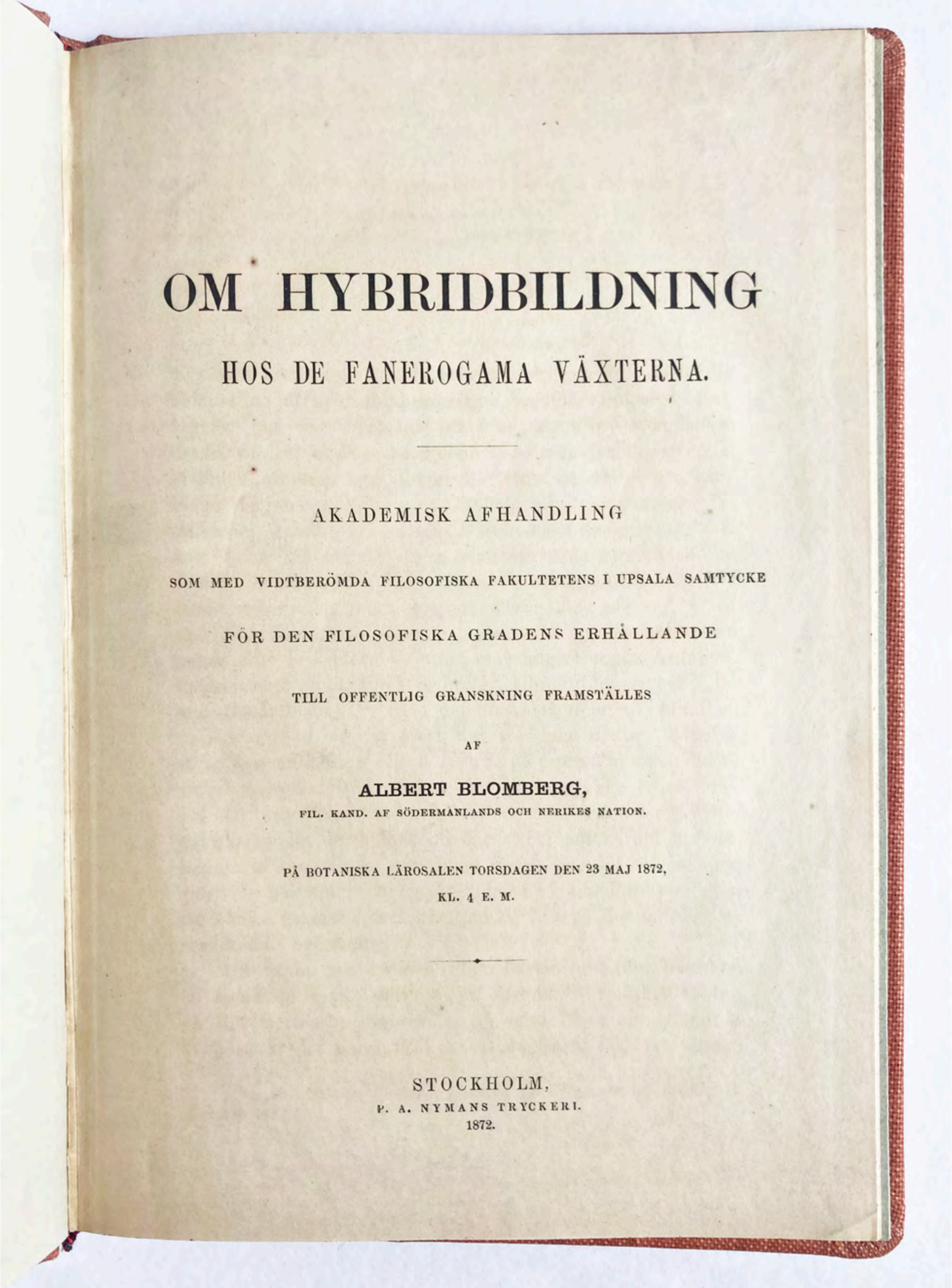
The earliest recorded discussion of Gregor Mendel's Laws of Inheritance. In 1865 Mendel had published his famous paper 'Versuche über Pflanzen-Hybriden', describing his experiments with pea plants (mostly *Pisum sativum*), in which he showed that traits are inherited as discrete units, and established the famous 1:2:1 ratio of variation. The standard account is that these results were entirely forgotten until 1900, when a group of papers constituted the 'rediscovery' of Mendel and the true origin of Mendelianism.

Extensive bibliographic research has revealed a more complicated situation: in 1869 Hermann Hoffmann referred briefly to Mendel, but did not discuss his Laws of Inheritance, merely mentioning the work and reporting briefly on the results. Then in 1872 the present work appeared, a dissertation by a little known Uppsala student botanist Albert Blomberg, the title of which translates as *On Hybrid Formation in Phanerogamous Species*. Blomberg's thesis is really a literature review of recent work on hybridization, and he cites Mendel a number of times, writing on page 37 that

> Mendel supposes that two kinds of characters are transmitted to the hybrid when it is formed: 'dominant' are those which in the first generation determine the appearance of the hybrid, and 'recessive' those which in the beginning are latent.

In addition to this specific reference to Mendel's breakthrough discovery, Blomberg also gives a careful account of Mendel's thinking on the constancy of hybrids. That Mendel would be known in Uppsala is perhaps explained by the presence there of the mycologist Elias Fries, who was an expert on *Hieracium* – the other main genus studies by Mendel after *Pisum*.

As a student thesis this text is predictably rare – in fact the reference to Mendel was only noticed in 1915. Two copies can be located in the UK, at Kew and the Natural History Museum. Only one copy can be located outside Europe, at the Center for Research Libraries, Chicago IL.



OM HYBRIDBILDNING

HOS DE FANEROGAMA VÄXTERNA.

AKADEMISK AFHANDLING

SOM MED VIDTBERÖMDA FILOSOFISKA FAKULTETENS I UPSALA SAMTYCKE

FÖR DEN FILOSOFISKA GRADENS ERHÅLLANDE

TILL OFFENTLIG GRANSKNING FRAMSTÄLLES

AF

ALBERT BLOMBERG,

FIL. KAND. AF SÖDERMANLANDS OCH NERIKES NATION.

PÅ BOTANISKA LÄROSALEN TORSDAGEN DEN 23 MAJ 1872,

KL. 4 E. M.

STOCKHOLM,

P. A. NYMANS TRYCKERI.

1872.

BORN'S QUANTUM MECHANICS: EDITOR'S COPY

BORN, Max (1882–1970)

Vorlesungen über Atommechanik

Berlin: Julius Springer, 1925

Octavo (209 x 145mm), softcover; pp. ix, 358

Fair condition: binding frail and edges chipped; housed in a custom clamshell box

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Provenance: Douglas Rayner Hartree (1897–1958), physicist and computer pioneer

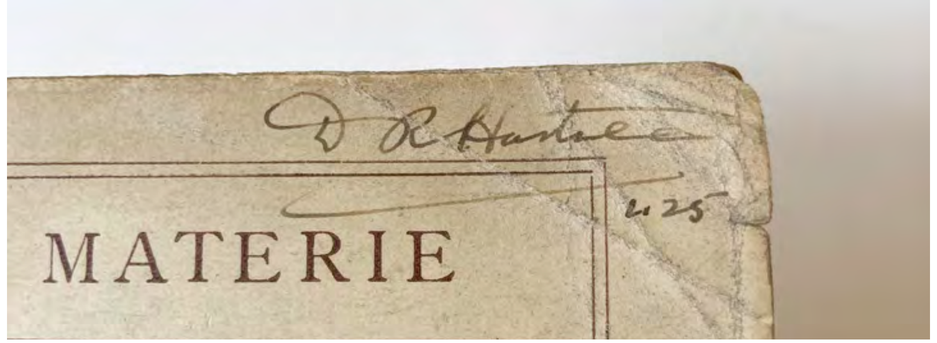
References: Giulini, 'Max Born's Vorlesungen über Atommechanik, Erster Band'

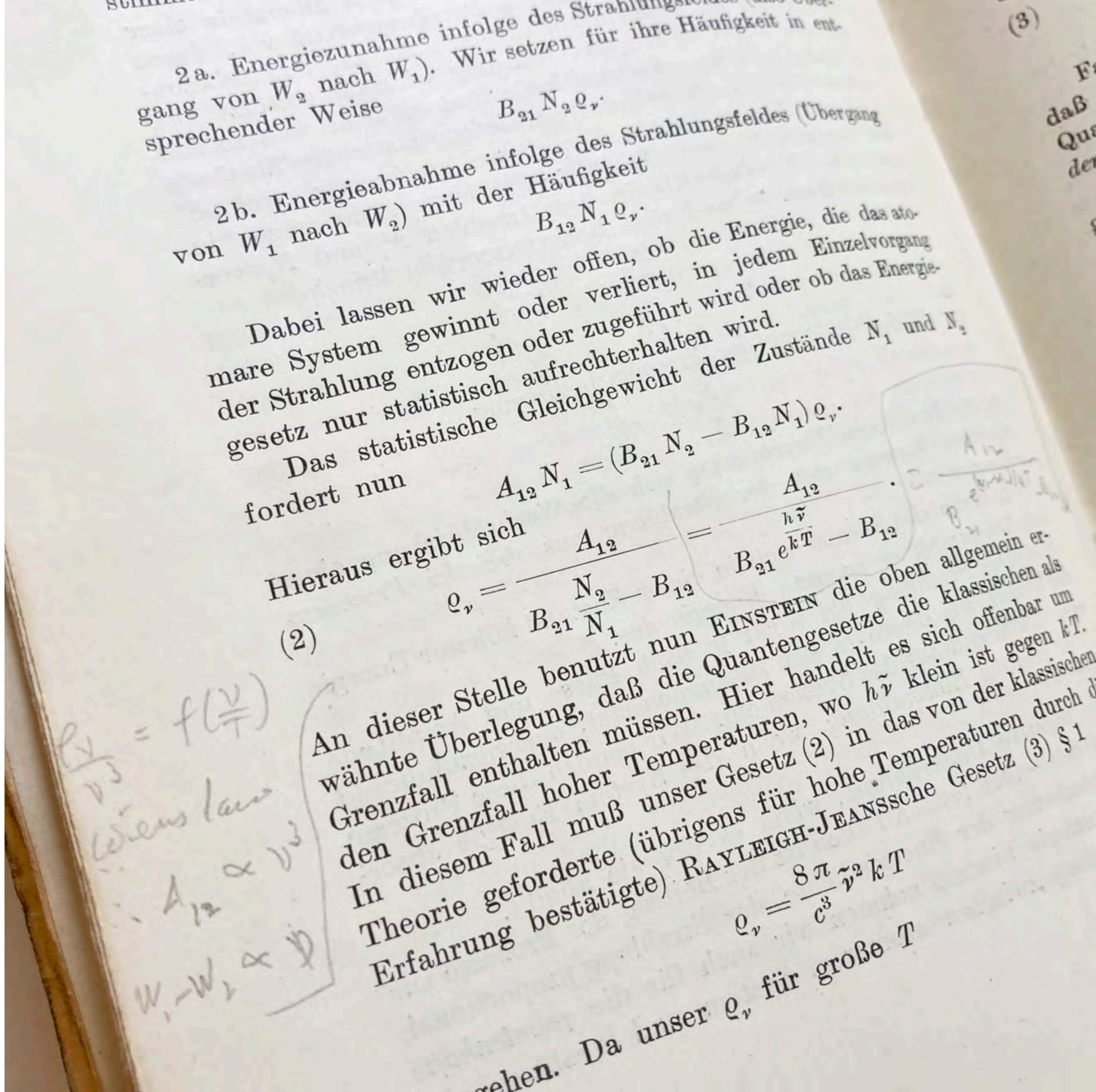
An important copy of Max Born's classic work on atomic structure: physicist Douglas Rayner Hartree's working copy, acquired by him in the year of publication and extensively used in his editorial work for the English publication, in 1927, as *The Mechanics of the Atom*.

Hartree (1897–1958) is now more famous for his very early contributions to the history of computing. But in fact his physics and work on computing are closely connected. Around the time he acquired and annotated this book he was working on Bohr's model of the atom, using his skill in numerical analysis to complete a PhD in 1926.

The book itself would have been crucial to Hartree: it was a state-of-the-art summary of the 'Bohr-Sommerfeld quantization' – Sommerfeld's improvement on Bohr's fundamental contribution to atomic theory in the 1910s. Hartree therefore was a natural choice to act as editor, and as evidenced from the marginalia he worked with Max Born in the preparation of the English version, though the translation itself was undertaken by J.W. Fisher.

The text is extensively annotated by Hartree, with corrections, additions and marginal notes, many of which resulted in changes to the text for the English version. The English version, then, is more than a simple translation – it is a revised version, with the marginal notes here constituting a unique record of Hartree's process of revision. Even in biographical material on Hartree there is little mention made of this work – the full study of which awaits its historian.





2a. Energiezunahme infolge des Strahlungsfeldes (Übergang von W_2 nach W_1). Wir setzen für ihre Häufigkeit in entsprechender Weise $B_{21} N_2 \varrho_\nu$.

2b. Energieabnahme infolge des Strahlungsfeldes (Übergang von W_1 nach W_2) mit der Häufigkeit $B_{12} N_1 \varrho_\nu$.

Dabei lassen wir wieder offen, ob die Energie, die das atomare System gewinnt oder verliert, in jedem Einzelvorgang der Strahlung entzogen oder zugeführt wird oder ob das Energiegesetz nur statistisch aufrechterhalten wird.

Das statistische Gleichgewicht der Zustände N_1 und N_2 fordert nun

$$A_{12} N_1 = (B_{21} N_2 - B_{12} N_1)\varrho_\nu .$$

Hieraus ergibt sich

$$(2) \qquad \varrho_\nu = \frac{A_{12}}{B_{21}\frac{N_2}{N_1} - B_{12}} = \frac{A_{12}}{B_{21} e^{\frac{h\tilde{\nu}}{kT}} - B_{12}} .$$

An dieser Stelle benutzt nun EINSTEIN die oben allgemein erwähnte Überlegung, daß die Quantengesetze die klassischen als Grenzfall enthalten müssen. Hier handelt es sich offenbar um den Grenzfall hoher Temperaturen, wo $h\tilde{\nu}$ klein ist gegen kT. In diesem Fall muß unser Gesetz (2) in das von der klassischen Theorie geforderte (übrigens für hohe Temperaturen durch die Erfahrung bestätigte) RAYLEIGH-JEANSsche Gesetz (3) § 1

$$\varrho_\nu = \frac{8\pi}{c^3}\tilde{\nu}^2 kT$$

…gehen. Da unser ϱ_ν für große T

CANTOR, Georg (1845–1918)

'Ein Beitrag zur Mannigfaltigkeitslehre'

[IN:] *Journal für die reine und angewandte Mathematik*, Vol. 84

Berlin: G. Reimer, 1877

Quarto (280 x 220mm); pp. iv, 359 (Cantor at pp. 242–258)

Whole volume in contemporary cloth binding; minimal ex-library markings. Very good condition faint foxing to prelims but otherwise very good internally

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References: Grattan-Guiness, *From the Calculus to Set Theory*, pp. 197ff.

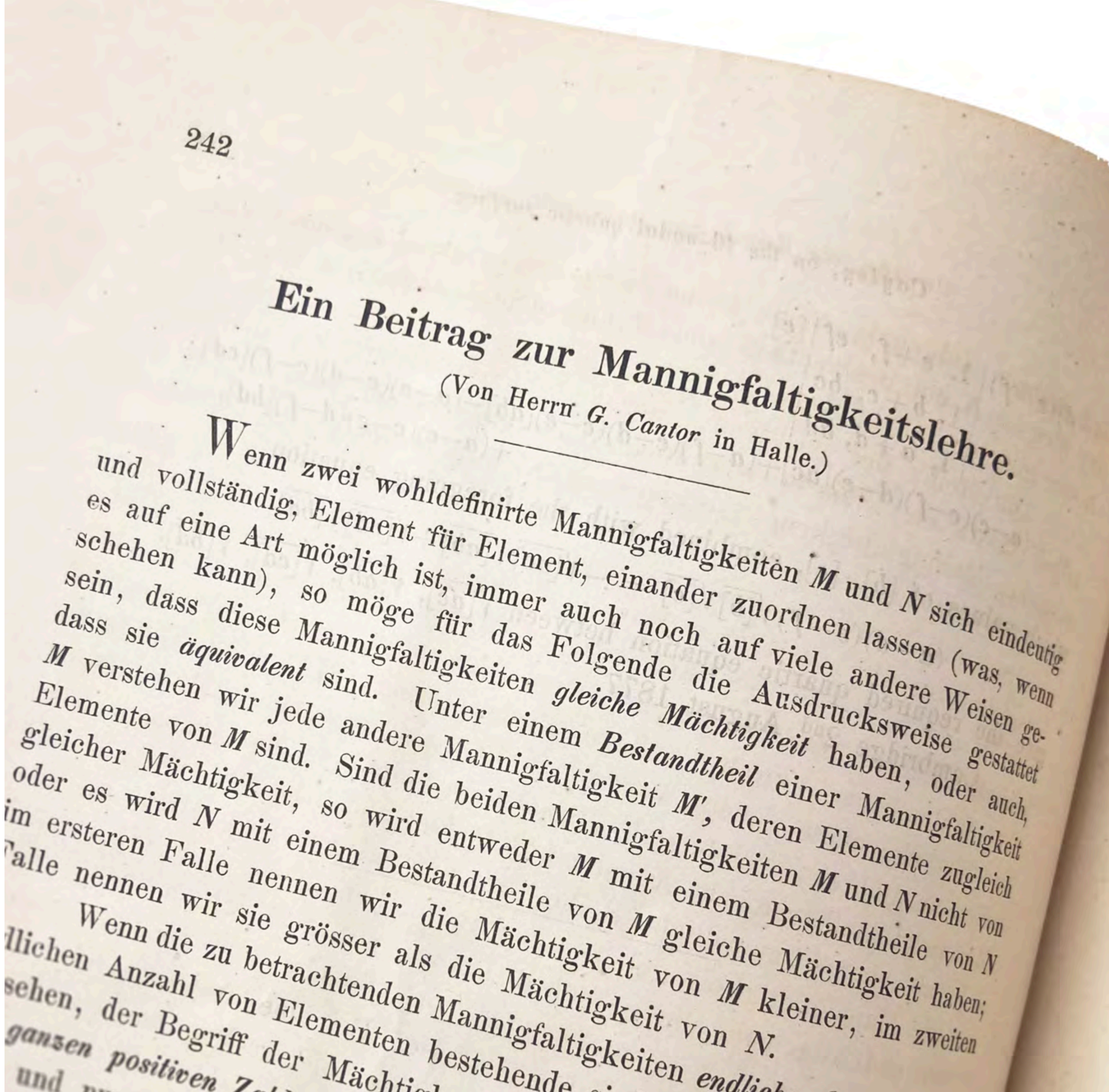
The first publication of 'the Continuum Hypothesis', one of the most profound statements about the nature of infinity, and a foundational work in Set Theory.

The Hypothesis states that: *There is no set whose cardinality is strictly between that of the integers and the real numbers.*

With this idea Cantor was attempting to resolve a fundamental question about the new kinds of infinity that his revolutionary Set Theory generated. The integers make up what we might call an intuitive infinity; Cantor, with his diagonal argument, had shown that the infinite set of real numbers was *bigger* than that of the integers – so how were these two orders of infinity related? The Continuum Hypothesis suggests that the two orders are contiguous, that another order of infinity cannot be interpolated between them.

David Hilbert was so impressed with this idea that he made its proof or disproof the first of his famous 23 problems in 1900. A few decades later Gödel showed that the Continuum Hypothesis was consistent with the axioms of Set Theory, i.e. it could not be *dis*proved with the mathematical tools then available. But, astonishingly, Paul Cohen later showed that the Continuum Hypothesis could not be *proved* either – work that won him the Fields Medal in 1966. So the Continuum Hypothesis lies outside of the known world of mathematics.

At the deepest level the Continuum Hypothesis poses a question about the nature of mathematical reasoning itself: can there be a problem to which there simply is no answer? Cohen believed so: the Continuum Hypothesis is unanswerable, so one could assume it was true or untrue and each would lead to a rigorous though independent mathematics. Gödel, meanwhile, believed that the failure to resolve the Continuum Hypothesis just showed the paucity of the methods employed. Research into the Continuum Hypothesis continues to this day, and has resulted in many breakthroughs in Set Theory in the last century and a half.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Ein Beitrag zur Mannigfaltigkeitslehre.

(Von Herrn *G. Cantor* in Halle.)

Wenn zwei wohldefinirte Mannigfaltigkeiten *M* und *N* sich eindeutig und vollständig, Element für Element, einander zuordnen lassen (was, wenn es auf eine Art möglich ist, immer auch noch auf viele andere Weisen geschehen kann), so möge für das Folgende die Ausdrucksweise gestattet sein, dass diese Mannigfaltigkeiten *gleiche Mächtigkeit* haben, oder auch, dass sie *äquivalent* sind. Unter einem *Bestandtheil* einer Mannigfaltigkeit *M* verstehen wir jede andere Mannigfaltigkeit *M'*, deren Elemente zugleich Elemente von *M* sind. Sind die beiden Mannigfaltigkeiten *M* und *N* nicht von gleicher Mächtigkeit, so wird entweder *M* mit einem Bestandtheile von *N* oder es wird *N* mit einem Bestandtheile von *M* gleiche Mächtigkeit haben; im ersteren Falle nennen wir die Mächtigkeit von *M* kleiner, im zweiten alle nennen wir sie grösser als die Mächtigkeit von *N*.

Wenn die zu betrachtenden Mannigfaltigkeiten *endlich*
llichen Anzahl von Elementen bestehende
sehen, der Begriff der Mächti
ganzen positiven Z
und

THE STRUCTURE OF DNA

CRICK, Francis (1916–2004); FRANKLIN, Rosalind (1920–1958); WATSON, James D. (b.1928); WILKINS, Maurice (1916–2004)

‘A Structure for Deoxyribose Nucleic Acid’ [with:] ‘Molecular Structure of Deoxypentose Nucleic Acids’ [with:] ‘Molecular Configuration in Sodium Thymonucleate’

[in:] *Nature*, Vol. 171, No. 4356

London: Macmillan, 1953

Large octavo (255 x 180mm); pp. cclxx–cclxxviii, [709]–732, i–xii [supplement], 733–758, cclxxix–cclxxvi

Single issue in self wraps as issued. Near fine condition; lower staple very slightly rusting; discreet library stamps

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Provenance: Cheshire Joint Sanatorium, received on the day of publication

References: Dibner, *Heralds of Science*, 200. Garrison-Morton 256.3; Judson, *Eighth Day of Creation*

A landmark in the history of science, and one of a handful of the most important (sets of) scientific papers ever published. Crick and Watson announce their double-helical structure for DNA; Franklin and Gosling present ‘Photo 51’; Wilkins publishes the paper that will place him alongside Crick and Watson for the 1962 Nobel Prize (with Franklin having died in 1958).

The longer story of DNA goes back to the 1860s, and the discovery of ‘nuclein’ by the Swiss physiological chemist Friedrich Miescher. The chemical composition of what came to be called deoxyribonucleic acid was worked out in the early 20th century. Around the same time, new innovations in x-ray crystallography led to the idea of understanding the physical structure of biomolecules.

In 1944 a paper was published by Oswald Avery and his colleagues at Rockefeller University showing that hereditary units, or genes, are composed of DNA. Inspired by this, Erwin Chargaff established his famous ‘rules’ that govern the ratios of the different nucleic acids.

By the early 1950s a number of research teams – at Cambridge and King’s College London – were close to solving exact arrangement in space the DNA molecule. Notoriously, Jim Watson was given a glimpse of Franklin’s work by Maurice Wilkins, and this proved to be the final piece of the puzzle: on 25 April 1953 *Nature* published three papers in issue No. 4356, with Crick and Watson claiming the ‘prize’ of discovery, and the two King’s teams represented by their complementary papers – Franklin’s including one of the most famous scientific images ever printed, ‘Photo 51’.

Far from being the end of the race, however, this marked just the start of a revolution in molecular biology. As Crick and Watson wryly commented at the end of their paper:

> It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material.

The 1962 Nobel Prize honoured two of the teams – Crick and Watson’s, and Wilkins’ – and subsequent historians have rightly placed Rosalind Franklin and her colleagues back at the heart of the story.

7. DARWIN: A FINE SCIENTIFIC LETTER

DARWIN, Charles (1809–1882)

Autograph Letter Signed ('Ch. Darwin'), to Henry Lee, on barnacles and their classification

23 December 1871, Down House, Kent

201 x 125mm; 2 leaves, retaining the original envelope, addressed in Darwin's hand; stamped at Down and Beckenham on 23 December and at Croydon on 24 December

Loose leaves, housed in a custom-made drop-leaf cloth-bound folder with leather spine, gilt title, and inset photograph of Charles Darwin. Fine condition; envelope a little worn and marked

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Provenance: Kenneth W. Rendell; Rick Watson

References: Darwin Correspondence Project, Letter no. 8086a; *The Correspondence of Charles Darwin* Volume 19; Stott, *Darwin and the Barnacle*

Charles darwin classifying barnacles. An attractive and revealing letter from Darwin, writing to the marine biologist Henry Lee (1826–1888), author of *Sea Monsters Unmasked* (1883). Here Darwin identifies two groups of barnacle specimens, telling Lee that both are *Lepas anatifera*, the pelagic gooseneck barnacle or smooth gooseneck barnacle. Darwin gives intricate details of the dissections he has conducted:

> I have disarticulated the right-hand scutal valve in both & the umbonal teeth are plain in both

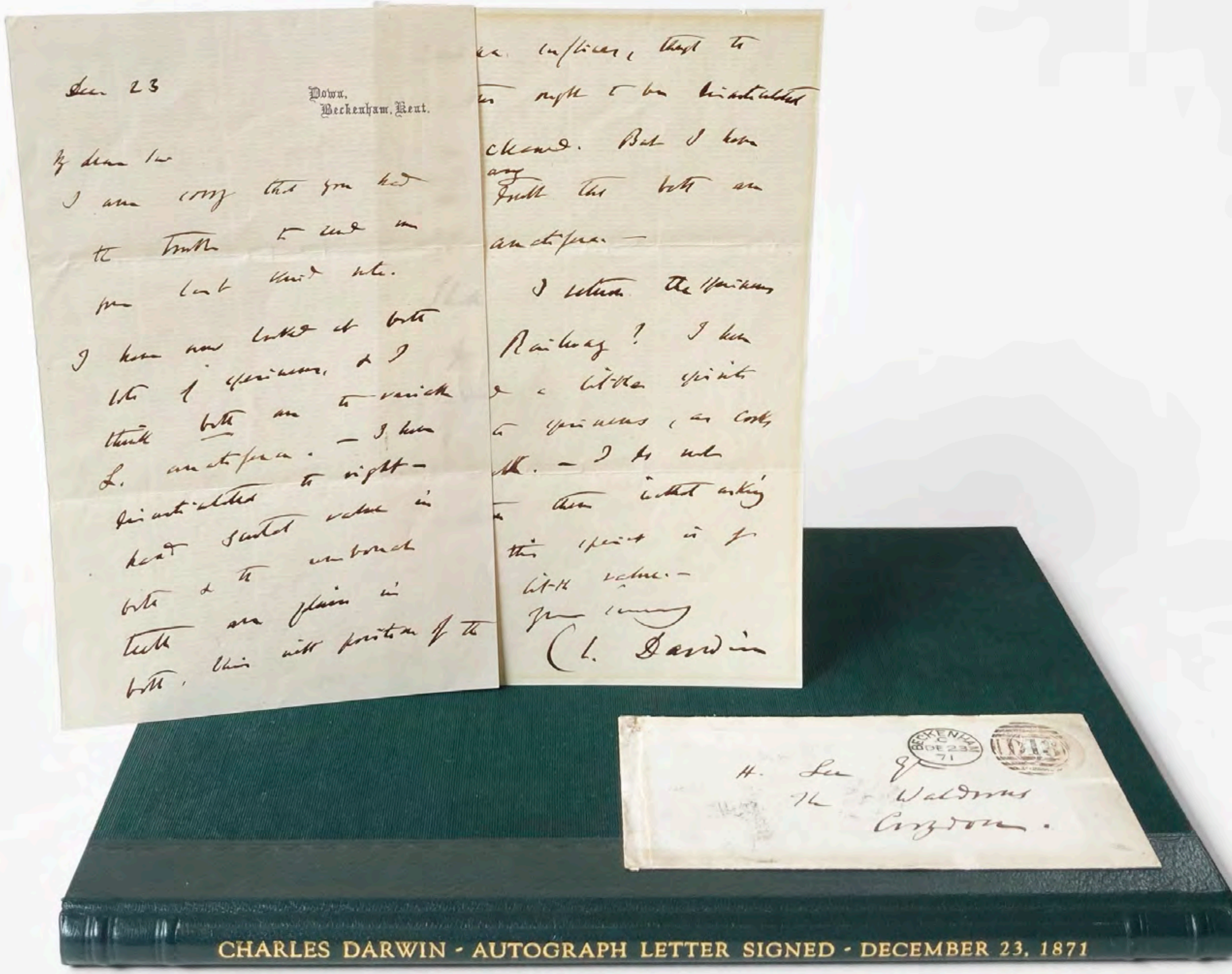
These are the diagnostic anatomical features that Darwin himself had identified in his *Living Cirripedia* (1851). Darwin goes on to discuss other minutiae of classification and offers to return the specimens by railway, adding 'I have added a little spirits to the specimens, as corks leak.'

Darwin's interest in this particular species was profound. While composing *Living Cirripedia* he had trained himself in microscopy and, especially, fine dissection. The *Lepas* genus had given Darwin a particular challenge, leading to reflection on the nature of speciation and the 'tree of life'.

More broadly, the barnacle work was important for Darwin for two reasons: first, it established him as a naturalist, rather than a geologist (as he had previous attempted to become), and, second, it allowed him to build up an exceptionally detailed knowledge of one single area of the natural world.

