JEAN-ÉTIENNE MONTUCLA (September 5, 1725 – December 18, 1799)

by HEINZ KLAUS STRICK, Germany

The story of ARCHIMEDES' death, which stemmed from his refusal to be disturbed while working on a mathematical problem, so impressed the then 13-year-old SOPHIE GERMAIN that she decided to become a mathematician. The book in which she read this story was JEAN-ÉTIENNE MONTUCLA's *Histoire des mathématiques* – published in the year 1758.

That MONTUCLA would one day write the first comprehensive history of mathematics could not be foreseen in his youth. MONTUCLA's father was a merchant in Lyon, and it can be assumed that he planned to hand the business over to his son in due course.

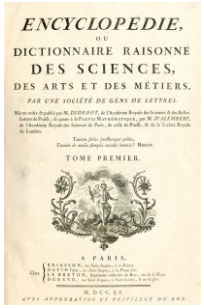
Nevertheless, he initially provided him with the best school education possible in Lyon: The boy was allowed to attend the local Jesuit *Collège de la Trinité*, whose reputation extended far beyond the region.