By the time of this letter Darwin was in his scientific prime. Where he had previously sought the advice of others on classification, he was now an acknowledged master, consulted by scientists like Lee, who had first contacted Darwin in 1868. A discussion over barnacle classification ensued and Lee sent the specimens referred to here. Testament to Darwin's diligence, the letter was composed just before Christmas, when family matters must surely have been pressing.

Unusually, the letter retains the envelope, personally addressed by Darwin himself, postmarked at Down and Beckenham, 23 December 1871, received at Croydon a day later.



DARWIN, Charles (1809–1882) – ANON. [but, OWEN, Richard (1804–1892)]

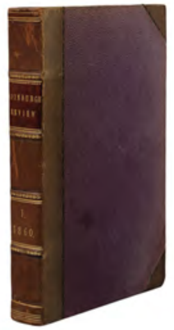
Review by Richard Owen of Darwin's On the Origin of Species by means of Natural Selection

[IN:] *The Edinburgh Review or Critical Journal*, Vol. CXI

Edinburgh: Longman, Green, Longman, and Roberts; London: Adam and Charles Black, 1860

Octavo (214 x 135mm); Owen at pp. 487–532

Contemporary half calf over purple textured boards (extremities lightly rubbed); a fine, clean copy with only some very faint insignificant spotting on last 2 leaves

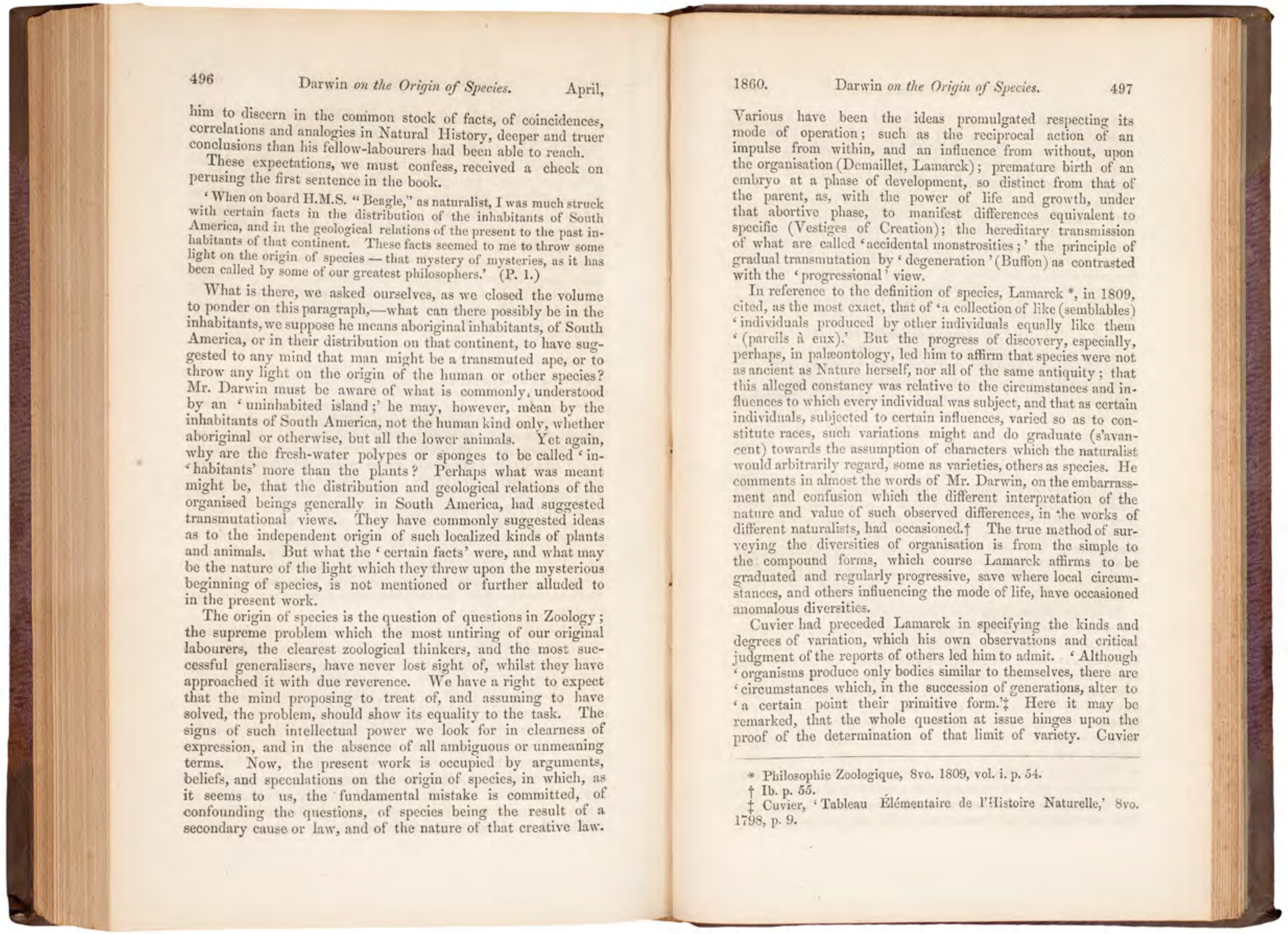


THE REVIEW THAT SHAPED all future public discourse about Darwinism. Richard Owen was the leading British biologist and anatomist of his time, and his opinion carried significant weight in Victorian Britain. Although submitted anonymously, this review of Darwin's work – in Freeman's words, 'The most important biological book ever written' – was widely read by both scientists and the educated public, and informed reaction. Although Owen acknowledged some of Darwin's research as 'gems' (p. 494), particularly regarding his work on bees and pigeons – he was fundamentally critical of Darwin's mechanism of natural selection and the speculative nature of Darwin's broader claims. Owen argued that Darwin's work left the question of the origin of species 'very nearly where the author found it' (p. 494), suggesting that Darwin had not provided a satisfactory explanation for the origin or diversification of life.

Owen vacillated between accepting some form of evolution (as long as it fit within his own framework of 'archetypes' and divine design) and rejecting Darwin's specific mechanism of natural selection. He believed in evolutionary change but attributed it to 'secondary causes' under divine guidance, rather than to natural selection as a blind, material process. This put him at odds with Darwin's naturalistic explanation and made his review a focal point in the broader debate between creationist and evolutionary interpretations of nature.

Thus, Owen's review marked the beginning of a public and personal rift between him and Darwin, which escalated into a long-standing scientific and personal rivalry. Owen not only criticized Darwin's theory but later attempted to claim priority for aspects of evolutionary theory himself, leading Darwin to respond in later editions of the *Origin* and in his 'Historical Sketch'.

Perhaps more importantly, the review contributed to the polarization of opinion both within the scientific community, as well as in the public sphere. Owen's stature lent credibility to anti-Darwinian arguments, while also prompting Darwin's supporters, such as T.H. Huxley, to defend and clarify the new theory, most famously in the 1860 Oxford evolution debate.



496 Darwin *on the Origin of Species.* April,

him to discern in the common stock of facts, of coincidences, correlations and analogies in Natural History, deeper and truer conclusions than his fellow-labourers had been able to reach.

These expectations, we must confess, received a check on perusing the first sentence in the book.

'When on board H.M.S. "Beagle," as naturalist, I was much struck with certain facts in the distribution of the inhabitants of South America, and in the geological relations of the present to the past inhabitants of that continent. These facts seemed to me to throw some light on the origin of species — that mystery of mysteries, as it has been called by some of our greatest philosophers.' (P. 1.)

What is there, we asked ourselves, as we closed the volume to ponder on this paragraph,—what can there possibly be in the inhabitants, we suppose he means aboriginal inhabitants, of South America, or in their distribution on that continent, to have suggested to any mind that man might be a transmuted ape, or to throw any light on the origin of the human or other species? Mr. Darwin must be aware of what is commonly understood by an 'uninhabited island;' he may, however, mean by the inhabitants of South America, not the human kind only, whether aboriginal or otherwise, but all the lower animals. Yet again, why are the fresh-water polypes or sponges to be called 'in-'habitants' more than the plants? Perhaps what was meant might be, that the distribution and geological relations of the organised beings generally in South America, had suggested transmutational views. They have commonly suggested ideas as to the independent origin of such localized kinds of plants and animals. But what the 'certain facts' were, and what may be the nature of the light which they threw upon the mysterious beginning of species, is not mentioned or further alluded to in the present work.

The origin of species is the question of questions in Zoology; the supreme problem which the most untiring of our original labourers, the clearest zoological thinkers, and the most successful generalisers, have never lost sight of, whilst they have approached it with due reverence. We have a right to expect that the mind proposing to treat of, and assuming to have solved, the problem, should show its equality to the task. The signs of such intellectual power we look for in clearness of expression, and in the absence of all ambiguous or unmeaning terms. Now, the present work is occupied by arguments, beliefs, and speculations on the origin of species, in which, as it seems to us, the fundamental mistake is committed, of confounding the questions, of species being the result of a secondary cause or law, and of the nature of that creative law.

1860. Darwin *on the Origin of Species.* 497

Various have been the ideas promulgated respecting its mode of operation; such as the reciprocal action of an impulse from within, and an influence from without, upon the organisation (Demaillet, Lamarck); premature birth of an embryo at a phase of development, so distinct from that of the parent, as, with the power of life and growth, under that abortive phase, to manifest differences equivalent to specific (Vestiges of Creation); the hereditary transmission of what are called 'accidental monstrosities;' the principle of gradual transmutation by 'degeneration' (Buffon) as contrasted with the 'progressional' view.

In reference to the definition of species, Lamarck *, in 1809, cited, as the most exact, that of 'a collection of like (semblables) 'individuals produced by other individuals equally like them '(pareils à eux).' But the progress of discovery, especially, perhaps, in palæontology, led him to affirm that species were not as ancient as Nature herself, nor all of the same antiquity; that this alleged constancy was relative to the circumstances and influences to which every individual was subject, and that as certain individuals, subjected to certain influences, varied so as to constitute races, such variations might and do graduate (s'avancent) towards the assumption of characters which the naturalist would arbitrarily regard, some as varieties, others as species. He comments in almost the words of Mr. Darwin, on the embarrassment and confusion which the different interpretation of the nature and value of such observed differences, in the works of different naturalists, had occasioned.† The true method of surveying the diversities of organisation is from the simple to the compound forms, which course Lamarck affirms to be graduated and regularly progressive, save where local circumstances, and others influencing the mode of life, have occasioned anomalous diversities.

Cuvier had preceded Lamarck in specifying the kinds and degrees of variation, which his own observations and critical judgment of the reports of others led him to admit. 'Although 'organisms produce only bodies similar to themselves, there are 'circumstances which, in the succession of generations, alter to 'a certain point their primitive form.'‡ Here it may be remarked, that the whole question at issue hinges upon the proof of the determination of that limit of variety. Cuvier

* Philosophie Zoologique, 8vo. 1809, vol. i. p. 54.
† Ib. p. 55.
‡ Cuvier, 'Tableau Élémentaire de l'Histoire Naturelle,' 8vo. 1798, p. 9.

EDDINGTON, Sir Arthur Stanley (1882–1944); DYSON, Sir Frank Watson (1868–1939)

Stereo diapositive image of the 1919 full solar eclipse, observations of which were used to confirm Einstein's Theory of General Relativity

90 x 170mm

Two glass transparencies loosely mounted on a clear glass plate; plates in fine condition; mount worn and fragile

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References: F.W. Dyson, 'Drawings of the Corona from Photographs at Total Eclipses'; L.A. Bauer, Résume of Observations concerning the Solar Eclipse of May 29, 1919, and the Einstein Effect', *Science*

An exceptional survival: the sole recorded stereoview of the famous 1919 eclipse, produced as part of the famous 'Eddington experiment', which offered the first experimental proof of Einstein's theory of General Relativity.

In May 1919 a team of observers led by Arthur Eddington and Frank Watson Dyson conducted observations of a total solar eclipse, from stations at Sobral in Brazil (Charles Davidson and Andrew Crommelin) and at Príncipe, off the West Coast of Africa (Eddington, with Edwin Turner Cottingham). Dyson remained in Europe to co-ordinate the operation, and was later responsible for analysing the data. The team's aim was to measure the deflection of star-light by the gravitational mass of the Sun – a phenomenon predicted by Einstein but only visible during eclipse conditions.

Close study of the images has revealed that the two images that make up this stereoview match published photographs taken at both locations just before midnight. It is almost certain that both images are from the set of observations made at Príncipe, as these were considered the superior observations, and the photographs made there had shorter exposures and are therefore much sharper.

Astronomical stereoviews were typically made from time-series (rather than being made from simultaneous photographs at different locations), and this is likely the case for the present stereoview. Although it is known that Eddington developed photographs immediately at Príncipe in order to measure the stellar positions, we propose that this stereoview was made by (or under the direction of) Dyson back at Greenwich, for it was Dyson who maintained an interest in solar phenomena separate to the Relativity studies. Further archival research may shed further light on the purpose of the stereoview: no published version or discussion is known.

The stereoview dramatically shows the solar flare that was visible during the eclipse. The totality lasted for more than 5 minutes, an exceptionally long time for a total eclipse, meaning that the photographers could capture many very fine images.

EUCLID (*fl.* 300 BCE) – BYRNE, Oliver (1810–1880)

The First Six Books of the Elements of Euclid in Which Coloured Diagrams and Symbols Are Used Instead of Letters for the Greater Ease of Learners

London: Charles Whittingham at the Chiswick Press for William Pickering, 1847

Quarto (230 x 183mm); pp. [i]–viii–xxix–[xxx], [1]–268, half-title, numerous criblé initials, most text in black, but the text interspersed with a plethora of illustrations, diagrams, figures and symbolic elements printed in 4 colours

Very good: occasional offsetting and scattered spotting as usual, but much cleaner than most other copies of this book. Contemporary calf (extremities lightly rubbed)

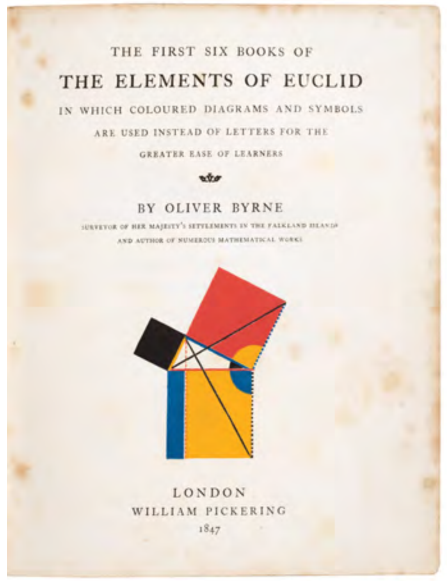
References: Friedman, *Color Printing in England* 43; Ing, *Charles Whittingham Printer*, 46; Keynes, *Pickering*, pp. 37, 65; McLean, *Victorian Book Design*, pp. 50–51

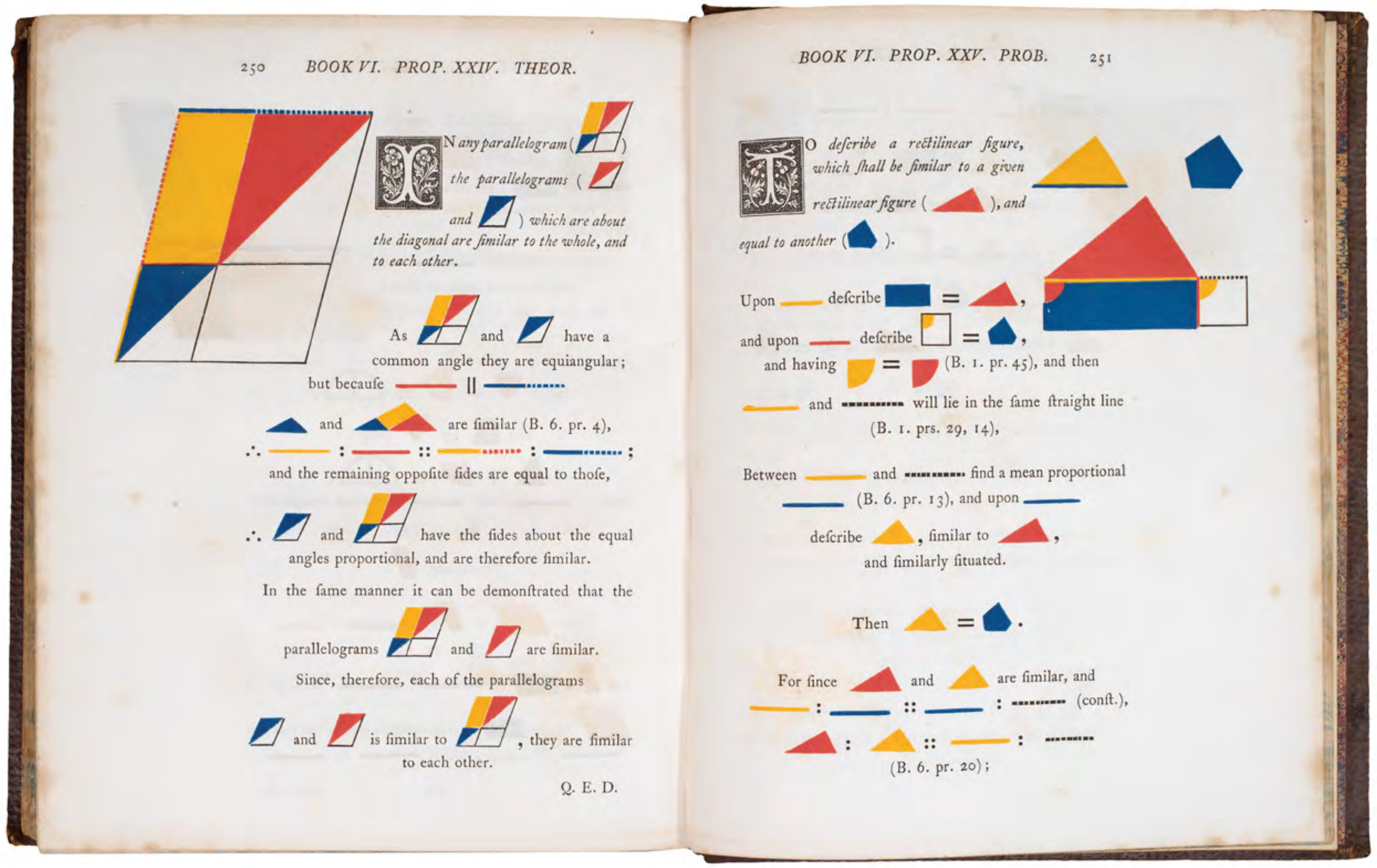
A TECHNICAL TOUR-DE-FORCE of colour printing. Oliver Byrne was a self-educated mathematician and engineer, who came to believe that

> it might be easier to learn geometry if colours were substituted for the letters usually used to designate the angles and lines of geometric figures. Instead of referring to, say, "angle ABC", Byrne's text substituted a blue or yellow or red section equivalent to similarly coloured sections in the theorem's main diagram (Friedman)

Exhibited at the Great Exhibition in London 1851 with a price of 25 shillings, the work was exceedingly expensive and unaffordable for educators who could have put the new teaching method to practical use.

Regardless, it is considered a landmark example of Victorian book production. Its innovative graphic conception and style prefigures the modernist experiments of the Bauhaus and De Stijl movements, and has so much contemporary appeal that the publisher Kroncker Wallis has initiated a Kickstarter campaign to complete all thirteen books of Euclid in the style of Byrne's production. See also Cat. No. 35 for a near-contemporary example of virtuosic printing in the service of scientific education.





FARADAY, Michael (1791–1867)

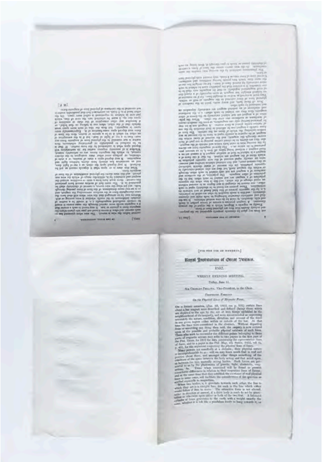
On the Physical Lines of Magnetic Force

London: Royal Institution, [1852]

Single halved demy sheet (225 x 114mm) twice folded; 5pp.

Fine condition, noting only the very faintest darkening to the lower right-hand corner. Uncut, as issued

References: Gribbin, *Science: A History*, pp. 411ff; Cox and Jeff Forshaw, *Why Does E=MC² (And Why Should We Care?)*, pp. 17–21



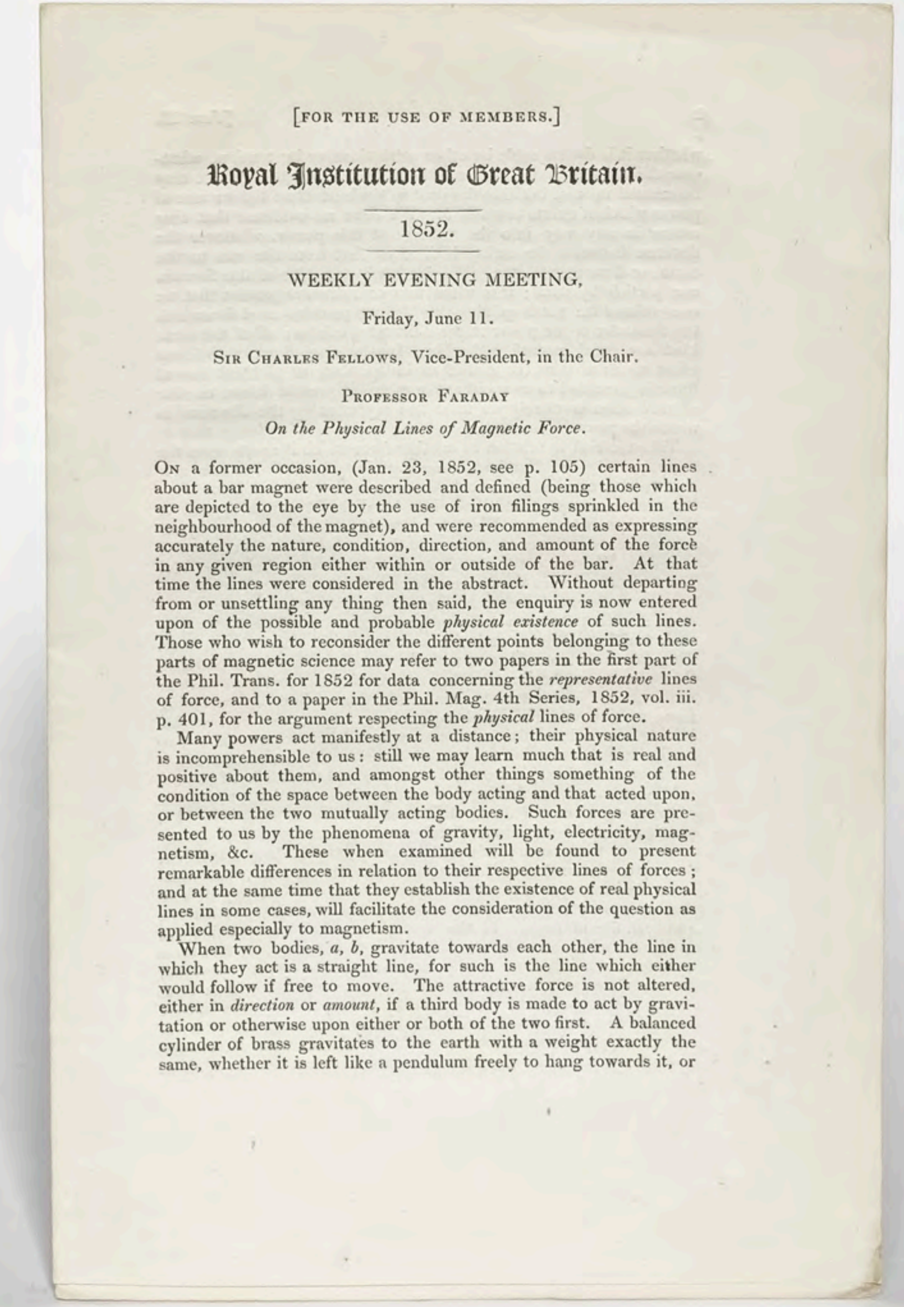
An exceptional copy of the separate printing of Faraday's famous lecture, arguing for the physical reality of the 'lines of force', read to the Royal Institution on Friday 11 June 1852, with demonstrations. Exceptionally scarce: no other copies recorded.

Faraday first developed his ideas about lines of force and the electromagnetic 'field' that they must comprise in the early 1830s – even taking the precaution of sealing an account of his theory in a vault in case he needed later to claim priority. He worked through the idea slowly, revisiting it in earnest only after his major period of experimental research into electricity and magnetism was concluded.

A few month's prior to the present lecture, Faraday had given a more tentative account of the lines of force to the Royal Institution, hedging on the issue of their physical reality. By June he was more confident, writing, in the text offered here:

> Many powers act manifestly at a distance; their physical nature is incomprehensible to us: still we may learn much that is real and positive about them, and amongst other things something of the condition of the space between the body acting and that acted upon [...] Such forces are presented to us by the phenomena of gravity, light, electricity, magnetism, &c.

Faraday's physical intuition about fields and lines of force held the interest of the scientific community. But one man, very different in character from Faraday, would bring new methods to bear on the problem. This was James Clerk Maxwell, who in the 1850s was a young mathematician at the University of Cambridge. By placing Faraday's work on sound mathematical foundations Maxwell was able to develop his famous field equations – the direct precursor to and inspiration for Einstein's work on relativity.



[FOR THE USE OF MEMBERS.]

Royal Institution of Great Britain.

1852.

WEEKLY EVENING MEETING,

Friday, June 11.

Sir Charles Fellows, Vice-President, in the Chair.

Professor Faraday

On the Physical Lines of Magnetic Force.

On a former occasion, (Jan. 23, 1852, see p. 105) certain lines about a bar magnet were described and defined (being those which are depicted to the eye by the use of iron filings sprinkled in the neighbourhood of the magnet), and were recommended as expressing accurately the nature, condition, direction, and amount of the force in any given region either within or outside of the bar. At that time the lines were considered in the abstract. Without departing from or unsettling any thing then said, the enquiry is now entered upon of the possible and probable *physical existence* of such lines. Those who wish to reconsider the different points belonging to these parts of magnetic science may refer to two papers in the first part of the Phil. Trans. for 1852 for data concerning the *representative* lines of force, and to a paper in the Phil. Mag. 4th Series, 1852, vol. iii. p. 401, for the argument respecting the *physical* lines of force.

Many powers act manifestly at a distance; their physical nature is incomprehensible to us: still we may learn much that is real and positive about them, and amongst other things something of the condition of the space between the body acting and that acted upon, or between the two mutually acting bodies. Such forces are presented to us by the phenomena of gravity, light, electricity, magnetism, &c. These when examined will be found to present remarkable differences in relation to their respective lines of forces; and at the same time that they establish the existence of real physical lines in some cases, will facilitate the consideration of the question as applied especially to magnetism.

When two bodies, *a*, *b*, gravitate towards each other, the line in which they act is a straight line, for such is the line which either would follow if free to move. The attractive force is not altered, either in *direction* or *amount*, if a third body is made to act by gravitation or otherwise upon either or both of the two first. A balanced cylinder of brass gravitates to the earth with a weight exactly the same, whether it is left like a pendulum freely to hang towards it, or

12. PRESENTED BY 'UNIV' TO STEPHEN HAWKING

HAWKING, Stephen W. (1942–2018)

'The Universe in a Nutshell'

[IN:] *Builders of the Millennium: A Series of Lectures Delivered to Celebrate the 750th Anniversary of the Endowment of University College, Oxford, 1249–1999*

Oxford: University College, Oxford, 2000

Octavo (216 x 151mm); pp. ix, [1], 104

Blue cloth binding with gilt title; near fine condition: slight warp to front cover, but otherwise fine

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Provenance: personal collection of Stephen W. Hawking, with a presentation bookplate to the inside cover, and a provenance label to the verso of the front free endpaper

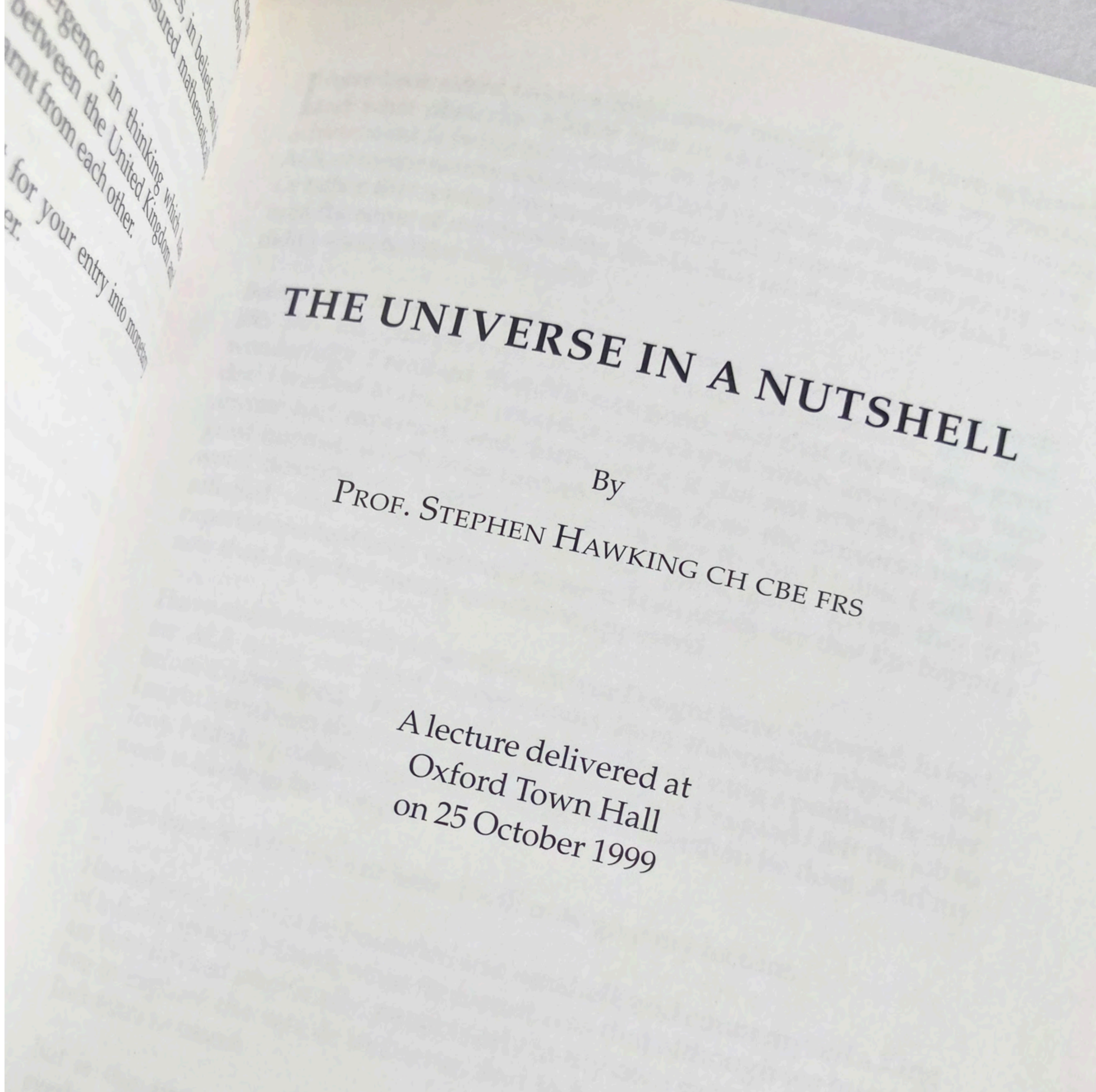
Stephen Hawking's own copy of this elegant commemorative volume, issued on the occasion of the 750th anniversary of his *alma mater*, University College Oxford, and containing lectures by a number of illustrious *alumni*, including Tony Blair, Richard Branson, and Rupert Murdoch.

Hawking's lecture is 'The Universe in a Nutshell' – the précis of his book of the same name, published a year after the present volume as a 'sequel' to *A Brief History of Time*.

The lecture is a minor classic, beginning with some of Hawking's personal circumstances, before turning to the size and nature of the universe, his and Roger Penrose's work on singularities, the Uncertainty Principle, the notion of a boundless universe, the anthropic principle, and much else. There are many humorous asides, including a comment that 'There must be a history of the universe, in which Oxford United won the Cup, though maybe the probability is low.'

The lecture concludes on a poignant note:

> This is a tiny, slightly flattened sphere. So it is quite like the nutshell with which I began the lecture. Yet this nut encodes everything that happens in real time. So Hamlet was quite right. We could be bounded in a nut shell, and count ourselves Kings of infinite space.
>
> What more can I say after that.



HENSLOW, John Stevens (1796–1861)

Geological Map of Anglesea

Cambridge: Cambridge Philosophical Society, 1822

285 x 445mm, hand-coloured, together with two plates of parallel sections from the NW to SE of the island, also hand-coloured, (3)

Near fine condition; a few very small chips to the edges

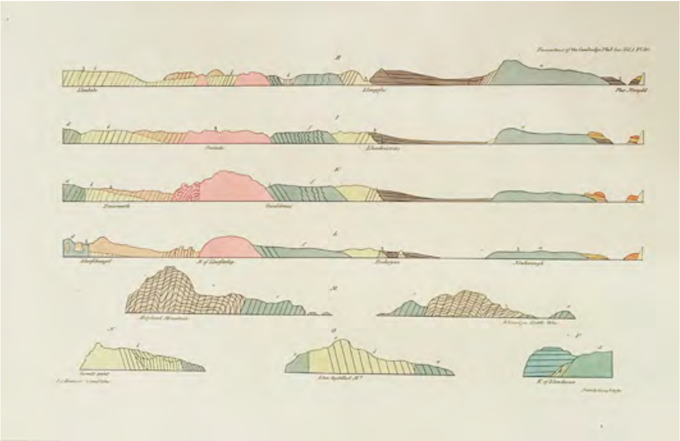
Provenance: Cambridge Philosophical Society, retained from the time of publication until 2024

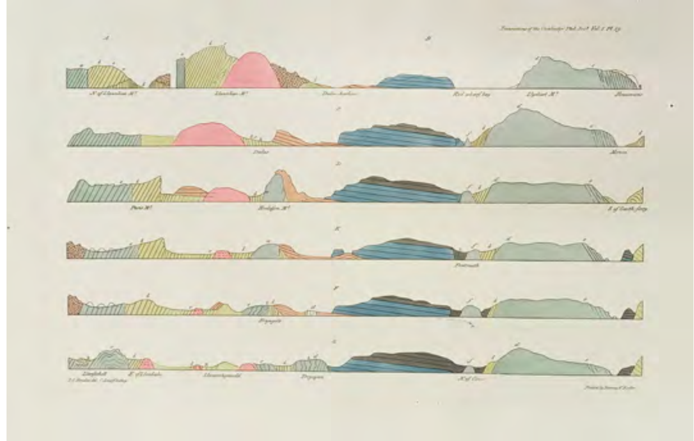
A STUNNING HAND-COLOURED geological map by John Stevens Henslow, printed to accompany his first published scientific paper – but here offered in its pristine unfolded state, having been retained by the Cambridge Philosophical Society as part of a collection of unissued archival materials.

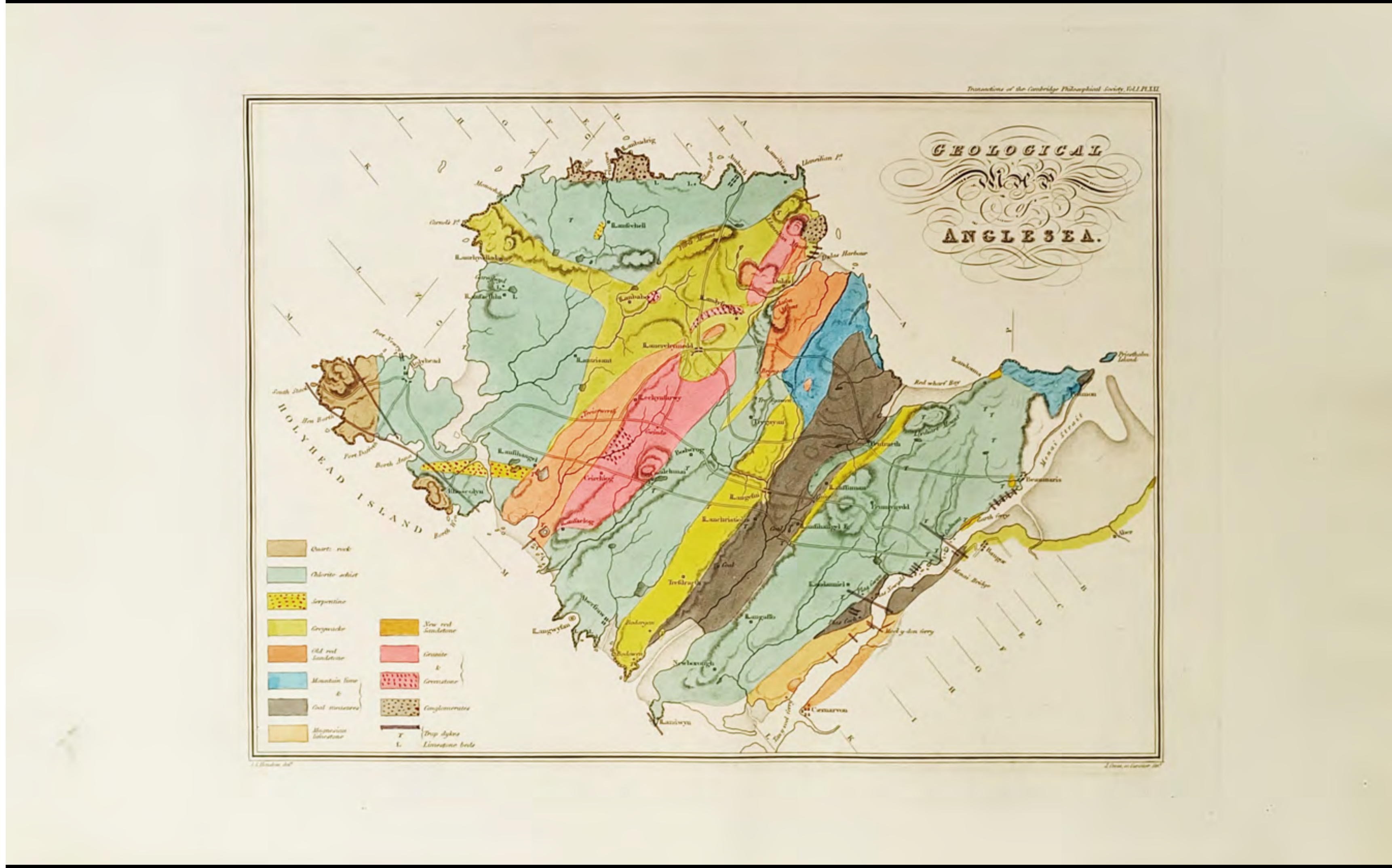
Although Henslow was to become most famous as a botanist, like his pupil Charles Darwin he began his scientific career in geology. His fieldwork in on Anglesey initiated the scientific study of the island:

> The history of geological study on Anglesey goes back to John Henslow (1796–1861) even though geologists first think of Edward Greenly when they hear of Anglesey. Henslow was educated at St John's College, Cambridge where he graduated in 1818, the year in which Adam Sedgwick became Woodwardian Professor of Geology. He developed a passion for geology and accompanied Sedgwick on fieldwork. He arrived on Anglesey to investigate aspects of the island's geology, recognising the belts of 'chloritic schists' and other exotic rocks, and published his observations in the first volume of the *Transactions of the Cambridge Philosophical Society* in 1822. (Geomon website)

Charles Darwin took a copy of Henslow's paper with him on the *Beagle* Voyage, and used the map as a model for his own geological studies of the Falkland Islands.







HERSCHEL, Caroline (1750–1848)

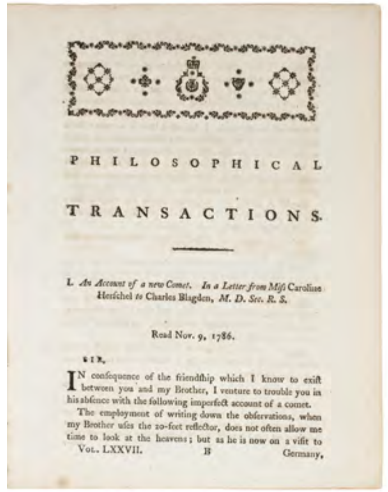
'An Account of a New Comet. In a Letter from Miss Caroline Herschel to Charles Blagden, M.D. Sec. R.S. Read. Nov. 9, 1786'

[IN:] *Philosophical Transactions*, Vol. LXXVII

London: Sold by Lockyer Davis, and Peter Elmsly, Printers to the Royal Society, 1787

Quarto (225 x 176mm); pp. [1]–5 [folding plate]

Extract; bound in modern marbled-paper wrappers. Very good condition: paper very lightly toned


PHILOSOPHICAL

TRANSACTIONS.

I. *An Account of a new Comet. In a Letter from Miss* Caroline Herschel *to* Charles Blagden, *M. D. Sec. R. S.*

Read Nov. 9, 1786.

SIR,

IN consequence of the friendship which I know to exist between you and my Brother, I venture to trouble you in his absence with the following imperfect account of a comet.

The employment of writing down the observations, when my Brother uses the 20-feet reflector, does not often allow me time to look at the heavens; but as he is now on a visit to

Vol. LXXVII. B Germany,

THE FIRST SCIENTIFIC PAPER in English ever published by a woman. Here Herschel announces the discovery of what is now known as Comet C/1786 P1, discovered while her brother William was travelling in Germany. This is an important detail: Caroline had become her brother's assistant, and, as she writes in the present paper,

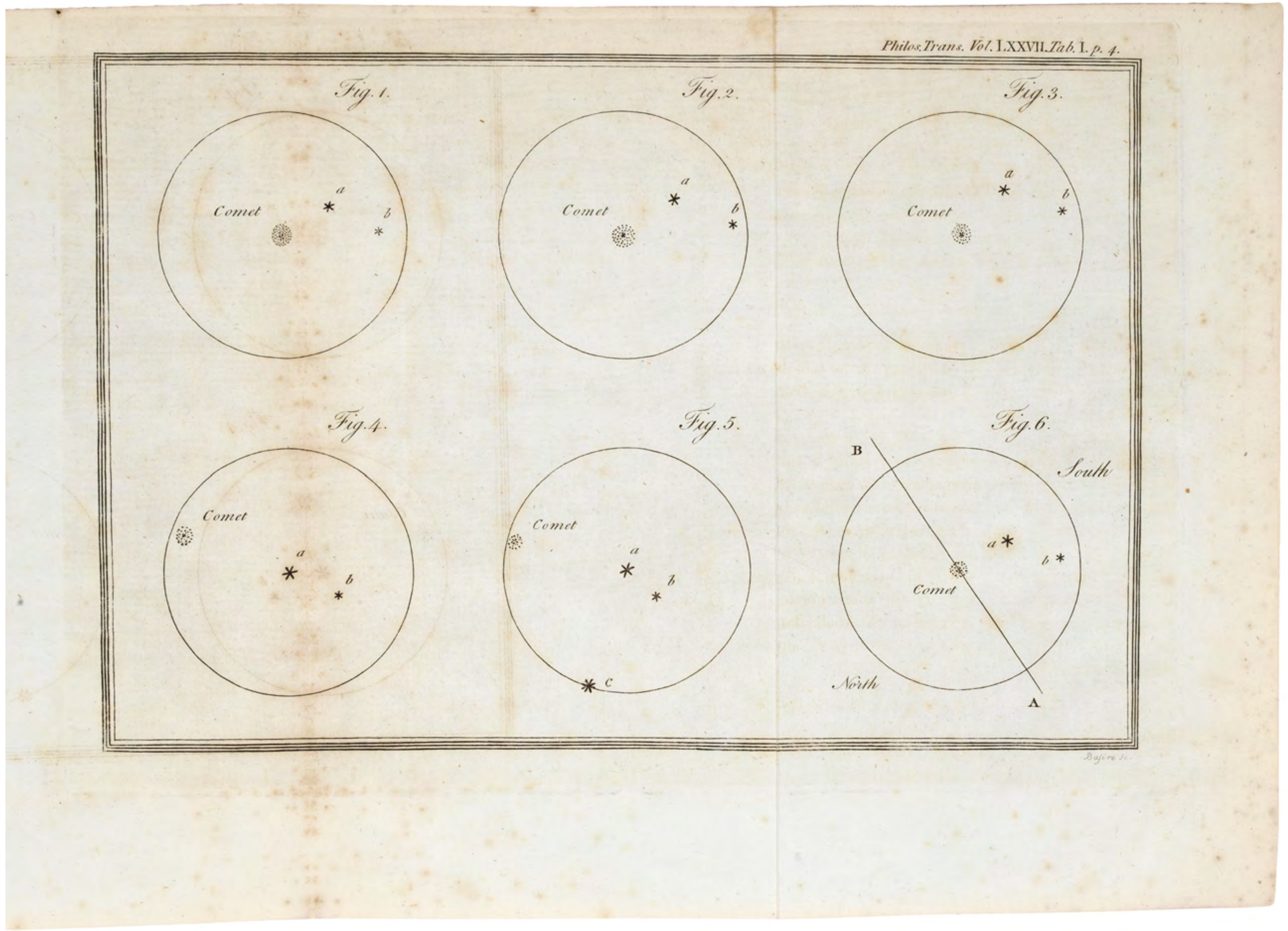
> The employment of writing down the observations, when my Brother uses the 20-feet reflector, does not often allow me time to look at the heavens; but as he is now on a visit to Germany, I have taken the opportunity of his absence to sweep in the neighbourhood of the sun, in search of comets; and last night, the 1st of August, about 10 o'clock, I found an object very much resembling in colour and brightness the 27th nebula of the Connoissance des Temps, with the difference however of being round. I suspected it to be a comet; but a haziness coming on, it was not possible intirely to satisfy myself as to its motion till this evening.

The discovery made Caroline Herschel the darling of the astronomical community, and – absolutely without precedent – she was granted an annual stipend of £50 from the King.

Herschel's career was remarkable. She was denied any formal education by her mother, and was rescued from Hanoverian torpitude in 1772 by her brother William, who had been resident in England since 1757 and was then living in Bath and working as an organist, with astronomy his main pastime. Learning the rudiments of algebra, geometry, and trigonometry, Caroline was soon serving as assistant to her brother, and by the time of their move to the neighbourhood of Windsor Castle she was in possession of two telescopes and could – in snatched moments away from her brother – conduct her own observations.

By the time of this paper Herschel had already observed three new nebulae, and over the coming years she discovered many new comets, and made dramatic improvements to existing star catalogues.

In 1835 she and Mary Somerville were the first two women to be elected honorary members of the Royal Society (the first full Fellows were Kathleen Lonsdale and Marjory Stephenson, elected 1945).



HOOKE, Robert (1635–1703)

'A Description of an Instrument for Dividing a Foot into Many Thousand Parts, and Thereby Measuring the Diameters of Planets to a Great Exactness, &c'

[IN:] *Philosophical Transactions*, No. 29
[TOGETHER WITH:] *Philosophical Transactions*, No. 25

London: Printed by T[homas] N[ewcomb] for John Martyn, Printer to the Royal Society, and are to be sold at the Bell a little without Temple-Bar, 1667

Two complete single issues, quarto (225 x 172mm); pp. 449–274 and 541–556 [folding plate], (2)

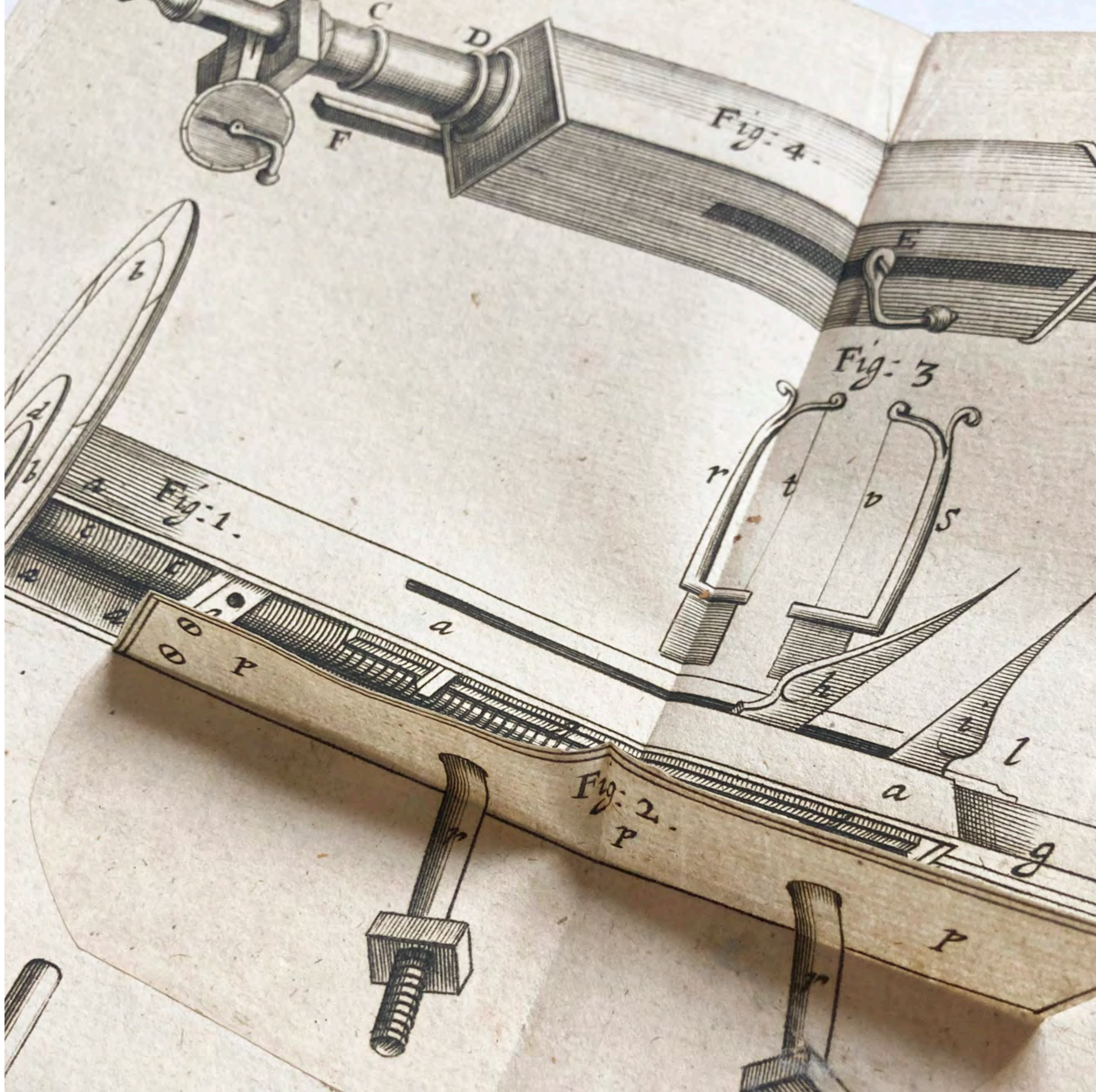
Very good; some light even browning throughout; bound in modern marbled-paper wrappers

A pivotal moment in the history of science: William Gascoigne's invention of the micrometer, communicated here by Richard Towneley and Robert Hooke in two issues of the *Philosophical Transactions* for 1667 (nos 25 & 29).

Inspired by the work of Johannes Kepler, Gascoigne studied astronomical phenomena from the 1630s until his early death in 1644. Around 1638 Gascoigne devised his micrometer, consisting of two fine wires brought closer together or further apart by means of a screw of known pitch. Together with the focal length it is possible to calculate the size of astronomical objects with this set-up. In 1666, the French astronomer Adrien Auzout wrote to the Royal Society to describe his own micrometer, which was similar in design to Gascoigne's. Gascoigne's collaborator Richard Towneley, who was in possession of a micrometer of Gascoigne's design, wrote a strongly worded letter to Society, published in the 25th number of the *Philosophical Transactions* [offered here]. Towneley claimed Gascoigne's priority and gave a brief description of the instrument, an example of which he then sent to London. Hooke created his own version of the micrometer and wrote a thorough description, published in No. 29 [also offered].

Perhaps the most significant feature of Hooke's description is the remarkable engraving of the micrometer, which reveals aspects of its design not covered in the text. Moreover, the engraving is a piece of paper engineering in its own right: it shows two aspects of the design by means of an ingenious flap, which allows exterior and interior views (see image overleaf).

The micrometer was immediately put to use by Hooke and, more importantly, John Flamsteed, who used one extensively in the creation of his masterpiece *Historiae coelestis*, begun in 1676. In various forms, the micrometer has been central to precision astronomer ever since, and has transformed scientific understanding of the nature of celestial objects.



HUTTON, James (1726–1797)

'Theory of the Earth; or an Investigation of the Laws Observable in the Composition, Dissolution, and Restoration of Land upon the Globe'

[IN:] *Transactions of the Royal Society of Edinburgh*, Vol. 1

Edinburgh: for J. Dickson, 1788

Full volume offered [TOGETHER WITH:] Vols 2–8, 1790–1817, bound in 9 volumes, quarto, volumes 2–7 in contemporary calf (265 x 210mm), volume 8 bound in two parts and in original boards (293 x 234mm); numerous engraved plates (not collated), a few joints cracked, volumes 5 and 7 front boards detached, spines scuffed, numbering-pieces and a few title-labels perished, (9)

Provenance: from the library of the Murrays of Dollerie, Crieff, Perthshire

References: Ward & Carozzi 1161; cf. PMM 247

ONE OF THE MOST IMPORTANT scientific papers ever published. James Hutton's 'Theory of the Earth' in its original journal appearance.

A true landmark in the history of science: in 1785 Hutton presented this paper to the Royal Society of Edinburgh, arguing for what we would call 'uniformitarianism':

> The formation of the surface of the earth is one continuous process which can be studied entirely from terrestrial materials without cosmological or supernatural intervention. (PMM 247)

Hutton's fundamental intervention was to propose a mechanism for the formation, alteration and ultimate destruction of vast geological features. In observable formations we see 'the ruins of an older world': mountains that have been built up by igneous forces and worn down by weathering and chemical processes. This cyclical view of creation and destruction is summed up in one of the most elegant phrases in the whole history of science:

> The result, therefore, of this physical enquiry is, that we find no vestige of a beginning,—no prospect of an end.

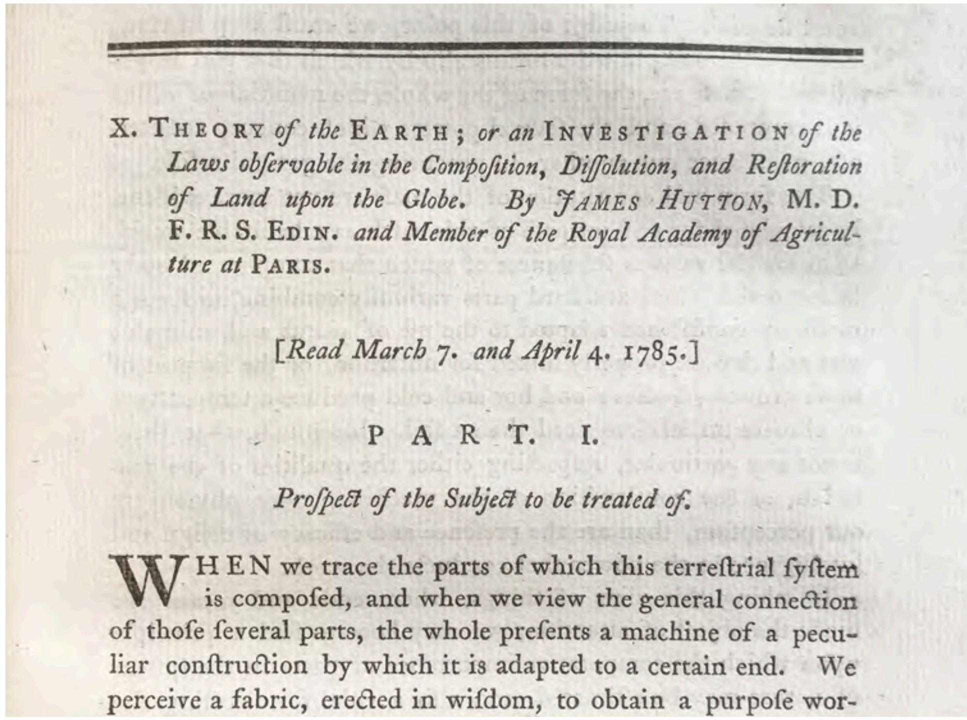
Ultimately Hutton's work was to be continued by Charles Lyell, and, in its treatment of gradual changes over vast spans of time, forms the philosophical background of Charles Darwin's theory of evolution.

More proximately, Hutton's work was continued, discussed and augmented within the pages of the *Transactions of the Royal Society of Edinburgh*, and here we offer not only the first presentation of Hutton's paper, but also his and others' contributions over the subsequent years, including Hutton's 'Observations on Granite', Playfair's biographical account of Hutton, and a group of papers by Sir James Hall constituting one of the most significant early defences of Hutton's theory.

James Hutton (1726–1797) was a Scottish geologist, physician, and naturalist often referred to as the 'father of modern geology.' Born in Edinburgh, he initially studied medicine but developed a deep interest in agriculture and natural sciences. After inheriting family land, Hutton applied scientific principles to farming, which led to his fascination with soil formation and rock layers. His observations during this period formed the foundation of his later geological theories.

Hutton travelled extensively across Scotland, studying rock formations, soil erosion, and the effects of weathering. He was struck by the evidence of deep time in the Earth's layers, noting that processes such as sedimentation and erosion must have occurred over vast time spans. These observations led him to reject the prevailing view of a young Earth shaped by catastrophic events, instead proposing that the Earth was continuously and gradually shaped by observable natural processes.

'The Theory of the Earth' was revised and published in two volumes in 1795, with a third volume being added much later in 1899, edited by Sir Archibald Geikie.



X. THEORY *of the* EARTH; *or an* INVESTIGATION *of the Laws obſervable in the Compoſition, Diſſolution, and Reſtoration of Land upon the Globe. By* JAMES HUTTON, M. D. F. R. S. EDIN. *and Member of the Royal Academy of Agriculture at* PARIS.

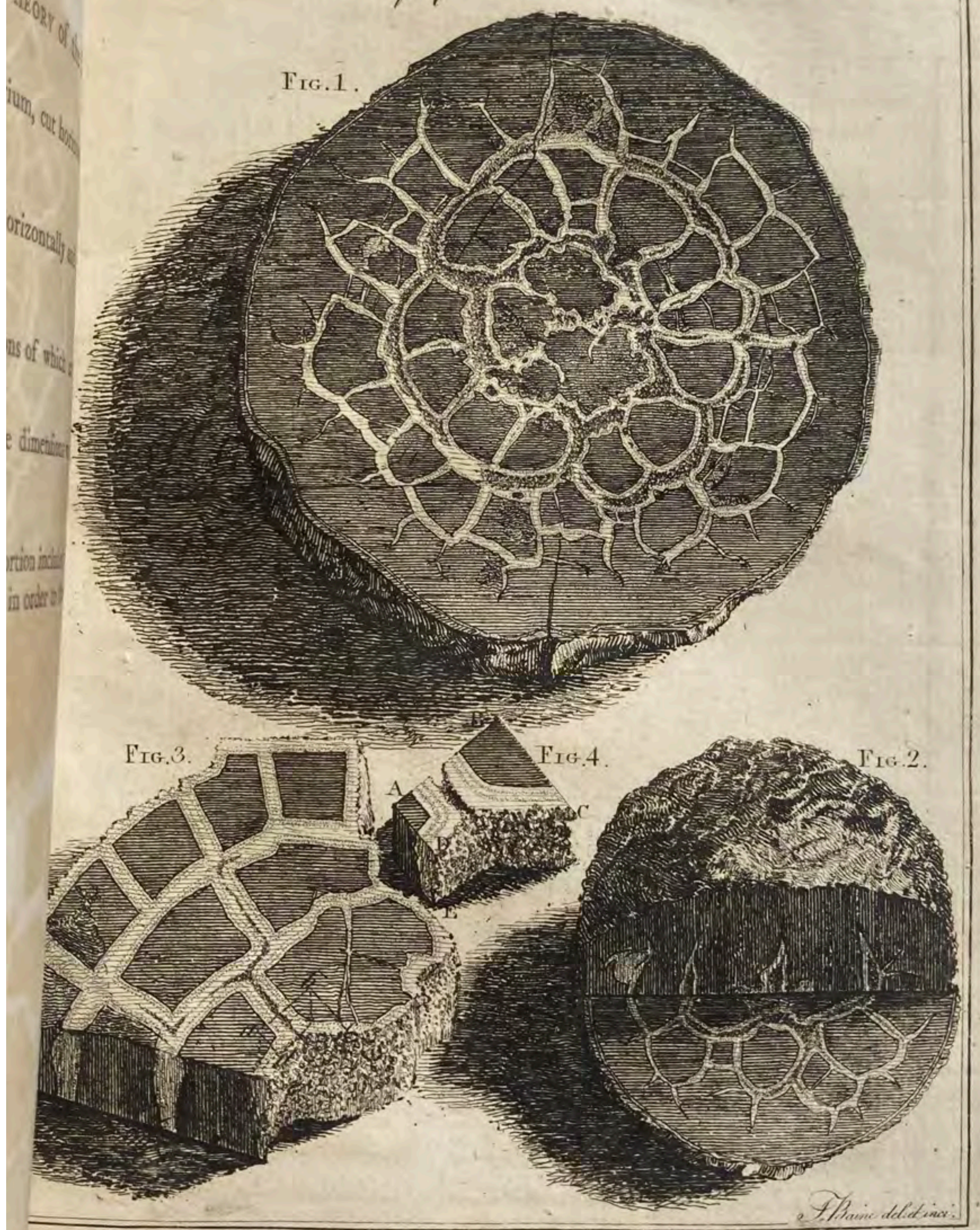
[*Read March* 7. *and April* 4. 1785.]

P A R T. I.

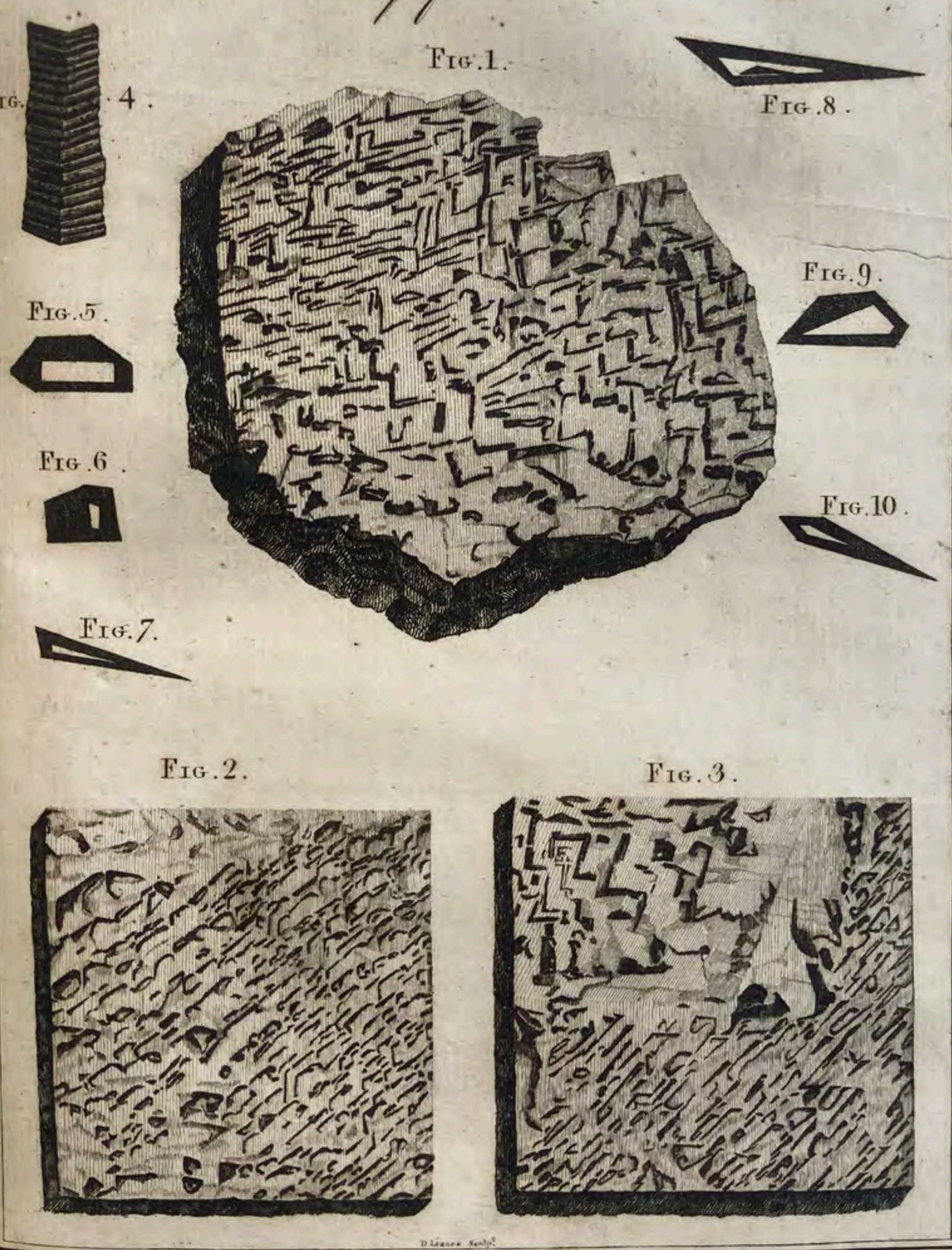
Proſpect of the Subject to be treated of.

WHEN we trace the parts of which this terreſtrial ſyſtem is compoſed, and when we view the general connection of thoſe ſeveral parts, the whole preſents a machine of a peculiar conſtruction by which it is adapted to a certain end. We perceive a fabric, erected in wiſdom, to obtain a purpoſe wor-

Theory of the Earth — PLATE I.



Theory of the Earth — PLATE II.



17.

THE GEOLOGY OF IRELAND

JUKES, Joseph Beete (1811–1869)

Geological Map of Ireland

London: Edward Stanford, and Dublin: Hodges & Smith, 2 December 1872

Folding lithographic map (1005 x 783mm), coloured by a contemporary hand, dissected and mounted on linen; two publisher's ads printed on yellow paper pasted onto two panels on verso; folding to octavo (200 x 130mm) and housed in the original green cloth slipcase with green printed paper label to upper cover

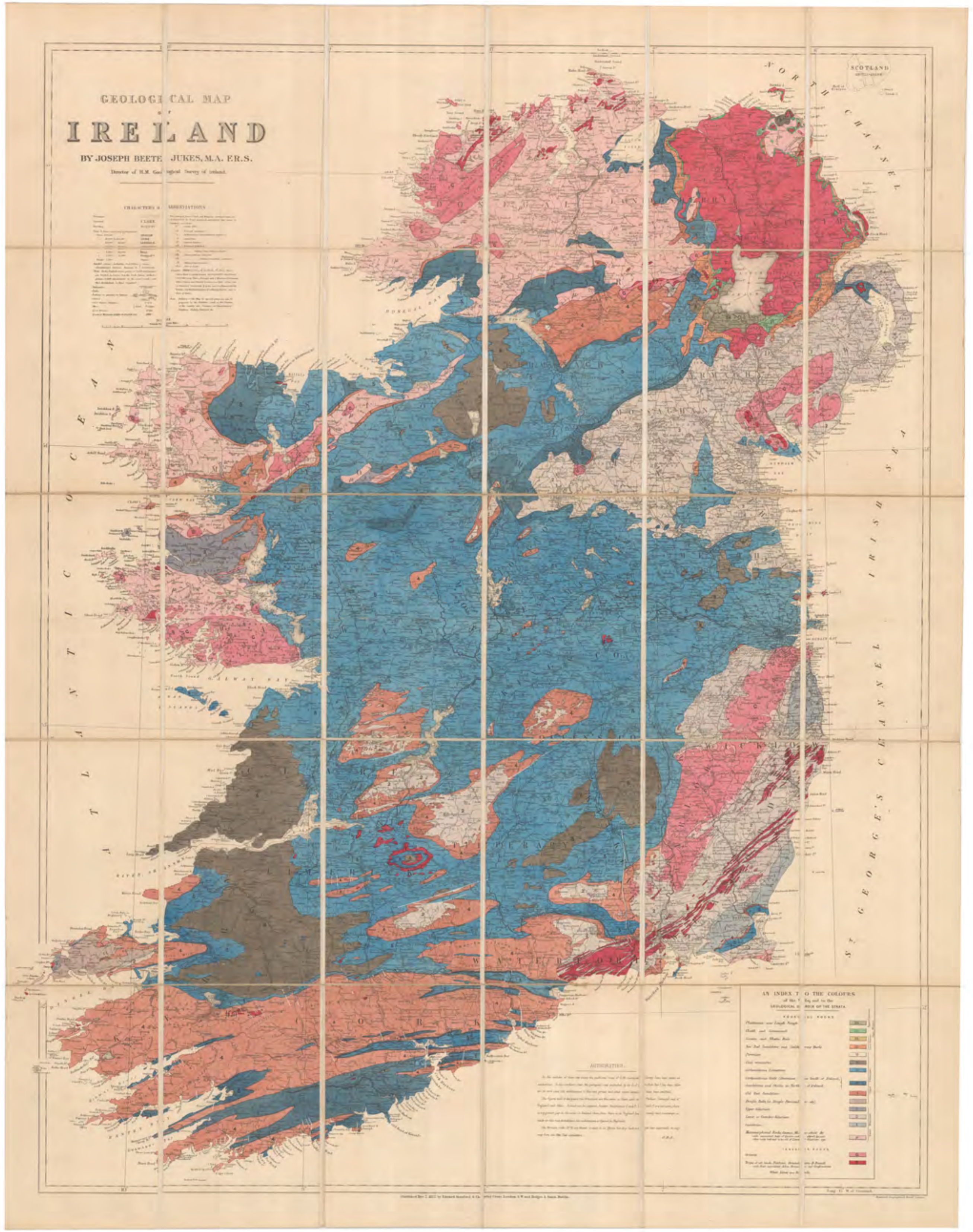
Very good condition: some light thumb-soiling to ads, very faint insignificant crease to lower blank margin, but otherwise near fine); (small gouge to label just touching one letter, otherwise near fine)

References: Davies, *Sheets of Many Colours. The mapping of Ireland's rocks 1750–1890*, p.190

Extremely rare third edition of Jukes' geological map of Ireland. Born in 1811, Joseph Beete Jukes was educated at Merchant Taylor's School, Wolverhampton, and King Edward VI's School, Birmingham, before entering St John's College, Cambridge. There, his interest in geology was nurtured by Adam Sedgwick (1785–1873), with whom he maintained a lifelong correspondence. Later, he was appointed geological surveyor of Newfoundland (1839–1840), at a time when there were no maps of the country, and from 1842 to 1846 he was naturalist aboard HMS *Fly*, sent to survey the coast of Australia and New Guinea. His publication, *A sketch of the physical structure of Australia* (London, 1850), included the first geological map of that continent.

Upon his return to England, Jukes became a member of the Geological Survey of Great Britain (1846–1850), and on the back of successful and important work in north Wales and the South Staffordshire coal field, he was asked to become director of the Irish branch of the geological survey which he held from 1850 until his death. It was while working on the memoir relating to the valley of the River Blackwater around Cappoquin, Co. Waterford, that Jukes noted the action of rivers on topography and their relationship to the underlying geological structure, which resulted in his most significant contribution to geology: 'On the formation of some of the river-valleys of the south of Ireland' (1862). This was a pioneering contribution to the understanding of the making of the Irish landscape, and is recognised as having international relevance and has become a classic in geomorphology.

From 1864 Jukes' health deteriorated, but he still managed to produce the present small-scale Geological map of Ireland. The first edition bears the publication date of 1st July 1867, and became known as 'Jukes's map'; it is well represented in institutional holdings. Jukes died in 1869, and there were a series of posthumous editions. A second edition was published in 1870; this is extremely rare, with only one record of this in an institution, namely the Universitäts- und Landesbibliothek Bonn, Germany. The present work is the third edition, we can only trace the National Library of Ireland's copy in institutional holdings.



18.

LAMARCK, Jean-Baptiste (1744–1829)

Zoological Philosophy: An Exposition with Regard to the Natural History of Animals

London: Macmillan & Co., 1914

Large octavo (225 x 155mm); pp. xcii, 410, [2]

Good condition, in original green cloth, with gilt spine titling; a little worn and handled; spine with a slight lean; early bookseller label inside cover (Heffer's, Cambridge); Young's name stamp sporadically throughout

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Provenance: J.Z. Young FRS (1907–1997), zoologist and neurophysiologist

References: Garrison Morton 216; cf. PMM 262

The first edition in English of Lamarck's *Philosophie zoologique* (1809), translated by the materialist philosopher of science Hugh Elliot and published just over a century after the French original. This copy from the library of the eminent zoologist and neurophysiologist J.Z. Young (1907–1997).

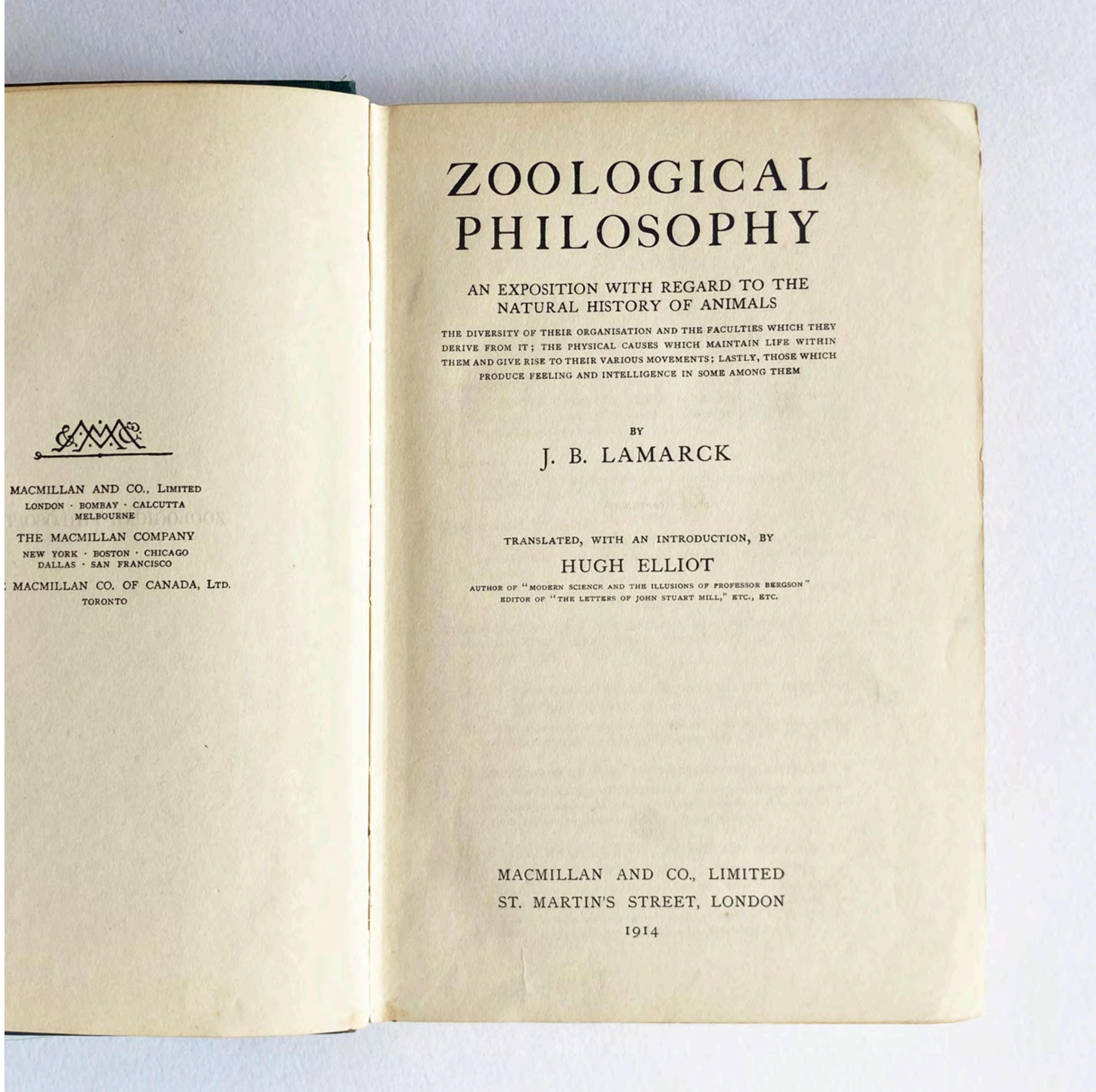
Lamarck's work is perhaps the most famous precursor of Darwin's theory of evolution, and was one of the first substantial treatises to challenge the fixity of species. Its importance is belied by the notoriety of 'the inheritance of acquired characteristics', and (at least in mid-century debates over evolution) by neo-Lamarckianism, especially Lysenkoism. Yet Lamarck was an inspiration for Darwin and laid out, in systematic form, a coherent (if incomplete) theory of evolution. Now, with the rise of epigenetics, Lamarck's ideas are undergoing another renaissance.

John Zachary Young was one of the twentieth century's pre-eminent biologists, renowned as 'the outstanding zoologist and teacher of zoology at Oxford from 1930 to 1945' (Royal Society obituary). His textbook *The Life of Vertebrates* (1950) became a classic (and cites the present volume), but in fact featured relatively little of the research for which he was to become famous, namely the discovery of the squid giant axon, and his extensive work on the nervous system.

After WWII Young turned increasingly to the science of the mind, conducting an important correspondence with Alan Turing, and writing many philosophical and methodological works.

At Oxford, when he acquired this book, he was under the guidance of two of the most able neo-Darwinian's of the era Gavin de Beer and E.S. Goodrich. The book has been carefully read, with pencil marks alongside passages throughout, and one partially erased pencil note.

Young's Oxford teaching was marked by its universality: Peter Medawar recalled that Young 'taught the whole of his subject'. In his autobiography Young emphasizes the centrality of Darwinian evolution to his work at Oxford; here we see him engaging historically with his subject.



LAVOISIER, Antoine (1743–1794)

Mémoire où l'on prouve par la décomposition de l'eau […]

[IN:] *Histoire de l'Academie Royale des Sciences. Année MDCCLXXXI*

Paris: De l'Imprimerie Royale, 1784

Quarto (260 x 209mm); pp. [7], [1]–773, folding plates (Lavoisier at pp. 269–282, with a folding plate)

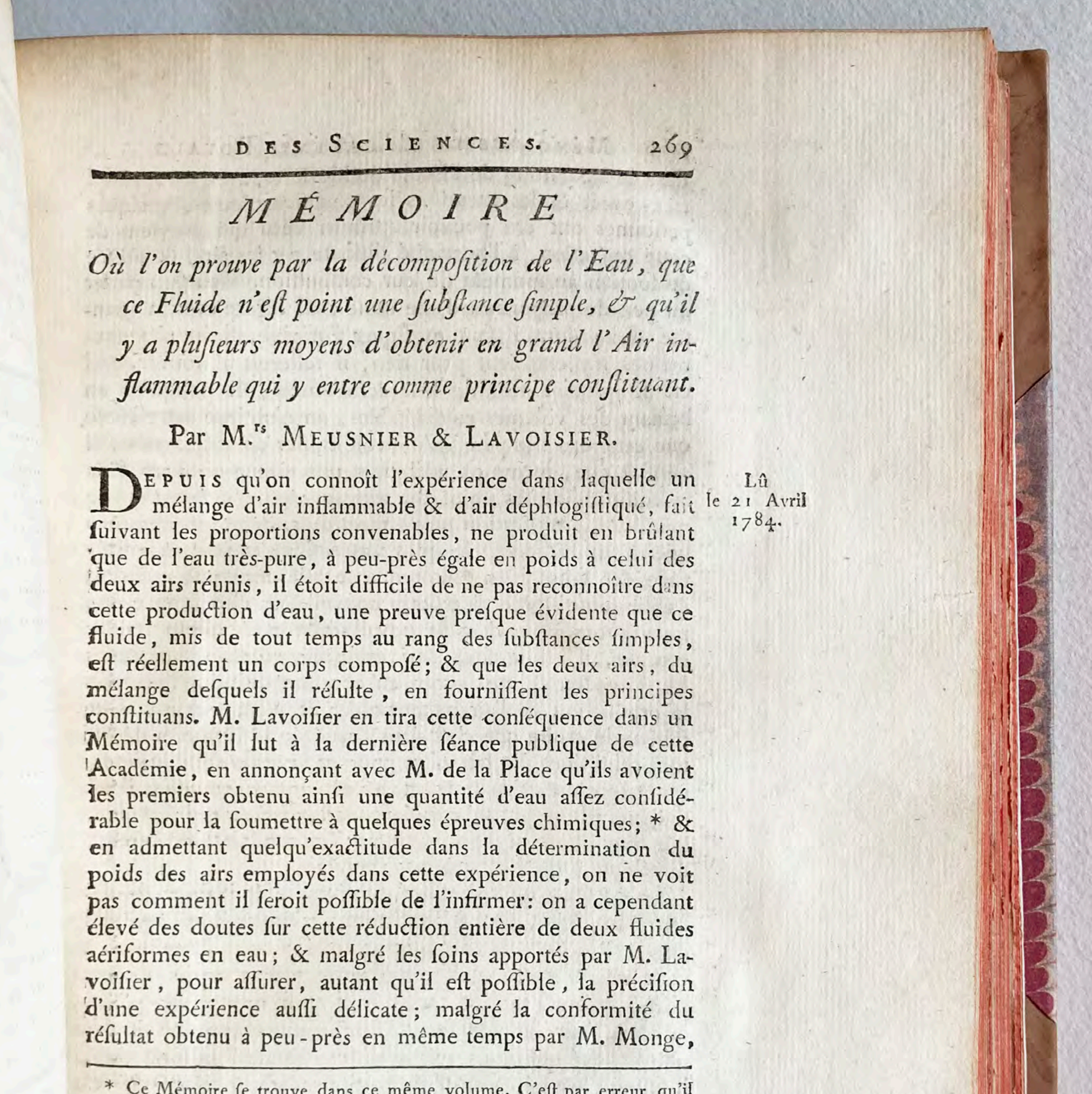
Entire volume offered: very good condition; rebacked with leather spine and original spine label laid down

Lavoisier's celebrated paper showing that water is a compound of two gases, oxygen and hydrogen.

In 1783 Lavoisier learned of Henry Cavendish's experiments in which 'inflammable air' and 'dephlogisticated air' were combined by means of an electric spark, resulting in water, equal in quantity to the two gases. Working with Laplace, Lavoisier repeated the experiments, satisfying himself that within the framework of his own theory of combustion water was an oxide of 'hydrogenerative' gas.

'Mémoire où l'on prouve par la décomposition de l'eau' is not only a landmark in the history of science – it is also one of the most controversial scientific papers ever published. Lavoisier has repeatedly been charged with plagiarism, and the so-called 'Water Controversy' of the 19th century resulted in countless analyses of the major protagonists: James Watt, Henry Cavendish, Joseph Priestley, and Lavoisier. The modern consensus is that Cavendish should be credited with the experimental discovery, but that Lavoisier supplied the correct interpretation of the results, free as he was from the older theory of 'phlogiston'.

Although this paper undermined the chemical purity of the last of the four classical elements, it was only one part of Lavoisier's theory of combustion. The composition of water was important to that theory because it provided clear evidence that combustion involved a chemical reaction with oxygen, not the release of a mysterious substance called 'phlogiston' as previously believed. By demonstrating that water is composed of hydrogen and oxygen, Lavoisier showed that oxygen was a key reactant in both the formation of water and the combustion of substances. This insight helped him refute the phlogiston theory and laid the foundation for modern chemistry by establishing the role of oxygen in oxidation and combustion processes.



DES SCIENCES. 269

MÉMOIRE

Où l'on prouve par la décompoſition de l'Eau, que ce Fluide n'eſt point une ſubſtance ſimple, & qu'il y a pluſieurs moyens d'obtenir en grand l'Air inflammable qui y entre comme principe conſtituant.

Par M.rs MEUSNIER & LAVOISIER.

DEPUIS qu'on connoît l'expérience dans laquelle un mélange d'air inflammable & d'air déphlogiſtiqué, fait ſuivant les proportions convenables, ne produit en brûlant que de l'eau très-pure, à peu-près égale en poids à celui des deux airs réunis, il étoit difficile de ne pas reconnoître dans cette production d'eau, une preuve preſque évidente que ce fluide, mis de tout temps au rang des ſubſtances ſimples, eſt réellement un corps composé; & que les deux airs, du mélange deſquels il réſulte, en fourniſſent les principes conſtituans. M. Lavoiſier en tira cette conſéquence dans un Mémoire qu'il lut à la dernière ſéance publique de cette Académie, en annonçant avec M. de la Place qu'ils avoient les premiers obtenu ainſi une quantité d'eau aſſez conſidérable pour la ſoumettre à quelques épreuves chimiques; * & en admettant quelqu'exactitude dans la détermination du poids des airs employés dans cette expérience, on ne voit pas comment il ſeroit poſſible de l'infirmer: on a cependant élevé des doutes ſur cette réduction entière de deux fluides aériformes en eau; & malgré les ſoins apportés par M. Lavoiſier, pour aſſurer, autant qu'il eſt poſſible, la préciſion d'une expérience auſſi délicate; malgré la conformité du réſultat obtenu à peu-près en même temps par M. Monge,

Lû le 21 Avril 1784.

* Ce Mémoire ſe trouve dans ce même volume. C'eſt par erreur qu'il

LEWIS, David (1941–2001)

Typed letter signed (TLS) on the Turing Test and Artificial Intelligence,

[Cambridge, MA], 3 October 1964

275 x 213mm; 3 leaves typescript; signed

Fine condition

Provenance: Jerome A. Shaffer; Samuel C. Wheeler III

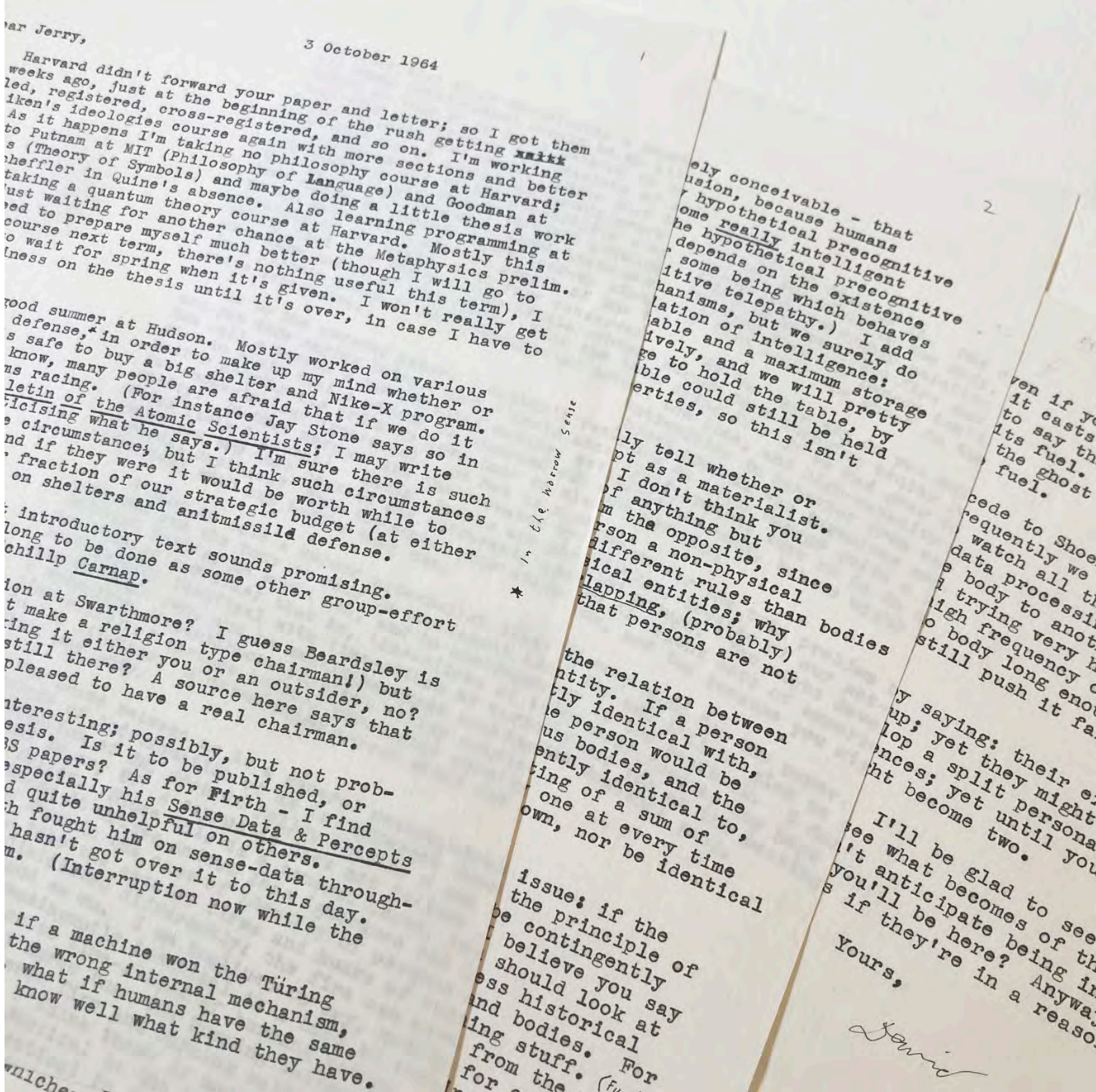
References: *Philosophical Letters of David K. Lewis*, Volume 1, No. 421

A very fine and rich letter from David Lewis to his former undergraduate teacher Jerome Shaffer, in which Lewis gives updates on his recent activities before diving into a discussion of the nature of human experience in relation to the famous 'Turing Test', proposed by Alan Turing in 1950.

David Kellogg Lewis (1941–2001) is regarded as one of the most significant post-war philosophers, in particular for his work on possible worlds, counterfactuals and 'modal realism'. Lewis' position as a staunch materialist lends additional weight to his thoughts on the Turing Test, which he never published – though the present letter reveals much about the development of his thinking on the topic of identity, about which he published a number of papers.

Turing's 'Test' determines whether a computer can be classed as 'intelligent': if a computer can fool a human then it passes the test and we remain agnostic about whether or not the structure of the computer matches in any way our own neurophysiology. Many philosophers have tackled the Turing Test, which has also become a touchstone of popular discussion about AI. Here Lewis attempts to clarify the central question of the Turing Test: could a computational mechanism substantially unlike the human brain (he uses the word 'wrong') ever be called 'intelligent'? Lewis cites Hilary Putnam and immediately spins the question on its head by asking whether human intelligence itself is an illusion (i.e. as illusory as the 'wrong' computational model). He admits this is 'conceivable – remotely conceivable'.

The letter rewards careful study: Lewis seems to understand the Turing test primarily as a provocation for thinking about human consciousness. Does this mean that AI must approach accurate neurophysiology in order to lay claim to intelligence? And is 'intelligence' therefore the wrong framework for thinking about the whole issue? In 1964 Lewis could only see mechanical cognition as an illusion - what would he make of Deep Learning?


ar Jerry,   3 October 1964

Harvard didn't forward your paper and letter; so I got them
weeks ago, Just at the beginning of the rush getting xxxxx
led, registered, cross-registered, and so on. I'm working
iken's ideologies course again with more sections and better
As it happens I'm taking no philosophy course at Harvard;
to Putnam at MIT (Philosophy of language) and Goodman at
s (Theory of Symbols) and maybe doing a little thesis work
heffler in Quine's absence. Also learning programming at
taking a quantum theory course at Harvard. Mostly this
ust waiting for another chance at the Metaphysics prelim.
ed to prepare myself much better (though I will go to
course next term, there's nothing useful this term), I
o wait for spring when it's given. I won't really get
ness on the thesis until it's over, in case I have to

ood summer at Hudson. Mostly worked on various
defense, in order to make up my mind whether or
s safe to buy a big shelter and Nike-X program.
know, many people are afraid that if we do it
ns racing. (For instance Jay Stone says so in
letin of the Atomic Scientists; I may write
ticising what he says.) I'm sure there is such
e circumstance; but I think such circumstances
nd if they were it would be worth while to
fraction of our strategic budget (at either
on shelters and anitmissild defense.

t introductory text sounds promising.
long to be done as some other group-effort
hillp Carnap.

ion at Swarthmore? I guess Beardsley is
t make a religion type chairman!) but
ing it either you or an outsider, no?
still there? A source here says that
pleased to have a real chairman.

nteresting; possibly, but not prob-
esis. Is it to be published, or
S papers? As for Firth - I find
specially his Sense Data & Percepts
d quite unhelpful on others.
h fought him on sense-data through-
hasn't got over it to this day.
m. (Interruption now while the

if a machine won the Türing
the wrong internal mechanism,
what if humans have the same
know well what kind they have.

LINNAEUS, Carl (1707–1778); [NYANDER, John]

Exanthemata viva, quae, consens. experient. Facult. Medicae in Regia Acad. Upsaliensi, praeside viro nobilissimo ac celeberrimo, Dn. Doct. Carolo Linnaeo […]

Small quarto (185 x 147mm); pp. 16

Very good; bound in modern marbled-paper wrappers

References: Kärrholm, *Swedish Dissertations and their Subjects, 1600–1820*, Vol. 2, No. 10580, DeLacy, *Contagionism Catches On*, Ch. 4

The most comprehensive early statement of the germ theory of disease, which did not take its modern form until a century later, in the work of Robert Koch and Louis Pasteur.

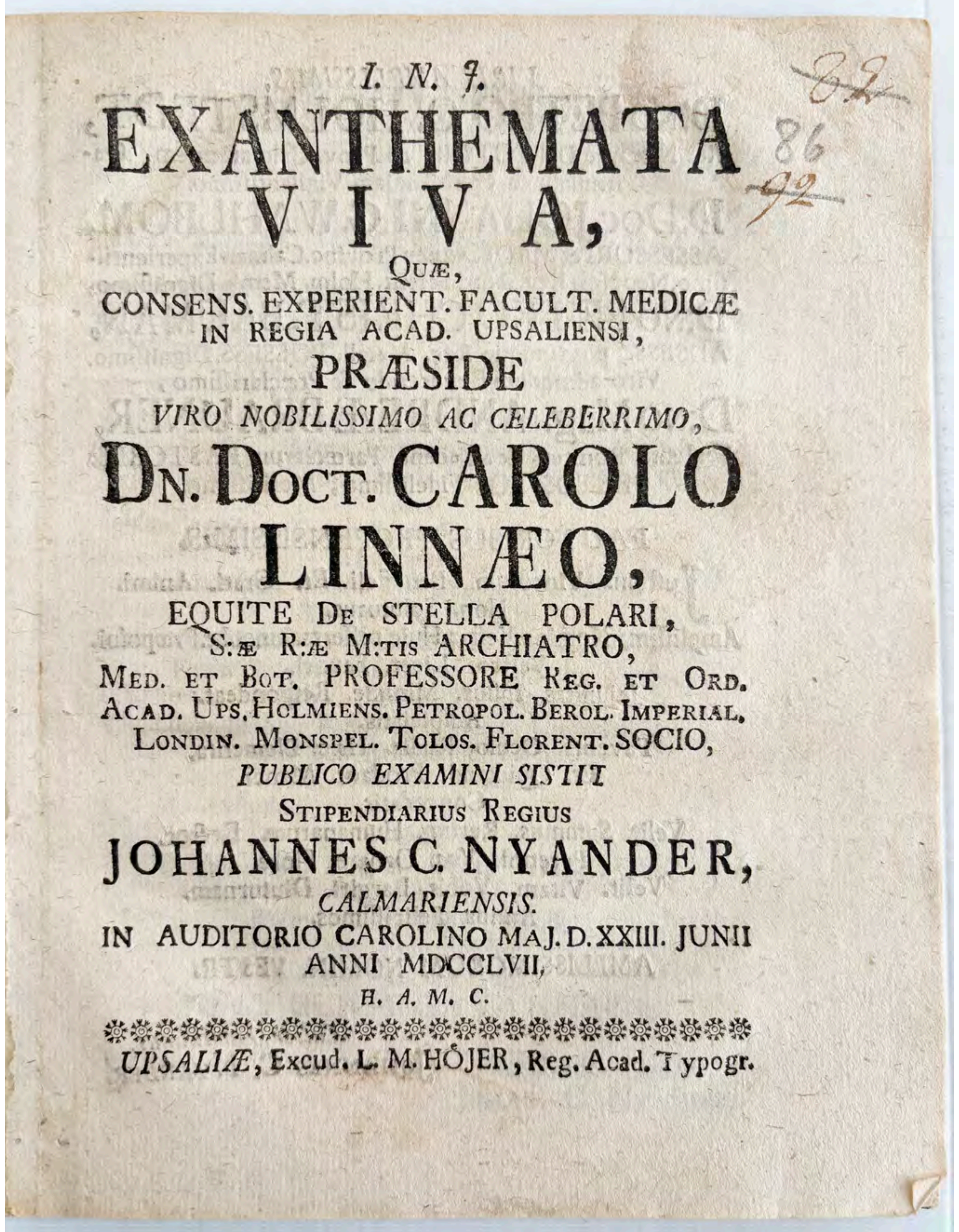
Although purportedly a thesis by the otherwise unknown John Nyander, the text was – as was custom – written by Linnaeus for Nyander to defend. As Kärrholm and others have shown, Swedish theses from this period were often part of the scientific avant-garde.

Generalized notions of the spread of disease by airborne contagions are ancient, but in the early-modern period a number of natural philosophers and medics attempted to investigate the question more thoroughly. In fact the present thesis accurately describes the theories of Kircher and Fracastorius as relying on the discredited theory of spontaneous generation. Linnaeus, meanwhile, made use of the discoveries of Antonie van Leeuenhoek. 'To summarize,' writes one historian, the *Exanthemata viva* argued

> that all eruptive diseases were caused by living pathogens, that each disease was specific to its causative organism, and that, because of differences in the viability of these organisms, some of these diseases could be transmitted only by contagion, at least in certain climates, whereas others could be caused by organisms that persisted in particular sites such as wooden drinking vessels.

Nor was Linnaeus' work merely an aside in the history of medicine. The *Exanthemata viva* was noticed by, for example, John Pringle, physician-general to the Army, who cited the work in the fourth (1764) edition of his influential *Observations on the Diseases of the Army*.

Rare: LibraryHub records only 5 copies in the UK, and OCLC finds copies only at Harvard, Yale and McGill in North America.



I. N. J.
EXANTHEMATA
VIVA,
QUÆ,
CONSENS. EXPERIENT. FACULT. MEDICÆ
IN REGIA ACAD. UPSALIENSI,
PRÆSIDE
VIRO NOBILISSIMO AC CELEBERRIMO,
DN. DOCT. CAROLO
LINNÆO,
EQUITE DE STELLA POLARI,
S:Æ R:Æ M:TIS ARCHIATRO,
MED. ET BOT. PROFESSORE REG. ET ORD.
ACAD. UPS. HOLMIENS. PETROPOL. BEROL. IMPERIAL.
LONDIN. MONSPEL. TOLOS. FLORENT. SOCIO,
PUBLICO EXAMINI SISTIT
STIPENDIARIUS REGIUS
JOHANNES C. NYANDER,
CALMARIENSIS.
IN AUDITORIO CAROLINO MAJ. D. XXIII. JUNII
ANNI MDCCLVII.
H. A. M. C.
UPSALIÆ, Excud. L. M. HÖJER, Reg. Acad. Typogr.

MORLAND, Sir Samuel
(1625–1695)

The Description and Use of Two Arithmetick Instruments. Together With a Short Treatise, explaining and Demonstrating the Ordinary Operations of Arithmetick. As likewise, a Perpetual Almanack, and several Useful Tables

London: Printed, and are to be Sold by Moses Pitt at the White-Hart in Little-Britain, 1673

Small octavo (143 x 85mm); various paginations, 25 plates

Collation: A^{8} B–F^{8} $A^{8}(-A8)$ $G^{8}(-G8)$ B^{8} $*^{8}$

Fair condition: text and plates in very good condition, noting some faint staining to the lower half of the first 7 or so leaves; disbound, retaining early boards, spine separated and therefore due a sensitive rebind

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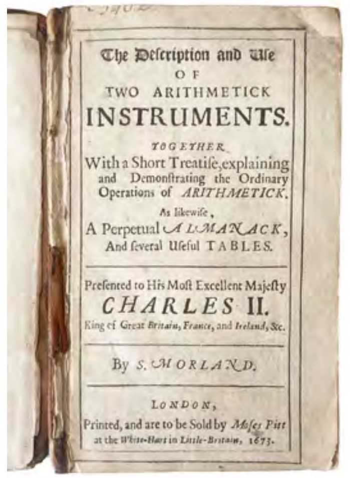
References: Origins of Cyberspace 9

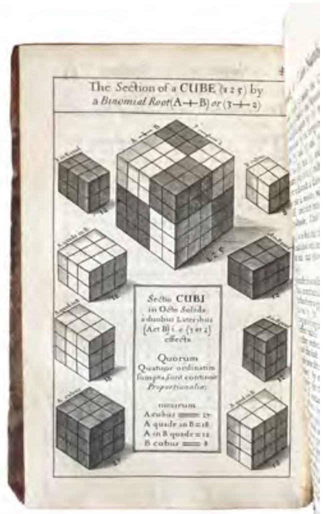
A LANDMARK TEXT by the courtier and inventor Samuel Morland (1625–1695). Preceded in the bibliography on modern computing only by works on the sector, Napier's Bones, and Pascal's manual for the 'Pascaline'. This, then, is the very first book in English on a mechanical calculating machine.

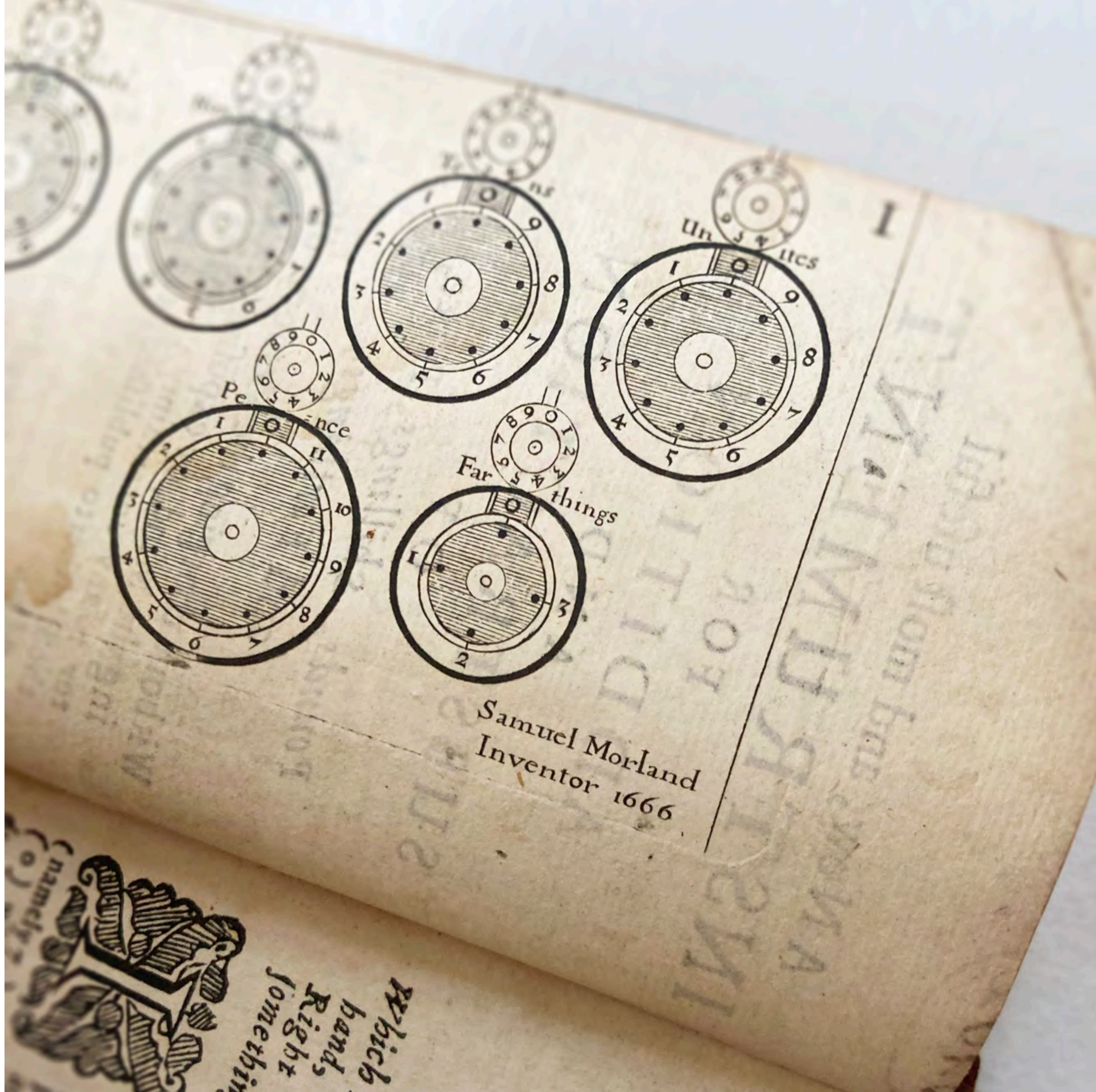
Here Morland introduces his machines for addition and subtraction (of currency), and for arithmetic. The book is also a compendium on calculation, including a perpetual almanac, tables of feasts and eclipses, and much else besides.

Two Arithmetick Instruments is a highly unusual production. The engravings are very fine, and some pages are printed in letterpress on one site and copperplate on the other. But it is a bibliographic conundrum, with many pagination errors and no standard collation. This copy is unusual in having all the plates fully intact, and lacks only the portrait frontispiece.

Sir Samuel Morland (1625–1695) was an English diplomat, inventor, and mathematician. He was secretary to Richard Thurloe during the Commonwealth, but became a double agent and then a courtier after the Restoration. He was a prolific inventor – alongside his contribution to the history of computing he also invented water pumps, a modified fire hearth, and a weighing machine for ship's anchors.


The Deſcription and Uſe
OF
TWO ARITHMETICK
INSTRUMENTS.
TOGETHER
With a Short Treatiſe, explaining and Demonſtrating the Ordinary Operations of ARITHMETICK.
As likewiſe,
A Perpetual ALMANACK,
And ſeveral Uſeful TABLES.
Preſented to His Moſt Excellent Majeſty
CHARLES II.
King of Great Britain, France, and Ireland, &c.
By S. MORLAND.
LONDON,
Printed, and are to be Sold by Moſes Pitt at the White-Hart in Little-Britain, 1673.





THE SILURIAN SYSTEM

MURCHISON, Sir Roderick Impey (1792–1871)

The Silurian System, founded on geological researches in the counties of Salop, Hereford, Radnor, Montgomery, Caermarthen, Brecon, Pembroke, Monmouth, Gloucester, Worcester, and Stafford; with descriptions of the coal-fields and overlying formations

London: John Murray, Albemarle Street, 1839

2 parts in one volume, quarto (320 x 270mm); pp. xxxii, 768, 3 engraved topographical maps on 2 sheets, 14 lithographic plates of which 2 folding and 3 hand-coloured, 9 folding hand-coloured engraved geological sections, 31 plates of fossils of which 25 are engraved and 6 are lithographs, 112 wood-engraved text illustrations (occasional spotting affecting some plates more heavily). Contemporary half morocco over marbled-paper covered boards (rebacked, preserving original spine, extremities rubbed, recently refurbished with expert repair to rear inner hinge) [COMPLETE WITH:] one very large, hand-coloured engraved geological map of 'The Silurian Region and adjacent counties of England and Wales Geologically Illustrated', printed on 3 sheets, together 1500 x 940mm, to a scale of 3 miles to one inch, 1:190,080, signed 'Drawn & Engraved by J. Gardner. Regent Street. London.' and in the lower-right corner 'Rod. S. Murchison', with inset map to top-left corner of the geological systems of England and Wales, and two geological sections along the bottom edge, dissected and mounted on linen (a fresh, clean copy); housed in a contemporary half calf over buckram solander box, gilt stamp of the Wigan Public Library to upper cover (extremities lightly rubbed, one hinge expertly repaired), (2)

References: Challinor 141; Donovan p. 117; Norman 1569; Thackray, 'R.I. Murchison's *Silurian System* (1839)'; Ward & Carozzi 1620

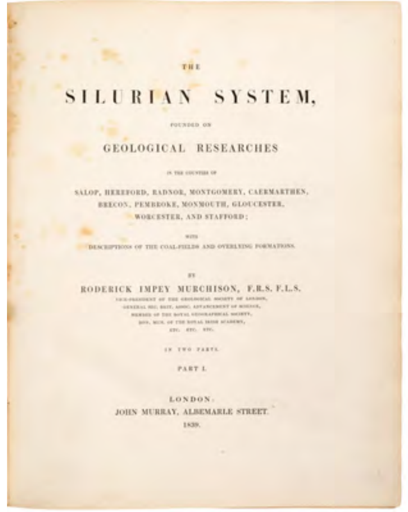
FIRST EDITION COMPLETE WITH THE VERY RARE MAP. Murchison was born in Tarradale, Easter Ross, into a prosperous family. He was educated at Durham School and the military college at Great Marlow, later serving in the British Army during the Peninsular War. After leaving the army in 1815 and marrying Charlotte Hugonin, Murchison initially pursued art and antiquities on the Grand Tour, and then settled at Castle Barnard, Co. Durham, where he seems mainly to have enjoyed field sports. However, inspired by meeting Sir Humphry Davy in 1823, Murchison turned to science, and moved to London.

Geology attracted him immensely, and by January 1825 he was a fellow of the Geological Society. The following year, his star had risen sufficiently for him to hold the position of Secretary, and five years later, in 1831, he was elected President. Murchison was also a founder member of the British Association for the Advancement of Science, attending its inaugural meeting at York on 27 September 1831, where he described the preliminary results of his fieldwork undertaken that summer in south Wales.

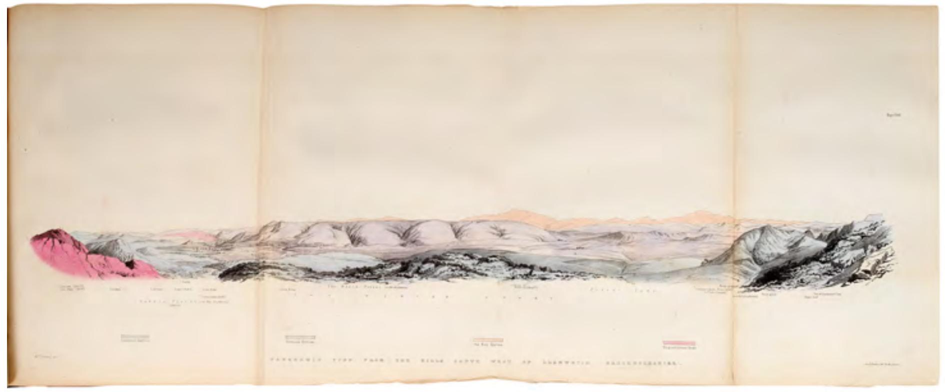
This fieldwork – an attempt to discover whether the greywacke rocks underlying the Old Red Sandstone could be grouped into a definite order of succession – resulted in the establishment of the Silurian system under which were grouped, for the first time, a remarkable series of formations, each replete with distinctive organic remains other than and very different from those of the other rocks of England. 'Murchison was the first to establish a uniform sequence of Transition strata, to which he gave the name "Silurian" after a British tribe; these strata constituted a major system with uniform fossil remains, displaying an abundance of invertebrates and a complete lack… of the remains of vertebrates or land plants' (Norman). Thus, the implications of Murchison's researches for the evolutionary history of the Earth were enormous.

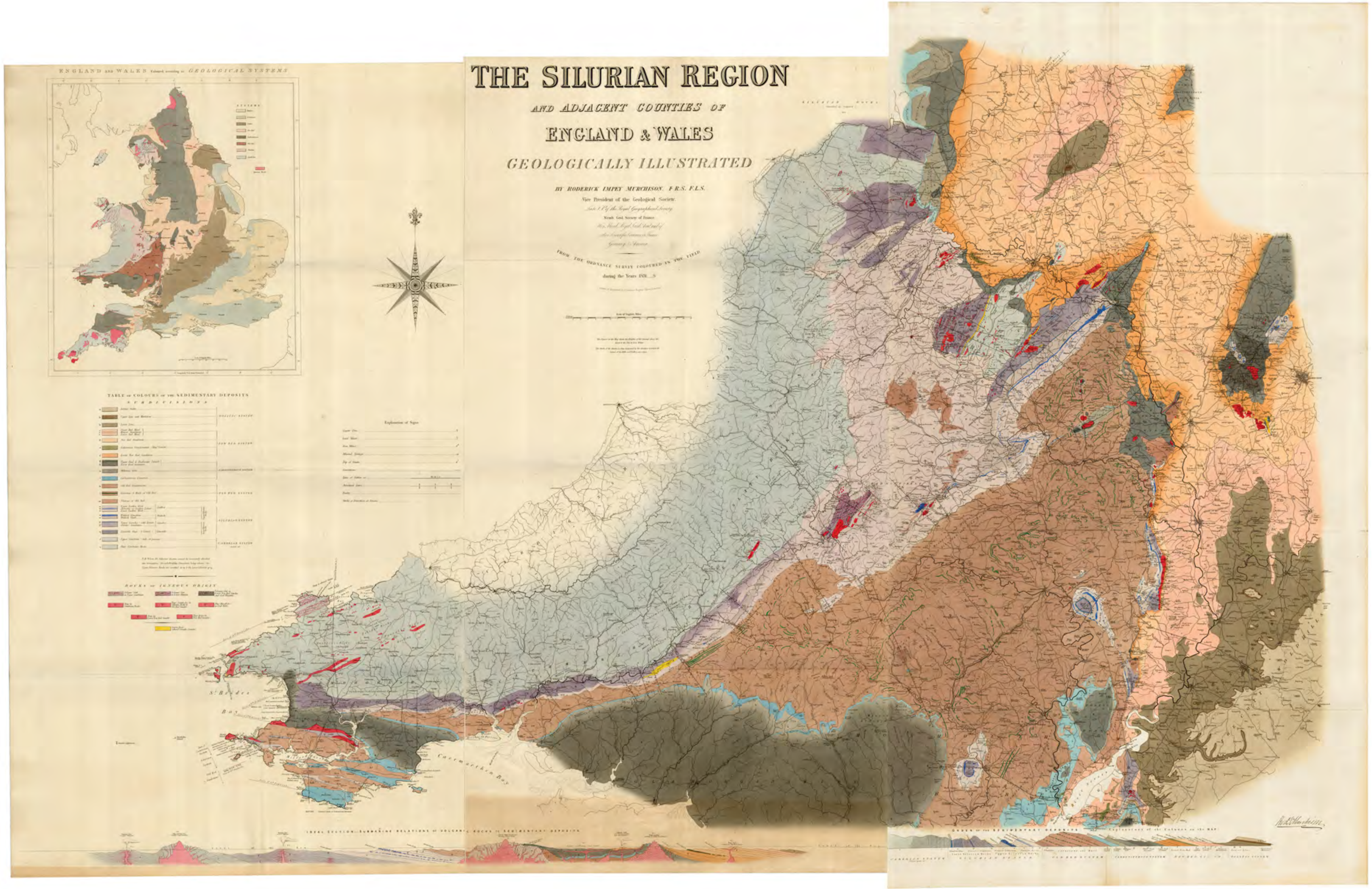
Today, the Silurian is understood as a geologic period and system that extends from the end of the Ordovician Period, about 443 million years ago, to the beginning of the Devonian Period, about 419 million years ago. As with other geologic periods, the rock beds that define the period's start and end are well identified, but the exact dates are uncertain by several million years. The base of the Silurian is set at a major extinction event when 60% of marine species were wiped out.

A full history and bibliographic description of the work is given by Thackray, although he omits mention of the 3 engraved topographical maps printed on 2 sheets. Suffice to mention here that Murchison received substantial help from Arthur Aikin with notes on Shropshire, while J. de C. Sowerby described the shells, Louis Agassiz the fishes,



THE
SILURIAN SYSTEM,
FOUNDED ON
GEOLOGICAL RESEARCHES
IN THE COUNTIES OF
SALOP, HEREFORD, RADNOR, MONTGOMERY, CAERMARTHEN,
BRECON, PEMBROKE, MONMOUTH, GLOUCESTER,
WORCESTER, AND STAFFORD;
WITH
DESCRIPTIONS OF THE COAL-FIELDS AND OVERLYING FORMATIONS.
BY
RODERICK IMPEY MURCHISON, F.R.S. F.L.S.
IN TWO PARTS.
PART I.
LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1839.





William Lonsdale (curator of the Geological Society's museum) the corals, while Charles Stokes aided Murchison on describing the trilobites. Delays in publication were caused in the main by Sowerby's slow delivery of the plates, combined with Murchison's changes of mind, leading to errors which needed to be corrected. Printing was completed by the end of December 1838, with the book published on, or shortly after 1st January 1839. 398 subscribers accounted for 452 copies; the entire print-run was probably around 800 copies. Despite the rarity of the large map today – most copies in commerce are lacking it – every copy of the book was published with the map.

24.

THE FIRST GEOLOGICAL MAP OF EUROPE

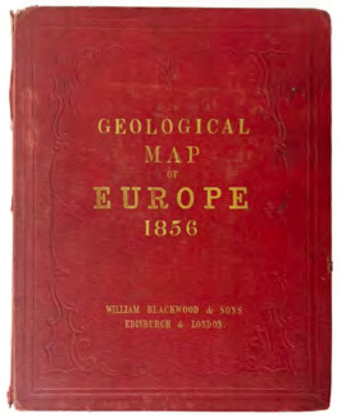
MURCHISON, Sir Roderick Impey (1792–1871) and NICOL, James (1810–1879)

Geological Map of Europe Exhibiting the Different Systems of Rocks According to the Most Recent Researches and Unedited Materials

Edinburgh: W. Blackwood & Sons, & W. and A.K. Johnston, 1856

Folding engraved map (1300 x 1077mm), coloured by a contemporary hand, dissected and mounted on linen, scale of 1 inch to 76 miles (1:4,800,000)

Very good condition: cloth binding somewhat frayed; one flattened fold to a corner of one segment, otherwise the map itself is in excellent condition



A high point of Victorian geology, and a stunning large-scale geological map – over a metre tall. Murchison and Nicol give a first overview of European stratigraphy and make a bold visual argument for deep geological time.

In 1839 Murchison published his monumental work *The Silurian System* (Cat. No. 23), establishing the Silurian Period (now understood as 443–419Ma) and making a vital contribution to the understanding of the first phase of fossil-bearing rocks.

During the composition of *The Silurian System* Murchison had entered into a famous dispute with Henry De la Beche over the correct age of certain rock formations in Devon – the so-called 'Great Devonian Controversy'. Murchison's proposal, with Adam Sedgwick, was to designate a new period, the Devonian, between his Silurian and the more recent coal-bearing rocks of the Carboniferous. To do this Murchison undertook and ambitious geological survey of the Rhineland and parts of Russia, resulting not only in the confirmation of the Devonian but the further establishment of the Permian Period as a sequel to the Carboniferous. In 1849, with the account of west-Russian geology published, Murchison conceived of an ambitious large-scale geological map of Europe: the first of its kind ever produced.

By the middle of the nineteenth century Murchison's pioneering work accounted almost the entirety of Victorian understanding of the period before the arrival of the dinosaurs: it is this vast achievement that is represented in the present map, which stretches from the south-west tip of Portugal to the edge of Siberia, and from Iceland in the north to the far shores of the Mediterranean in the south.

The only comparable project was that of the Belgian geologist André Dumont, whose European map was completed in 1857. Murchison saw a copy of this map while visiting Poppelsdorf, but perhaps predictably he considered it to be derivative of his own work.

OPPENHEIMER'S UNPUBLISHED LECTURES

OPPENHEIMER, J. Robert (1904–1967)

The Problems of the Interaction Of Elementary Particles: Transcriptions of Lectures by Dr. J. Robert Oppenheimer, Given At The California Institute Of Technology

N.p. [California Institute of Technology, Pasadena CA], 1950

280 x 216mm; pp. 87 leaves, printed on rectos only

Mimeographed lecture notes. Very good condition: stapled as issued, with three hole punches; top edge chipped; final leaf detached, browned to the verso

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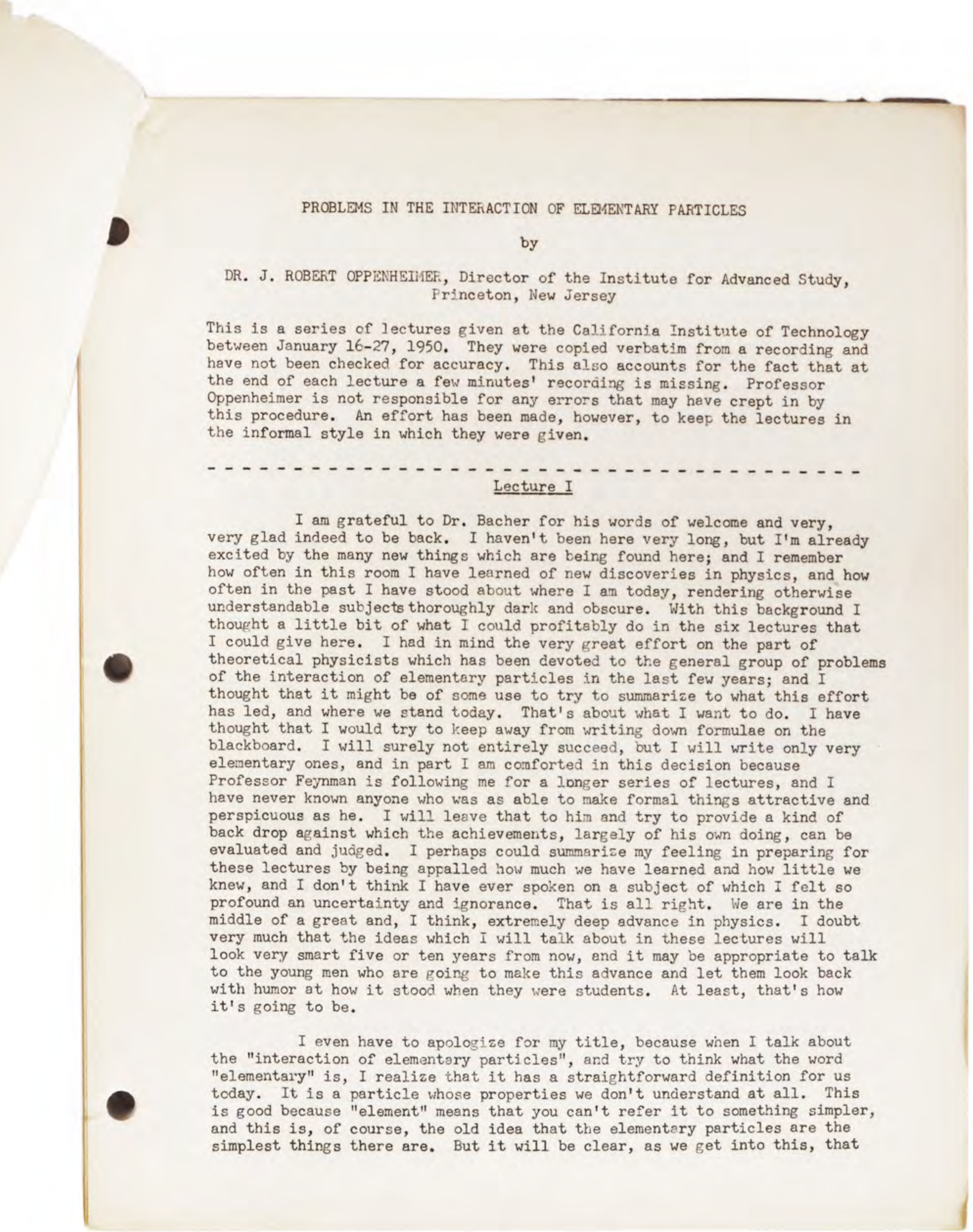
References: Schweber *QED and the Men Who Made It*

An exceptionally scarce set of mimeographed transcriptions of Oppenheimer's ambitious survey of Quantum Electrodynamics up to 1950. Never published, and barely known in the literature on the history of physics.

Oppenheimer himself had presided over a series of landmark postwar conferences on quantum physics, 1947–1949 (at Shelter Island, Pocono and Oldstone), which had seen the convergence of research by Richard Feynman, Julius Schwinger, and Sin-Itiro Tomonaga. As Schweber points out in *QED and the Men Who Made It*, Oppenheimer's Caltech lectures stand at the pinnacle of this achievement (Introduction, xxviii).

In spite of his fame for the development of the atomic bomb, it is the subject of elementary particle interaction that provides the leitmotif for Oppenheimer's whole career: his first major papers of the late 1920s were on this topic, and immediately after the war Oppenheimer sought to use his position as a 'statesman of science' to oversee a new research programme on quantum physics, culminating in the present work.

Although OCLC returns no results for these lectures, we have been able to locate three copies: one in the Richard Latter Papers at the Hoover Institution Library and Archives; two at Caltech Library (one in the William A. Fowler Papers).



PROBLEMS IN THE INTERACTION OF ELEMENTARY PARTICLES

by

DR. J. ROBERT OPPENHEIMER, Director of the Institute for Advanced Study, Princeton, New Jersey

This is a series of lectures given at the California Institute of Technology between January 16-27, 1950. They were copied verbatim from a recording and have not been checked for accuracy. This also accounts for the fact that at the end of each lecture a few minutes' recording is missing. Professor Oppenheimer is not responsible for any errors that may have crept in by this procedure. An effort has been made, however, to keep the lectures in the informal style in which they were given.

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Lecture I

I am grateful to Dr. Bacher for his words of welcome and very, very glad indeed to be back. I haven't been here very long, but I'm already excited by the many new things which are being found here; and I remember how often in this room I have learned of new discoveries in physics, and how often in the past I have stood about where I am today, rendering otherwise understandable subjects thoroughly dark and obscure. With this background I thought a little bit of what I could profitably do in the six lectures that I could give here. I had in mind the very great effort on the part of theoretical physicists which has been devoted to the general group of problems of the interaction of elementary particles in the last few years; and I thought that it might be of some use to try to summarize to what this effort has led, and where we stand today. That's about what I want to do. I have thought that I would try to keep away from writing down formulae on the blackboard. I will surely not entirely succeed, but I will write only very elementary ones, and in part I am comforted in this decision because Professor Feynman is following me for a longer series of lectures, and I have never known anyone who was as able to make formal things attractive and perspicuous as he. I will leave that to him and try to provide a kind of back drop against which the achievements, largely of his own doing, can be evaluated and judged. I perhaps could summarize my feeling in preparing for these lectures by being appalled how much we have learned and how little we knew, and I don't think I have ever spoken on a subject of which I felt so profound an uncertainty and ignorance. That is all right. We are in the middle of a great and, I think, extremely deep advance in physics. I doubt very much that the ideas which I will talk about in these lectures will look very smart five or ten years from now, and it may be appropriate to talk to the young men who are going to make this advance and let them look back with humor at how it stood when they were students. At least, that's how it's going to be.

I even have to apologize for my title, because when I talk about the "interaction of elementary particles", and try to think what the word "elementary" is, I realize that it has a straightforward definition for us today. It is a particle whose properties we don't understand at all. This is good because "element" means that you can't refer it to something simpler, and this is, of course, the old idea that the elementary particles are the simplest things there are. But it will be clear, as we get into this, that

OSTROM, John H. (1928–2005)

Osteology of Deinonychus antirrhopus, an Unusual Therapod from the Lower Cretaceous of Montana

New Haven CT: Yale University, 1969

Octavo; 251 x 174mm; pp. 165

Softcover. Fair to good condition: extensively used, as noted, with Ostrom's tape repair to the spine, and marginalia throughout

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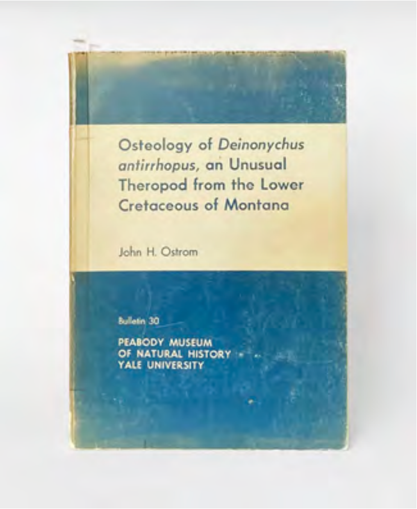
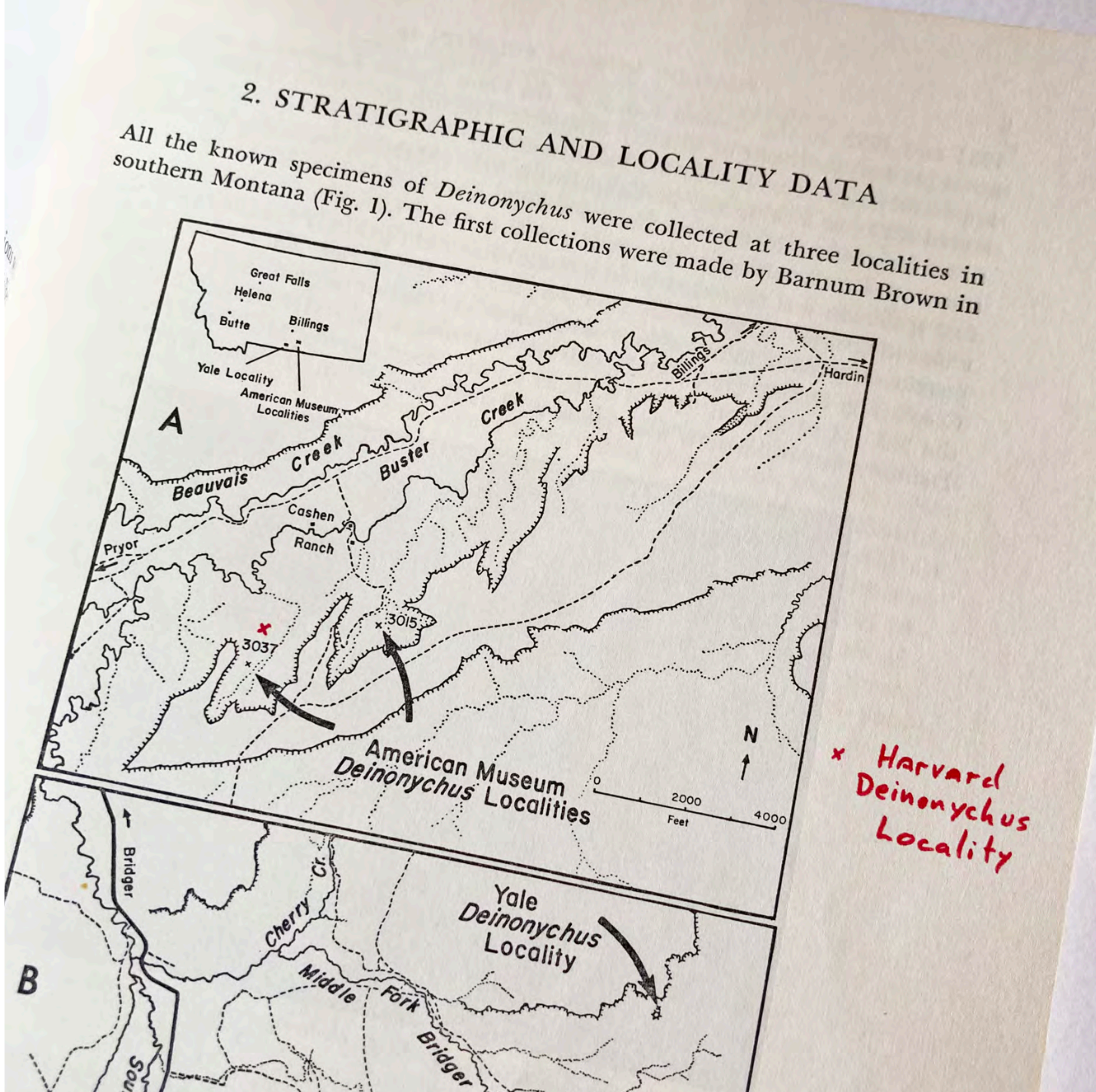
Provenance: John H. Ostrom's own working copy



THE AUTHOR'S OWN WORKING COPY of this foundational text in the 'Dinosaur Renaissance', which transformed dinosaurs in scientific and popular understanding from plodding swamp-dwelling beasts into agile, possibly warm-blooded predators. *Deinonychus*, specifically, created an evolutionary 'link' between land-dwelling dinosaurs, *Archaeopteryx*, and birds, and is in fact the dinosaur presented as the 'Velociraptor' in Michael Crichton's *Jurassic Park*. Ostrom's discovery of *Deinonychus* has been described as 'the single most important discovery – perhaps in the recent history of all dinosaurs' (Fastovsky and Weishampel, *The Evolution and Extinction of the Dinosaurs*).

This copy contains Ostrom's notes on subsequent specimens of *Deinonychus*, particularly the Harvard University specimen discovered by Steven Orzack in 1974 (MCZ 4371), which caused Ostrom to revise his description of the genus. Ostrom has added the location of the find to the map at the beginning of the volume, and interpolated MCZ 4371's measurements throughout. The volume also contains many minor textual corrections (particularly significant, as this volume was never reissued). Other attractive annotations include a speculative addition to the cladistic diagram near the end of the volume, adding *Saurornitholestes* to the evolutionary tree of *Dromaeosauridae*; also a note of the name and contact details of the 'current rancher at the site' – the latter dated 1995, three years after Ostrom's retirement, showing his continued interest in *Deinonychus*.

John H. Ostrom (1928–2005) is considered one of the most important palaeontologists of the twentieth century. He spent his entire career at Yale University, and focused on field sites in Wyoming and Montana. His earliest studies of the craniometry of the *Hadrosaur* prefigured his later work, as he speculated that the *Hadrosaur*'s environment was dry conifer forests, rather than swampy ground. The discovery of *Deinonychus* in 1964 transformed his career, leading to a large number of technical and popular publications, and further research into the evolution of birds, culminating in his classic 1976 paper '*Archaeopteryx* and the evolution of birds', seen as the definitive statement of an idea that goes all the way back to T.H. Huxley's speculative work in the 1860s.



QUIN, Edward (1794–1828)

An Historical Atlas; In a Series of Maps of the World as Known at Different Periods […]

London: Printed for R.B. Seeley and W. Burnside, 1830

Folio (415 x 340mm); pp. [3, interpolated leaves including the title-page, contents and first letterpress page], 93, [2], 21 maps (6 folding)

Very good condition: all maps in excellent condition; a few small marks to aquatinting introduced during the printing process to the first map; rebacked in brown cloth, matching the original half-leather binding, and retaining the original marbled boards and paper cover title (worn); new endpapers. Some edge-wear and chipping to page edges as always

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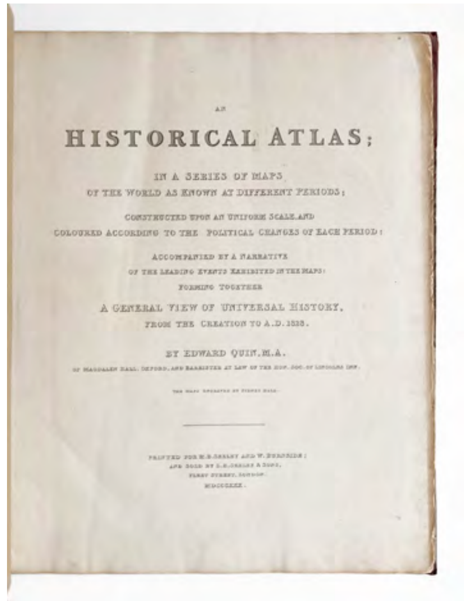
References: Goffart, *Historical Atlases The First Three Hundred Years, 1570–1870*; Rumsey No. 2839

The world revealed in historical sequence. Quin's *Historical Atlas* is justly famous as a masterpiece of atlas conception and printing. The unusual format of the maps is to use extensive black aquatint to show the 'parting clouds' of historical discovery, with exquisite hand-colouring of the landmasses themselves.

The sequence is unashamedly Western-centric and Christian apologist. The first map, 'The Deluge', shows only Eden – a tiny yellow hand-coloured area in a sea of black (see the rear cover of this catalogue). subsequent maps show the Exodus of the Israelites (Assyria, Syria, Canaan, Egypt), the Foundation of Rome, the Empires of Cyrus and Alexander, the Rise of the Roman Empire, and so on, up to the spectacular 'Discovery of America' – the first double-size folding map (detail shown overleaf).

Owing to the practice of splitting this atlas, complete bound copies in good condition are increasingly rare.



AN

HISTORICAL ATLAS;

IN A SERIES OF MAPS
OF THE WORLD AS KNOWN AT DIFFERENT PERIODS;

CONSTRUCTED UPON AN UNIFORM SCALE AND
COLOURED ACCORDING TO THE POLITICAL CHANGES OF EACH PERIOD:

ACCOMPANIED BY A NARRATIVE
OF THE LEADING EVENTS EXHIBITED IN THE MAPS:
FORMING TOGETHER
A GENERAL VIEW OF UNIVERSAL HISTORY,
FROM THE CREATION TO A.D. 1828.

BY EDWARD QUIN, M.A.

PRINTED FOR R.B. SEELEY AND W. BURNSIDE;

RAMANUJAN, Srinivasa (1887–1920)

On Certain Arithmetical Functions [TOGETHER WITH:] **On certain trigonometrical sums and their applications in the theory of numbers**

[COMPRISING:] *Transactions of the Cambridge Philosophical Society,* Vol. XXII, Nos 9 and 13

Cambridge: Cambridge University Press, 1916 and 1918

Two vols, quarto (293 x 225mm), pp. [4], 159–184 [2], and [4], 259–276 [2]

Two single issues in original printed wrappers; fine condition, (2)

Provenance: Cambridge Philosophical Society, retained from the time of publication until 2024

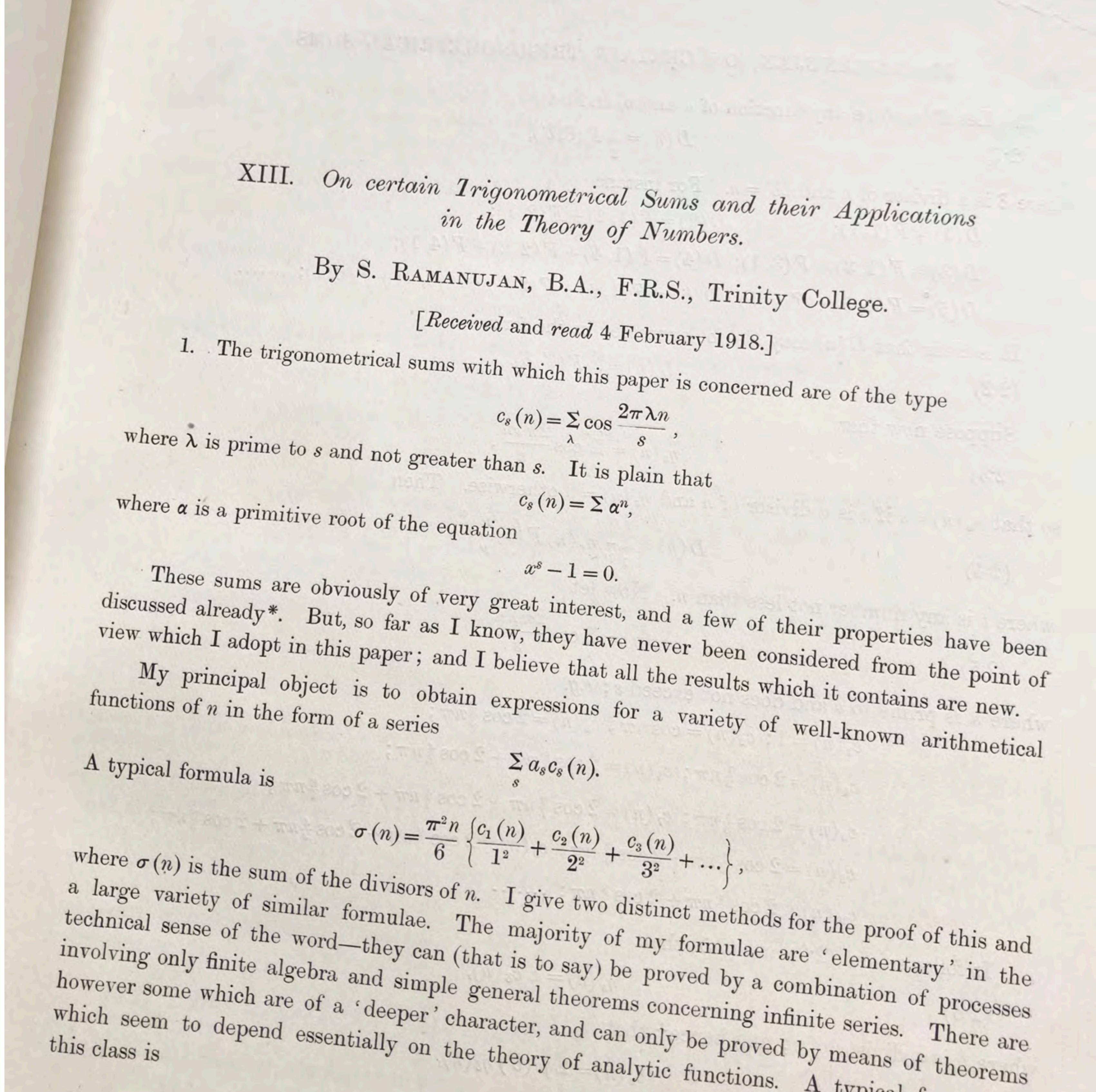
TWO CLASSIC PAPERS by the legendary Indian mathematician Srinivasa Ramanujan, the self taught savant who was brought to Cambridge by G.H. Hardy in one of the most extraordinary careers in the history of mathematics.

Ramanujan's attempts to interest others in his work led, in 1913, to a correspondence with Hardy in Cambridge, with the older mathematician quickly realising that he was in touch with a highly unusual 'student'. Some of Ramanujan's results were so stunning that Hardy wrote later that they 'defeated me completely; I had never seen anything in the least like them before'. Hardy began arrangements to bring Ramanujan to Cambridge before he had even sent his reply, and in 1914, once Ramanujan had secured his parents' blessing, he travelled to England. In Cambridge Hardy tutored him Ramanujan in modern mathematical techniques, while attempting not to 'break the spell of his inspiration' (Hardy, RS obit. notice). The result was an unquestioned triumph: Ramanujan published more than 20 papers in European journals, alongside many in the *Journal of the Indian Mathematical Society*.

Hardy considered the present two papers among Ramanujan's finest, and wrote that they 'should be read together'. 'They contain,' he wrote, 'very beautiful contributions to the theory of the representation of numbers by sums of squares.' Yet even this praise underplays the importance of the papers:

> Ramanujan's innocently titled paper 'On Certain Arithmetical Functions' is arguably his most important work. The results in this paper include 'congruences', which would later play a role in developing ideas that were critical to the proof of Fermat's last theorem, and it contained a conjecture that would later be proved by Deligne in his 1974 paper for which he was awarded the Fields Medal. (Ono and Aczel, *My Search for Ramanujan*)

The second paper is no less important, introducing 'Ramanujan's sums', which play a key role in analytic number theory and multiplicative function analysis. They connect analytic number theory, Fourier analysis, and even engineering applications, showing the remarkable reach of Ramanujan's intuition.



XIII. *On certain Trigonometrical Sums and their Applications in the Theory of Numbers.*

By S. RAMANUJAN, B.A., F.R.S., Trinity College.

[*Received* and *read* 4 February 1918.]

1. The trigonometrical sums with which this paper is concerned are of the type

$$c_s(n) = \sum_{\lambda} \cos \frac{2\pi\lambda n}{s},$$

where λ is prime to s and not greater than s. It is plain that

$$c_s(n) = \sum \alpha^n,$$

where α is a primitive root of the equation

$$x^s - 1 = 0.$$

These sums are obviously of very great interest, and a few of their properties have been discussed already*. But, so far as I know, they have never been considered from the point of view which I adopt in this paper; and I believe that all the results which it contains are new.

My principal object is to obtain expressions for a variety of well-known arithmetical functions of n in the form of a series

$$\sum_s a_s c_s(n).$$

A typical formula is

$$\sigma(n) = \frac{\pi^2 n}{6}\left\{\frac{c_1(n)}{1^2} + \frac{c_2(n)}{2^2} + \frac{c_3(n)}{3^2} + \dots\right\},$$

where $\sigma(n)$ is the sum of the divisors of n. I give two distinct methods for the proof of this and a large variety of similar formulae. The majority of my formulae are 'elementary' in the technical sense of the word—they can (that is to say) be proved by a combination of processes involving only finite algebra and simple general theorems concerning infinite series. There are however some which are of a 'deeper' character, and can only be proved by means of theorems which seem to depend essentially on the theory of analytic functions. A typical
this class is

[ROYAL SOCIETY]

The Philosophical Transactions and Collections, to the End of the Year MDCC, Abridged and Disposed under General Heads

London: Printed for W. Innys [et al.], 1734–1749

Quarto (232 x 180mm); 8 vols, various paginations, numerous plates, many folding, (8)

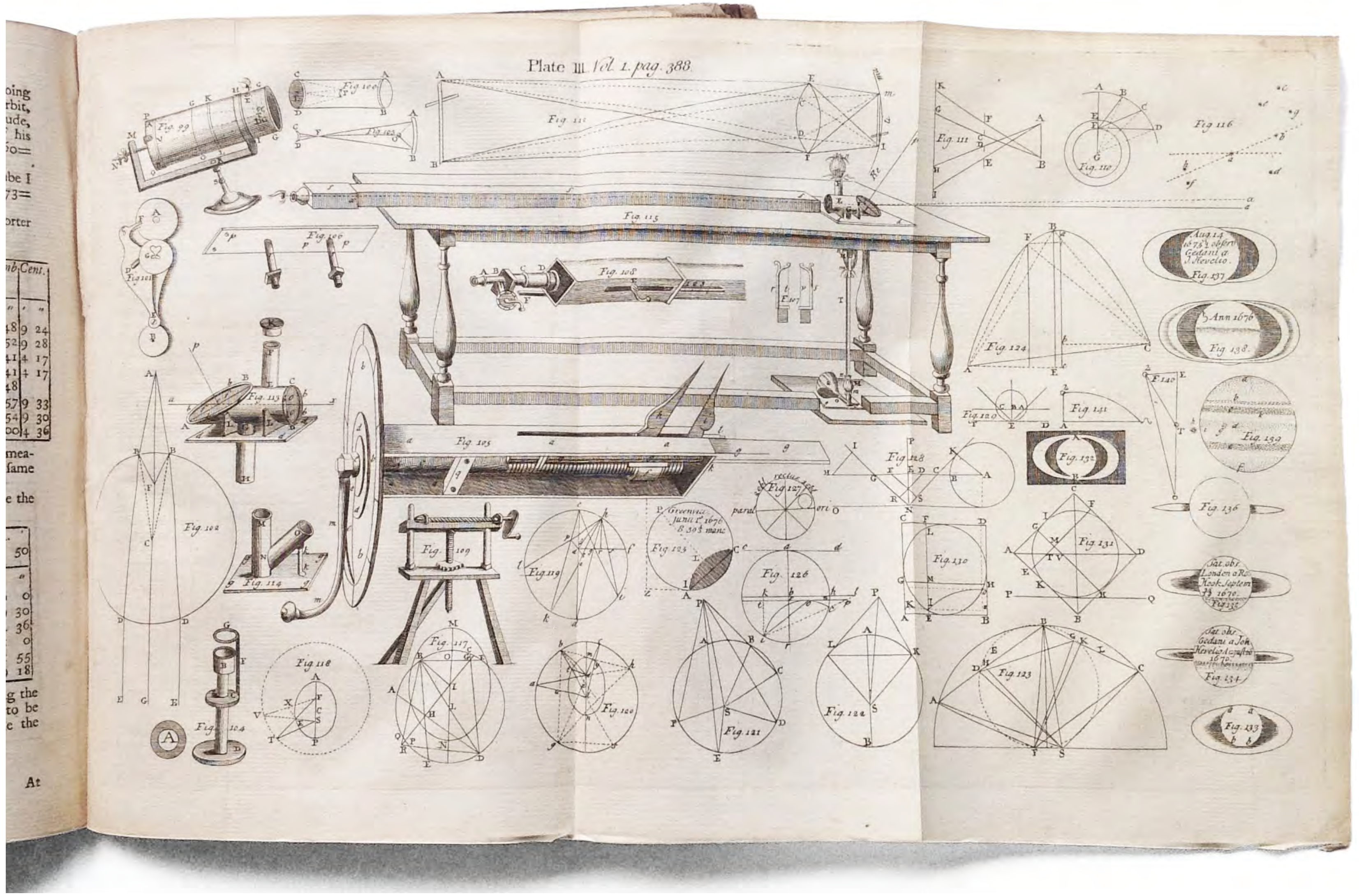
Very good condition: internally the collection is clean and bright throughout, occasional very light foxing; plates in excellent condition, very fine impressions. All figures run consecutively (though one plate is bound a few pages after its intended location) and the pagination is complete throughout. The bindings have been expertly restored (full leather restoration, retaining gilt spine decoration and adding new endpapers)

An outstanding complete set of the *Phil Trans* abridgements, in original uniform leather bindings. 7 volumes in 8, with a total of 168 plates containing some 1,600 figures.

Edited by John Lowthorp, Henry Jones, John Eames and John Martyn. This set of abridgements contains many of the most important works of the scientific revolution, including microscopic discoveries, Newton's work on optics, astronomical observations by Hevelius, Halley, Cassini, Flamsteed and others, Boyle's researches into the nature of air, and countless other subjects.

Many volumes bear the imprimatur of Isaac Newton, who oversaw the project of abridgement. There are also copiously illustrated archaeological, geographic, botanical, physiological and geological papers. The plates show the instruments and inventions characteristic of the era, notably including Newton's reflecting telescope and Wilson's pocket microscope. Vol. V contains Father Kino's famous map showing a land route to California, which ended the myth that the peninsula was an island.

This is a uniform set assembled in the eighteenth century from the following editions: Vols I–III, covering 1665-1700: fifth edition (1749); vols IV–V, covering 1700-1720: third edition (1749); VI–VII, covering 1719-1733: first edition (1734). Sensitive restoration results in an attractive and easy to handle set.



SABINE, Edward (1788–1883)

'Magnetic observations'

[OFFPRINT FROM:] *Narrative of the Surveying Voyages of His Majesty's Ships Adventure and Beagle [...] Vol. I. Proceedings of the first expedition, 1826–30, under the command of Captain P. Parker King, R.N., F.R.S.*

London: Henry Colburn, c.1837–1839

Octavo (210 x 130mm); A-B8, pp. 32

Modern green wrappers (author and title inscribed on upper wrapper in ballpoint pen; tiny ballpoint ink mark at head of upper wrapper). A fine, clean copy with only some very faint insignificant spotting on pp. 9–10 and pp. 13–14 with fore-edge just slightly irregularly trimmed

References: cf. Freeman 10

AN OFFPRINT OF ABSOLUTE RARITY by Edward Sabine, analysing magnetic variation and dip readings taken by Fitzroy on board the *Beagle*.

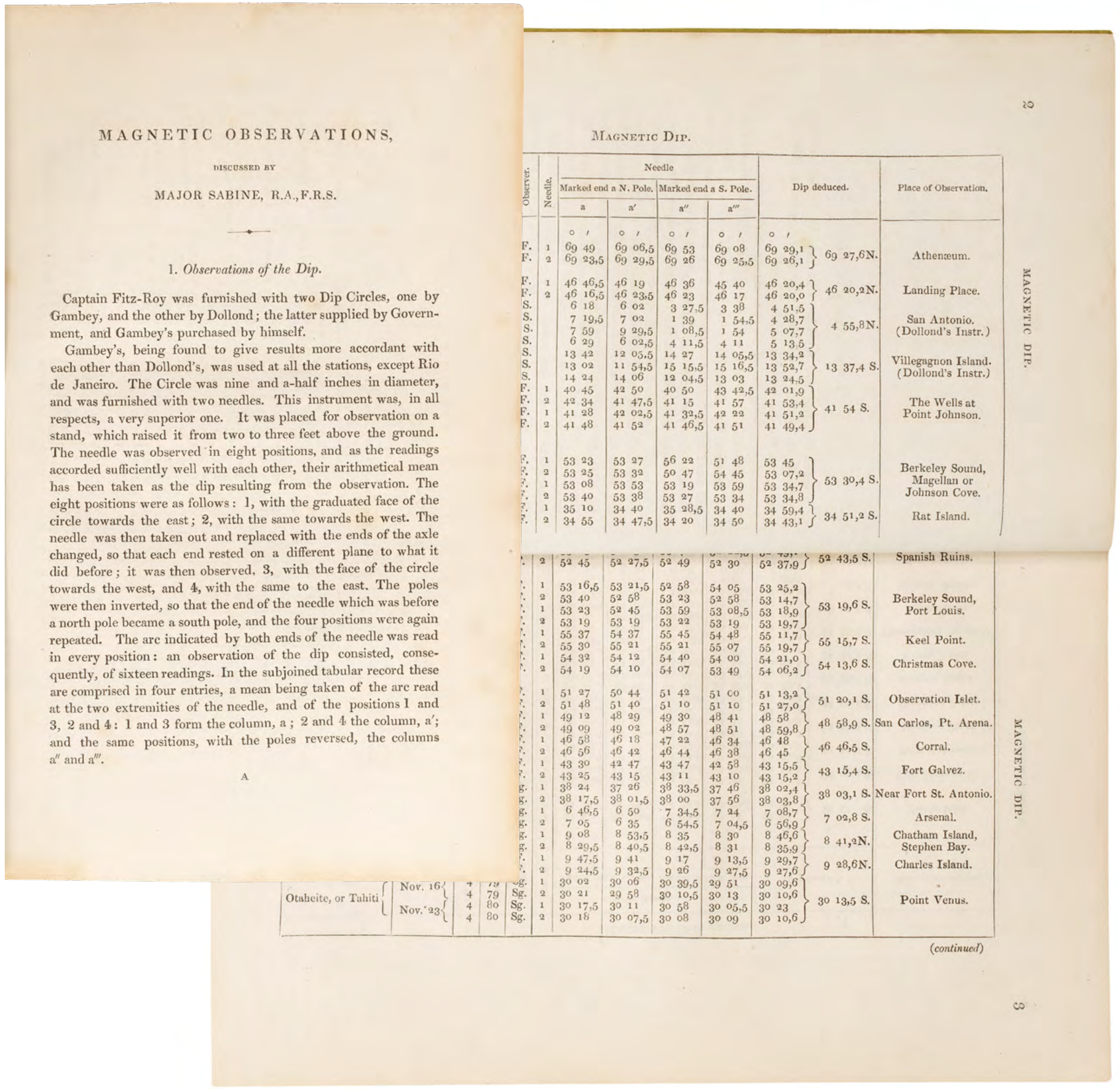
It is for his work on the Earth's magnetism that Sabine is best known. In 1818, he joined John Ross on the North-West Passage expedition as an astronomer and scientific officer. In 1819, Sabine returned to the Arctic with William Parry, conducting a magnetic survey on their expedition to Melville Island. Sabine's became a central figure in what became known as the 'magnetic crusade,' a global effort to study Earth's magnetic field. It is therefore no surprise that Sabine was asked to analyse the magnetic observations made by Captains Fitzroy and King. Sabine notes on p.27:

> Captain Fitz-Roy's observations are so well distributed over the southern hemisphere, that a good view of the changes which the variation is undergoing throughout its meridians may be obtained by comparing his determinations with those of earlier observers at the same stations.

In other words, the volume and geographical spread of Fitzroy's magnetic observations have enabled Sabine to build an accurate picture of how the Earth's magnetic field was changing over time.

The Beagle returned to Britain in 1836, although the publication of the *Narrative of the Surveying Voyages of His Majesty's Ships Adventure and Beagle* was delayed until 1839. Sabine had completed his analysis of the magnetic readings from the circumnavigation well before that date, since he reported the results in his 1837 paper 'Report on the variations of the magnetic intensity observed at different points of the earth's surface'. It therefore seems extremely likely that this offprint appeared in either 1837 or 1838, prior to the appearance of the volumes in 1839.

The offprint is composed of two gatherings each of eight leaves signed A-B8 and paginated [1]–32, whereas the article in the whole volume is printed on two gatherings each of eight leaves signed 2K-2L8 paginating 497–512; additionally, the offprint omits 'VOL.I.' at the foot of the first page. For such a cornerstone document in the history of geomagnetism, it is intriguing that no other such offprints can be traced either in institutions or on the market.



MAGNETIC OBSERVATIONS,

DISCUSSED BY

MAJOR SABINE, R.A., F.R.S.

1. *Observations of the Dip.*

Captain Fitz-Roy was furnished with two Dip Circles, one by Gambey, and the other by Dollond; the latter supplied by Government, and Gambey's purchased by himself.

Gambey's, being found to give results more accordant with each other than Dollond's, was used at all the stations, except Rio de Janeiro. The Circle was nine and a-half inches in diameter, and was furnished with two needles. This instrument was, in all respects, a very superior one. It was placed for observation on a stand, which raised it from two to three feet above the ground. The needle was observed in eight positions, and as the readings accorded sufficiently well with each other, their arithmetical mean has been taken as the dip resulting from the observation. The eight positions were as follows: 1, with the graduated face of the circle towards the east; 2, with the same towards the west. The needle was then taken out and replaced with the ends of the axle changed, so that each end rested on a different plane to what it did before; it was then observed, 3, with the face of the circle towards the west, and 4, with the same to the east. The poles were then inverted, so that the end of the needle which was before a north pole became a south pole, and the four positions were again repeated. The arc indicated by both ends of the needle was read in every position: an observation of the dip consisted, consequently, of sixteen readings. In the subjoined tabular record these are comprised in four entries, a mean being taken of the arc read at the two extremities of the needle, and of the positions 1 and 3, 2 and 4: 1 and 3 form the column, a; 2 and 4 the column, a'; and the same positions, with the poles reversed, the columns a'' and a'''.

A

2 MAGNETIC DIP.

Observer.	Needle.	Needle: Marked end a N. Pole. a	a'	Marked end a S. Pole. a''	a'''	Dip deduced.		Place of Observation.
		° ′	° ′	° ′	° ′	° ′		
F.	1	69 49	69 06,5	69 53	69 08	69 29,1	69 27,6N.	Athenæum.
F.	2	69 23,5	69 29,5	69 26	69 25,5	69 26,1		
F.	1	46 46,5	46 19	46 36	45 40	46 20,4	46 20,2N.	Landing Place.
F.	2	46 16,5	46 23,5	46 23	46 17	46 20,0		
S.		6 18	6 02	3 27,5	3 38	4 51,5	4 55,8N.	San Antonio. (Dollond's Instr.)
S.		7 19,5	7 02	1 39	1 54,5	4 28,7		
S.		7 59	9 29,5	1 08,5	1 54	5 07,7		
S.		6 29	6 02,5	4 11,5	4 11	5 13,5		
S.		13 42	12 05,5	14 27	14 05,5	13 34,2	13 37,4 S.	Villegagnon Island. (Dollond's Instr.)
S.		13 02	11 54,5	15 15,5	15 16,5	13 52,7		
S.		14 24	14 06	12 04,5	13 03	13 24,5		
F.	1	40 45	42 50	40 50	43 42,5	42 01,9	41 54 S.	The Wells at Point Johnson.
F.	2	42 34	41 47,5	41 15	41 57	41 53,4		
F.	1	41 28	42 02,5	41 32,5	42 22	41 51,2		
F.	2	41 48	41 52	41 46,5	41 51	41 49,4		
F.	1	53 23	53 27	56 22	51 48	53 45	53 30,4 S.	Berkeley Sound, Magellan or Johnson Cove.
F.	2	53 25	53 32	50 47	54 45	53 07,2		
F.	1	53 08	53 53	53 19	53 59	53 34,7		
F.	2	53 40	53 38	53 27	53 34	53 34,8		
F.	1	35 10	34 40	35 28,5	34 40	34 59,4	34 51,2 S.	Rat Island.
F.	2	34 55	34 47,5	34 20	34 50	34 43,1		

MAGNETIC DIP.

	Date			Observer.	Needle.	a	a'	a''	a'''	Dip deduced.		Place of Observation.
					2	52 45	52 27,5	52 49	52 30	52 37,9	52 43,5 S.	Spanish Ruins.
					1	53 16,5	53 21,5	52 58	54 05	53 25,2	53 19,6 S.	Berkeley Sound, Port Louis.
					2	53 40	52 58	53 23	52 58	53 14,7		
					1	53 23	52 45	53 59	53 08,5	53 18,9		
					2	53 19	53 19	53 22	53 19	53 19,7		
					1	55 37	54 37	55 45	54 48	55 11,7	55 15,7 S.	Keel Point.
					2	55 30	55 21	55 21	55 07	55 19,7		
					1	54 32	54 12	54 40	54 00	54 21,0	54 13,6 S.	Christmas Cove.
					2	54 19	54 10	54 07	53 49	54 06,2		
					1	51 27	50 44	51 42	51 00	51 13,2	51 20,1 S.	Observation Islet.
					2	51 48	51 40	51 10	51 10	51 27,0		
					1	49 12	48 29	49 30	48 41	48 58	48 58,9 S.	San Carlos, Pt. Arena.
					2	49 09	49 02	48 57	48 51	48 59,8		
					1	46 58	46 18	47 22	46 34	46 48	46 46,5 S.	Corral.
					2	46 56	46 42	46 44	46 38	46 45		
					1	43 30	42 47	43 47	42 58	43 15,5	43 15,4 S.	Fort Galvez.
					2	43 25	43 15	43 11	43 10	43 15,2		
				g.	1	38 24	37 26	38 33,5	37 46	38 02,4	38 03,1 S.	Near Fort St. Antonio.
				g.	2	38 17,5	38 01,5	38 00	37 56	38 03,8		
				g.	1	6 46,5	6 50	7 34,5	7 24	7 08,7	7 02,8 S.	Arsenal.
				g.	2	7 05	6 35	6 54,5	7 04,5	6 56,9		
				g.	1	9 08	8 53,5	8 35	8 30	8 46,6	8 41,2N.	Chatham Island, Stephen Bay.
				g.	2	8 29,5	8 40,5	8 42,5	8 31	8 35,9		
					1	9 47,5	9 41	9 17	9 13,5	9 29,7	9 28,6N.	Charles Island.
					2	9 24,5	9 32,5	9 26	9 27,5	9 27,6		
Otaheite, or Tahiti	Nov. 16			g.	1	30 02	30 06	30 39,5	29 51	30 09,6	30 13,5 S.	Point Venus.
		4	79	Sg.	2	30 21	29 58	30 10,5	30 13	30 10,6		
	Nov. 23	4	80	Sg.	1	30 17,5	30 11	30 58	30 05,5	30 23		
		4	80	Sg.	2	30 18	30 07,5	30 08	30 09	30 10,6		

(*continued*)

3

31.

MARIE THARP AND PLATE TECTONICS

THARP, Marie (1920–2006), and HEEZEN, Bruce C. (1924–1977)

The Floor of the Oceans

Paris: Éditions Charon, 1977

Lithographic world map printed in colours; 1150 x 662mm; scale of 1:40,000,000

Very good condition: laminated as issued, with some minor wear to the lamination at the edges

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References: Felt, *Sounding: The Story of the Remarkable Woman Who Mapped the Ocean Floor*

A crucial and visually striking contribution to the theory of Plate Tectonics. Marie Tharp and Bruce Heezen collaborated for more than three decades, producing a series of regional ocean floor maps, with this world map marking the conclusion of this remarkable partnership. Tharp and Heezen used data from echo soundings collected by research ships, in order to plot the ocean floor's topography. The first startling finding was a vast, continuous ridge running down the middle of the Atlantic. Most striking was the discovery of a central rift valley within the ridge – a geologic feature that indicated seafloor spreading and supported the then-controversial theory of continental drift. This visualization played a pivotal role in validating the emerging theory of plate tectonics, which transformed our understanding of Earth's dynamic crust.

Marie Tharp, a geologist and oceanographic cartographer, was the intellectual force behind the mapping project, although she initially faced skepticism in a male-dominated field. At a time when women were largely excluded from shipboard research, Tharp worked from the lab, analysing thousands of sonar readings by hand and turning raw data into groundbreaking insights. When she first proposed the existence of the rift valley, Heezen initially dismissed her findings as 'girl talk'. But as more data confirmed her interpretation, her analysis proved unassailable. Tharp's work not only demonstrated her exceptional scientific ability but also highlighted the importance of persistence and precision in scientific discovery. Her maps remain iconic not just for their scientific significance, but also for their elegance and clarity in visualizing the unseen world beneath the sea.

Together, Tharp and Heezen's efforts culminated in the present map, titled *The Floor of the Oceans*. This map brought to life the vast, rugged terrain of the ocean basins and helped shift scientific consensus toward accepting plate tectonics as the unifying theory of geology. It provided the missing piece linking continental drift, seafloor spreading, and the movement of tectonic plates. This work was instrumental in bridging observation with theory, making visible the hidden architecture of our planet and enabling a new era of Earth science.

TURING, Alan Mathison (1912–1954)

'The Word problem in Semi-groups with Cancellation'

[IN:] *Annals of Mathematics* Vol. 2, No. 52

Princeton NJ: Princeton University Press, September 1950

Octavo (254 x 175mm); pp. 245–508, Turing at pp. 491–505

Single issue in original wraps; near fine condition; spine slightly wrinkled as often

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References: *The Turing Guide*, pp. 394–397; *Alan Turing: His Work and Impact*, 343–357; Martin Davis, 'What is a Computation?'

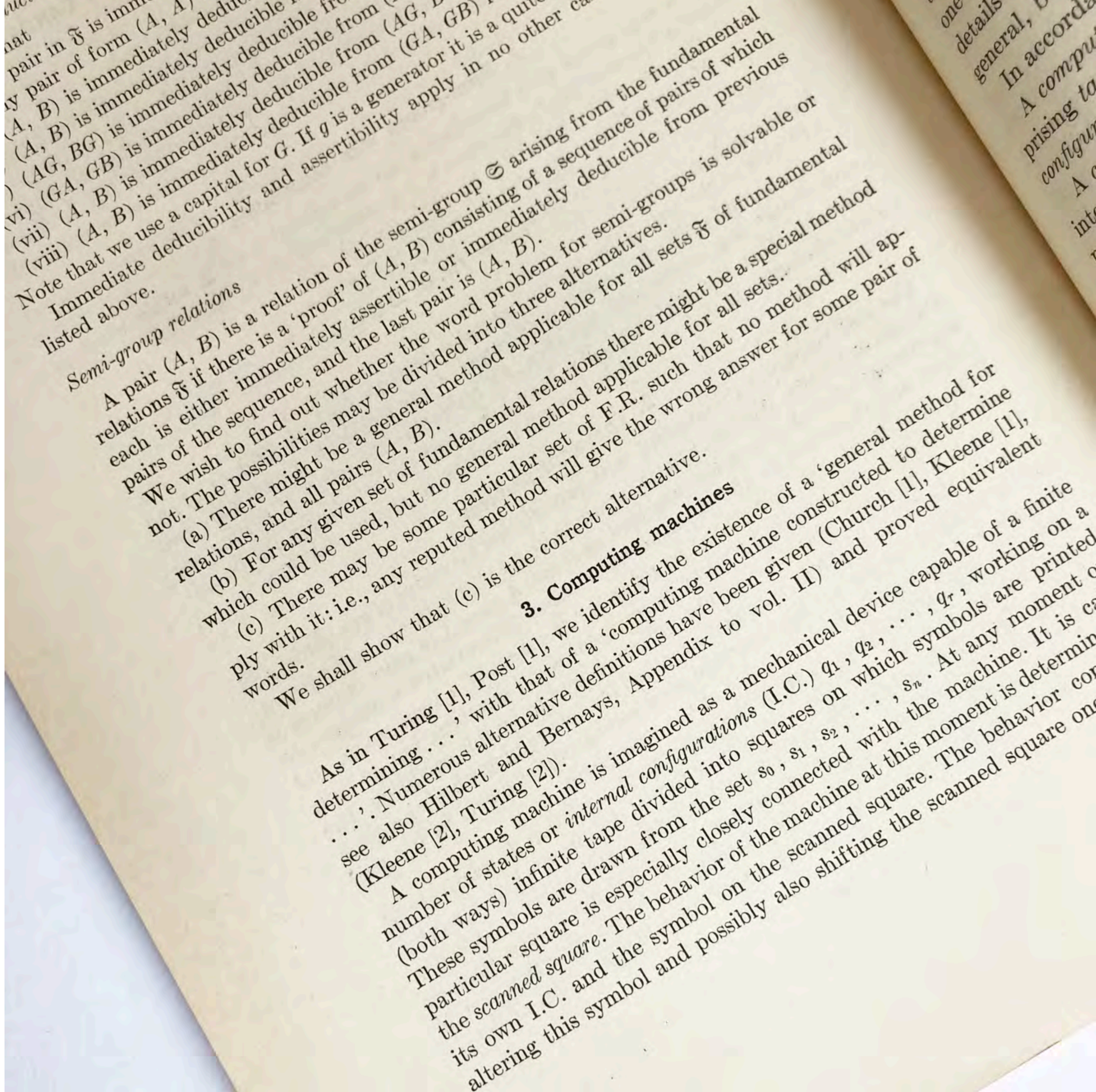
TURING'S LAST STATEMENT on the eponymous 'Turing Machine' – the 1936 thought experiment that launched the entire field of computing machinery.

In his 1936 paper Alan Turing famously proposed an imaginary device which would manipulate symbols on an infinite strip of tape. With the simple set of rules by which this device operated, Turing was able not only to show that the 'Entscheidungsproblem' (decision problem) set by David Hilbert was unsolvable, but also to give a formal definition of computability, and to construct a 'machine' that could carry out any possible computation. This was a landmark in the history of mathematics – and also stands as the founding moment in the history of modern computing.

But it was far from the last word on what came to be called 'Turing Machines'. The search for more problems that could be analysed in this way led, in 1947, to the publication of Emil Post's 'Recursive Unsolvability of a Problem of Thue', which proposed several improvements on Turing's original concept and applied it to what is known as the 'word problem' in algebraic Group Theory, showing that for a special case the so-called 'word problem' is unsolvable.* This was an area of mathematics in which Turing had published his first ever paper, in 1935. Post's 1947 contribution was therefore of the greatest interest to Turing, who at this time was back at Cambridge and looking for new problems, following his departure from the project to build the 'Pilot ACE' computer. With typical bravado Turing quickly believed he had shown that the word problem in general is unsolvable. In fact, Turing's proof was incomplete, and so he published only this partial result – now more notable for its presentation of an updated 'Turing Machine' on pp. 493–495.

In spite of the monumental contributions still to come from Turing – in artificial intelligence, computer programming and morphogenesis – he remained committed to work in pure mathematics, and particular to the refinement of his theory of computing machines.

* The word problem is a specific instance of a general type of problem that can be quite simply explained with an example: take a string of letters (a 'word'), and apply rules about how different words relate (abc=ca, b=cba and so on). The problem is this: can an algorithm be found that will show whether any given word can be transformed into another word?


Immediate deducibility and assertibility apply in no other cases listed above.

Semi-group relations

A pair (A, B) is a relation of the semi-group 𝔖 arising from the fundamental relations 𝔉 if there is a 'proof' of (A, B) consisting of a sequence of pairs of which each is either immediately assertible or immediately deducible from previous pairs of the sequence, and the last pair is (A, B).

We wish to find out whether the word problem for semi-groups is solvable or not. The possibilities may be divided into three alternatives.

(a) There might be a general method applicable for all sets 𝔉 of fundamental relations, and all pairs (A, B).

(b) For any given set of fundamental relations there might be a special method which could be used, but no general method applicable for all sets.

(c) There may be some particular set of F.R. such that no method will apply with it: i.e., any reputed method will give the wrong answer for some pair of words.

We shall show that (c) is the correct alternative.

3. Computing machines

As in Turing [1], Post [1], we identify the existence of a 'general method for determining ...' with that of a 'computing machine constructed to determine ...'. Numerous alternative definitions have been given (Church [1], Kleene [1], see also Hilbert and Bernays, Appendix to vol. II) and proved equivalent (Kleene [2], Turing [2]).

A computing machine is imagined as a mechanical device capable of a finite number of states or *internal configurations* (I.C.) $q_1, q_2, \dots, q_r$, working on a (both ways) infinite tape divided into squares on which symbols are printed. These symbols are drawn from the set $s_0, s_1, s_2, \dots, s_n$. At any moment o... particular square is especially closely connected with the machine. It is ca... the *scanned square*. The behavior of the machine at this moment is determin... its own I.C. and the symbol on the scanned square. The behavior co... altering this symbol and possibly also shifting the scanned square on...

FERMAT'S LAST THEOREM: SOLVED

WILES, Andrew (b.1952)

'Modular elliptic curves and Fermat's Last Theorem'

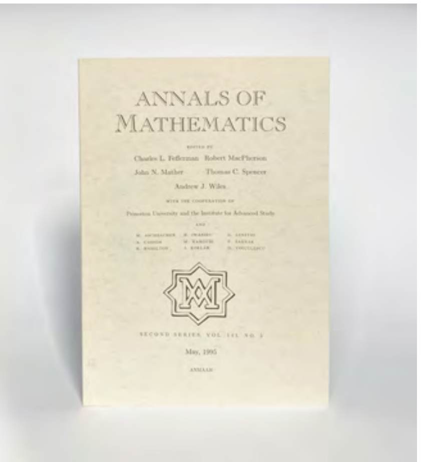
[IN:] *Annals of Mathematics*, Vol. 141, No. 3

Princeton NJ: Princeton University Press, May 1995

Octavo (254 x 178mm); pp. 245–508, Wu *et al*. at pp. 491–505

Single issue in original wraps; fine condition

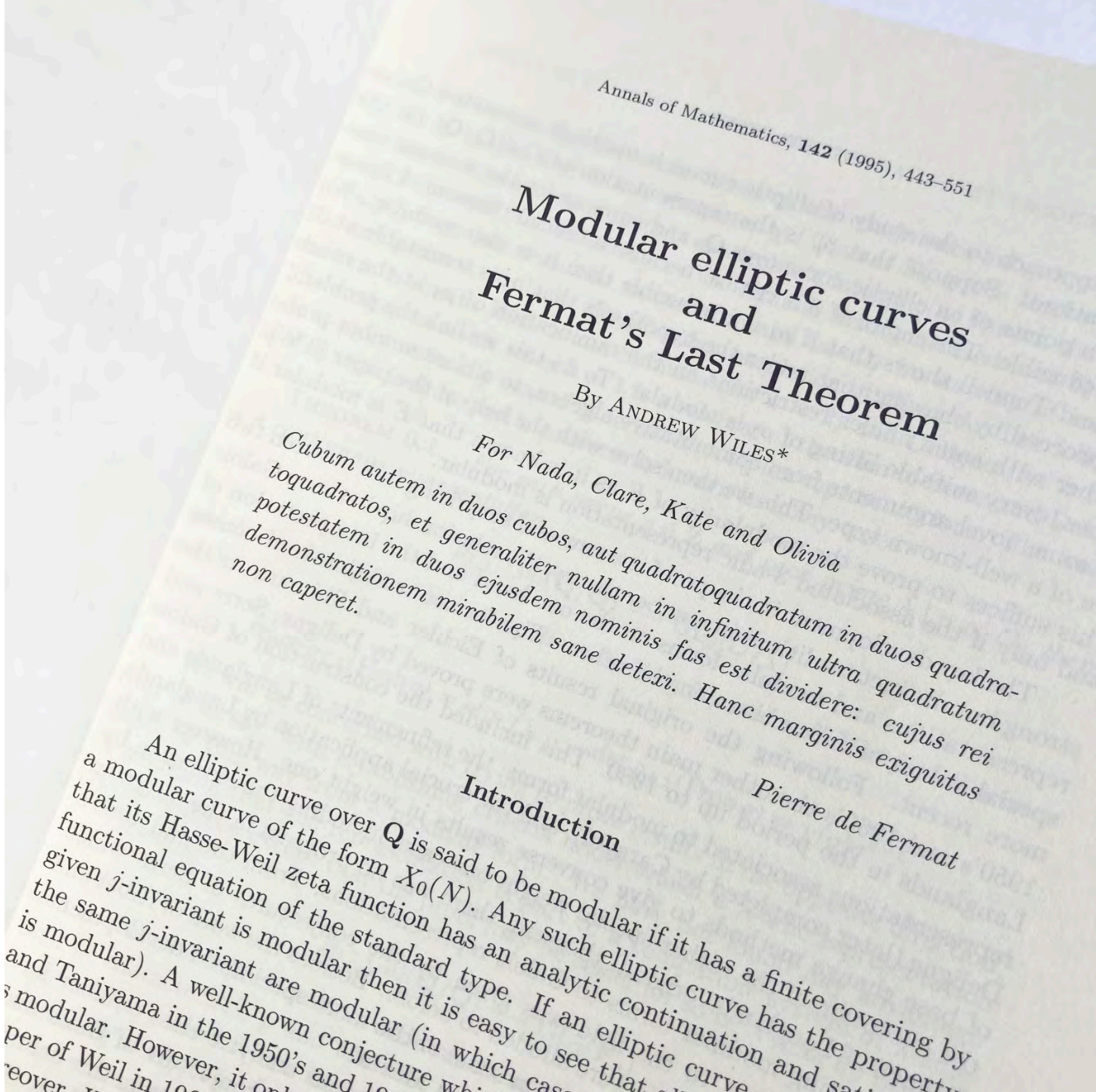
References: Singh, *Fermat's Last Theorem*



One of the most romantic stories in the history of mathematics. On offer is the famous May 1995 issue of *Annals of Mathematics*, given over entirely to Wiles' proof (with a supplementary paper by Wiles with Richard Taylor) of the famous conjecture, written by Pierre de Fermat in 1637 into the margin of his copy of the *Arithmetica* of Diophantus: if n>2, then an+bn=cn has no solutions in nonzero integers a, b, and c. This is such an extraordinary statement because it is related to the Pythagorean theorem: $a^2+b^2=c^3$, which is true of all right triangles, and which has many whole-number solutions – in fact infinitely many.

Fermat tantalisingly wrote 'I have a truly marvellous demonstration of this proposition which this margin is too narrow to contain.' But in fact the apparatus necessarily to prove 'Fermat's Last Theorem' took more than three centuries to create, and required Wiles' brilliance and seven years of his own tireless work. As Simon Singh recounts in his classic popular book on the topic, a host of world-class mathematicians (Euler, Gauss, Galois, Kummer, Germain, Abel…) contributed partial solutions and mathematical tricks that would play a part in Wiles' masterpiece. The personal tale of Wiles' own journey to the proof is if anything more remarkable than the long history of the Theorem and those who have grappled with it.

Wiles worked for many years to complete this work, first prematurely announcing his success in a lecture series in Cambridge in 1993. A mistake in this proof nearly proved fatal to the entire enterprise, but a little over a year later inspiration struck, Wiles proved the so-called 'Taniyama-Shimura Conjecture', and Fermat's Last Theorem in turn fell. This, as the great John Conway put it, was 'the proof of the century'. Singh goes further and calls it 'the world's most important proof'. Wiles list of honours is truly impressive, including prizes specifically for solving Fermat's Last Theorem, a knighthood, the Abel Prize, and the Copley Medal.


Annals of Mathematics, **142** (1995), 443–551

Modular elliptic curves and Fermat's Last Theorem

By Andrew Wiles*

For Nada, Clare, Kate and Olivia

Cubum autem in duos cubos, aut quadratoquadratum in duos quadratoquadratos, et generaliter nullam in infinitum ultra quadratum potestatem in duos ejusdem nominis fas est dividere: cujus rei demonstrationem mirabilem sane detexi. Hanc marginis exiguitas non caperet.

Pierre de Fermat

Introduction

An elliptic curve over **Q** is said to be modular if it has a finite covering by a modular curve of the form $X_0(N)$. Any such elliptic curve has the property that its Hasse-Weil zeta function has an analytic continuation and sat functional equation of the standard type. If an elliptic curve given j-invariant is modular then it is easy to see that al the same j-invariant are modular (in which cas is modular). A well-known conjecture wh and Taniyama in the 1950's and 19 s modular. However, it on per of Weil in 19 reover

34.

WU, Chien-Shiung (1912–1997), *et al.*

'Experimental Test of Parity Conservation in Beta Decay'

[IN:] *Physical Review*, Vol. 105, No. 4

Lancaster PA and New York NY: American Institute of Physics, 15 February 1957

Octavo (267 x 201mm); pp. 245–508, Wu *et al.* at pp. 491–505

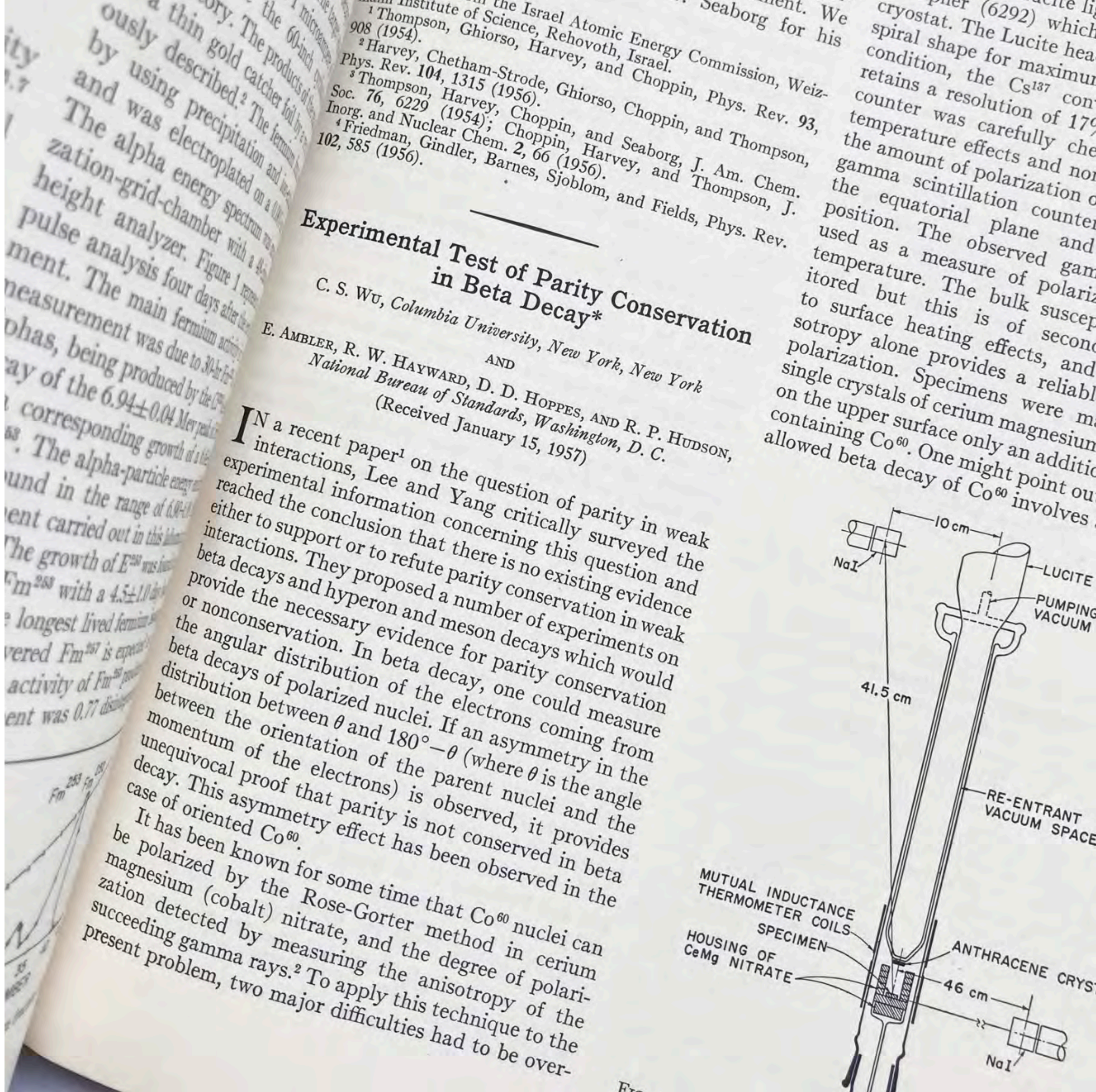
Single issue in original wraps; near fine condition

References: *The Biographical Dictionary of Women in Science*, Vol. 2, pp. 1409–1410; Jiang, *Madame Wu Chien-Shiung: The First Lady of Physics Research*

One of the most important experiments in the history of science. The Wu Parity Experiment, conducted in 1956 by physicist Chien-Shiung Wu and her collaborators, fundamentally changed our understanding of the laws of physics. At the time, it was widely believed that the laws of nature were symmetrical under spatial inversion – a concept known as parity conservation. This assumption implied that the laws governing physical processes should remain unchanged if all spatial coordinates were flipped, like viewing the process in a mirror. However, theoretical work by Tsung-Dao Lee and Chen-Ning Yang questioned this assumption for weak nuclear interactions, suggesting parity might not be conserved in such cases.

To test this, Wu designed a meticulous experiment using the beta decay of cobalt-60 atoms at extremely low temperatures and in the presence of a strong magnetic field to align their nuclear spins. Her team observed that the emitted electrons were preferentially emitted in a direction opposite to the nuclear spin – a clear violation of mirror symmetry. This provided direct, experimental evidence that parity is not conserved in weak interactions, overturning a long-standing principle in physics. The results were so profound that they shook the foundations of quantum mechanics and required revisions to theoretical models of particle interactions.

Chien-Shiung Wu was a trailblazing physicist whose contributions to nuclear and particle physics not only advanced science but also broke significant gender and cultural barriers in the scientific community. Often referred to as the 'First Lady of Physics', Wu's precision, rigour, and ingenuity in experimental design earned her a reputation as one of the most accomplished experimental physicists of the 20th century. Her neglect by the Nobel Prize committee is considered one of the greatest injustices in the history of the prize. In 1978 Wu was awarded the inaugural Wolf Prize, finally granting her recognition for this extraordinary experimental breakthrough.


[1] Thompson, Ghiorso, Harvey, and Choppin, Phys. Rev. 93, 908 (1954).
[2] Harvey, Chetham-Strode, Ghiorso, Choppin, and Thompson, Phys. Rev. 104, 1315 (1956).
[3] Thompson, Harvey, Choppin, and Seaborg, J. Am. Chem. Soc. 76, 6229 (1954); Choppin, Harvey, and Thompson, J. Inorg. and Nuclear Chem. 2, 66 (1956).
[4] Friedman, Gindler, Barnes, Sjoblom, and Fields, Phys. Rev. 102, 585 (1956).

Experimental Test of Parity Conservation in Beta Decay*

C. S. Wu, *Columbia University, New York, New York*

AND

E. Ambler, R. W. Hayward, D. D. Hoppes, and R. P. Hudson, *National Bureau of Standards, Washington, D. C.*

(Received January 15, 1957)

In a recent paper[1] on the question of parity in weak interactions, Lee and Yang critically surveyed the experimental information concerning this question and reached the conclusion that there is no existing evidence either to support or to refute parity conservation in weak interactions. They proposed a number of experiments on beta decays and hyperon and meson decays which would provide the necessary evidence for parity conservation or nonconservation. In beta decay, one could measure the angular distribution of the electrons coming from beta decays of polarized nuclei. If an asymmetry in the distribution between θ and $180°-\theta$ (where θ is the angle between the orientation of the parent nuclei and the momentum of the electrons) is observed, it provides unequivocal proof that parity is not conserved in beta decay. This asymmetry effect has been observed in the case of oriented Co^{60}.

It has been known for some time that Co^{60} nuclei can be polarized by the Rose-Gorter method in cerium magnesium (cobalt) nitrate, and the degree of polarization detected by measuring the anisotropy of the succeeding gamma rays.[2] To apply this technique to the present problem, two major difficulties had to be over-

35.

A VISUAL ATLAS OF CHEMISTRY

YOUMANS, Edward L. (1821–1887)

Chemical Atlas; or, the Chemistry of Familiar Objects: Exhibiting the General Principles of the Science in a Series of Beautifully Colored Diagrams

New York: D. Appleton, 1856

Quarto (304 x 258mm); 13 colour plates

Good condition: endpapers chipped with three discreet repairs; a few pages with some flattened creases; faded ink splashes to two pages of text; rebacked, with some scattered fading to the upper right corner of the front cover

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References: Reese, *Nineteenth Century American Color Plate Books* 82

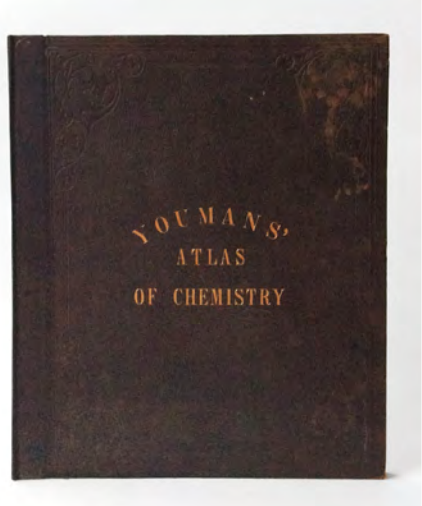
A pioneering work of visual science. Like Byrne's Euclid (see Cat. No. 10), Youmans' *Chemical Atlas* was highly innovative in its use of colour printing to convey information, particularly the use of specific colours to denote different elements (red for oxygen, blue for nitrogen).

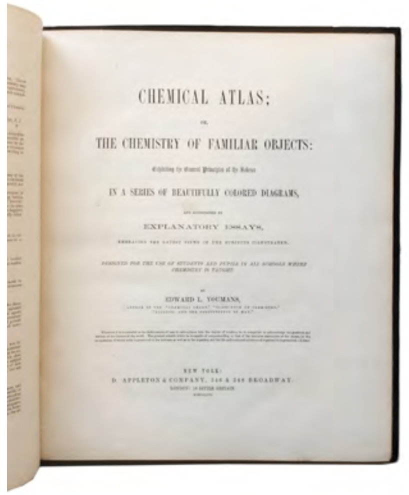
Youmans was a remarkable character: he was largely self-taught, and also only partially sighted, perhaps accounting for the bold visualizations in this book. While barely making a living as a writer, he began creating chemical wall-charts, which form the basis of the *Chemical Atlas* – though no original wall charts are known to have survived.

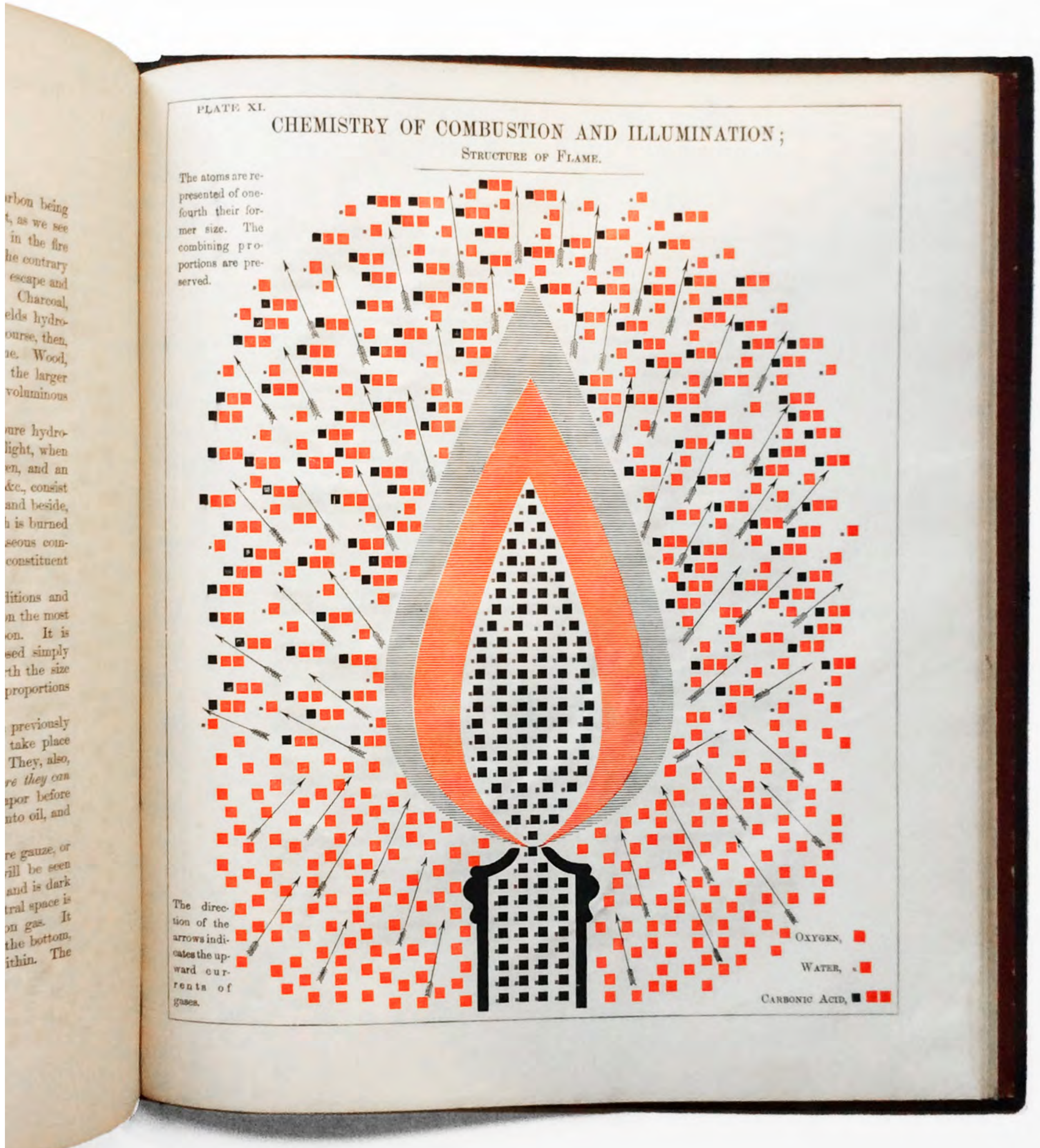
Illustrations in the *Chemical Atlas* show a wide range of phenomena, from the carbon cycle to the variety of theories of chemical reaction in use in this period before the Karlsruhe Congress of 1860.

Most famously, and recalling Faraday's *Chemical History of a Candle*, the process of combustion is shown in a glorious full page illusration.

The book was entered according to Act of Congress, in the year 1854, but we can only locate early printings dated 1855, 1856 (present volume), and 1857. All editions are rare.







36.

THE WAVE THEORY OF LIGHT

YOUNG, Thomas (1773–1829)

A Syllabus of a Course of Lectures on Natural and Experimental Philosophy

London: Press of the Royal Institution, 1802

Octavo (235 x 197mm); pp. [vi], 162, 32; 4 parts in one volume, woodcut text diagrams

Nineteenth-century half calf with cloth sides, green speckled edges, and gilt spine titles. Very good condition: light abrasion to the spine; upper rear corner bumped; top edge age-darkened; minor offsetting to endpapers, but otherwise internally fine

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Provenance: Northern Lighthouse Board gilt stamp at head of spine

References: cf. PMM 259; Einstein, foreword to Newton's *Opticks*, 4th edition; Hudson Gurney, *Memoir of the life of Thomas Young*; J. D. Mollon, 'The Origins of the Concept of Interference'

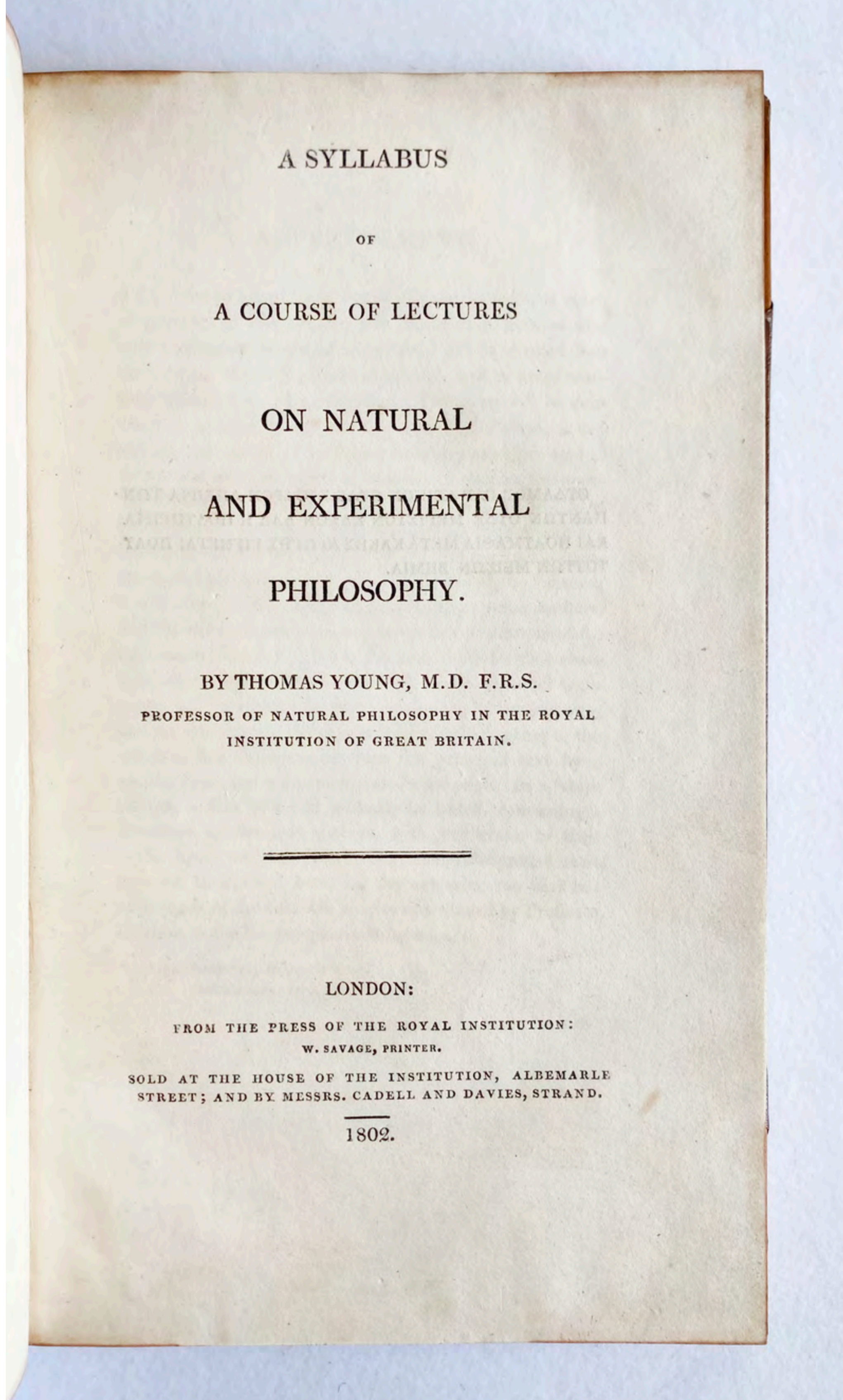
The first printing of Thomas Young's 'general law' of interference: the modern form of the wave theory of light. Contained in Young's remarkable *Course of Lectures*, delivered at the Royal Institution, covering the entire field of natural philosophy:

> the general law, by which all these appearances are governed, may be very easily deduced from the interference of two coincident undulations, which either cooperate, or destroy each other, in the same manner as two musical notes produce an alternate intension and remission, in the beating of an imperfect unison (p. 117)

Einstein called this 'the next great theoretical advance' in our understanding of the nature of light after Newton's *Opticks*. At a single stroke, Young had transformed the wave theory from a controversial alternative to the Newtonian 'corpuscular' theory to an experimentally verified reality. An idea as old as the work of Christian Huyghens and Robert Hooke was now set on firm empirical foundations, to be carried on in the coming decades by Fresnel, Poisson, Maxwell and, ultimately, Einstein himself.

Young's *experimentum crucis* was his famous double-slit experiment of 1801: a disarmingly simple way of showing the amplification or cancelling of light 'waves' – an analogy Young and others had taken from the motion of water and the scientific study of sound. At the end of 1801 Young gave his celebrated Bakerian Lecture 'On the Theory of Light and Colours' to the Royal Society, and at the same time prepared the text of his *Course of Lectures* to the Royal Institution. The *Course of Lectures* (January 1802) precedes the publication of the 'On the Theory of Light and Colours' (spring 1802) and is therefore the debut of Young's theory.

Young (1773–1829) was a celebrated polymath: 'the last of the natural philosophers who could know all that was to be known' (PMM 259, note). He studied medicine at London, Edinburgh, Göttingen and Cambridge, before becoming a colleague of Humphry Davy's at the Royal Institution. In addition to his work on optics, Young made major contributions to physiology and medicine, the theory of music, linguistics and the study of Egyptian hieroglyphs. Notably he was the first to give a full translation of the Rosetta Stone.



A SYLLABUS

OF

A COURSE OF LECTURES

ON NATURAL

AND EXPERIMENTAL

PHILOSOPHY.

BY THOMAS YOUNG, M.D. F.R.S.

PROFESSOR OF NATURAL PHILOSOPHY IN THE ROYAL INSTITUTION OF GREAT BRITAIN.

LONDON:

FROM THE PRESS OF THE ROYAL INSTITUTION:

W. SAVAGE, PRINTER.

SOLD AT THE HOUSE OF THE INSTITUTION, ALBEMARLE STREET; AND BY MESSRS. CADELL AND DAVIES, STRAND.

1802.

BORIS JARDINE RARE BOOKS

Boris Jardine Rare Books was founded in January 2024. Boris has particular expertise in scientific instruments, and the history of technology – especially computing. He is also Director of the antique science and technology marketplace Fleaglass.com.

Boris Jardine Rare Books specialises in science and technology – but also offers fine first editions, archives and ephemera, and documents of avant-garde art and poetry.

JULIAN WILSON RARE BOOKS

Julian Wilson began his career in the book trade at Maggs Bros Ltd in 1997. In 2008, Julian joined Christie's as a Specialist, rising to Associate Director and Senior Specialist, where he catalogued and sold significant works in natural history, science, and travel, and helped pioneer markets for technological artefacts like Apple-1 computers and Enigma machines. In January 2025, Julian left the auction world to establish his own independent dealership.

EXHIBITING AT

PBFA London Rare & Antiquarian Book Fair 2025

Saturday 17th May – 1.00 pm to 7.00pm
Sunday 18th May – 10.00 am to 4.00pm

ILEC Conference Centre
IBIS London Earls Court
47 Lillie Road
London SW6 1UD

EXHIBITING AT

London Map Fair 2025

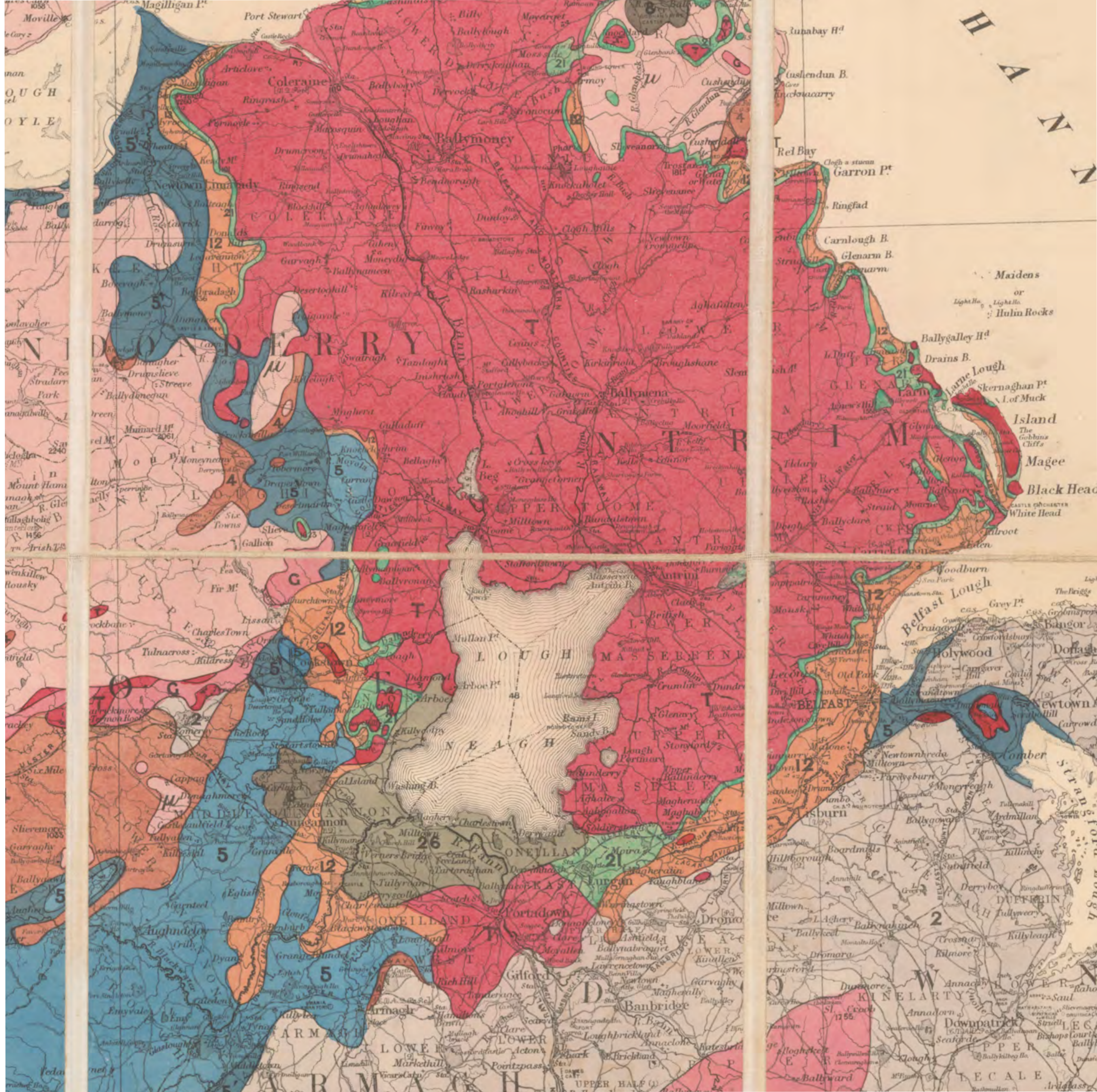
Saturday 7th June – 12.00 pm to 7.00 pm
Sunday 8th June – 10.00 am to 6.00 pm

Royal Geographical Society
1 Kensington Gore
(Entrance Exhibition Road)
London SW7 2AR

Printed by Blue Chip Printing® Limited
bluechipprinting.co.uk

Designed by Boris Jardine, set in Akzidenz Grotesk
and Adobe Caslon Pro

Photography by Boris Jardine
Additional Photography: antiquarianphotographer.com




Mt. Ararat
Land of Nod
Enoch
EDEN
ETHIOPIA
HAVILAH
CUSH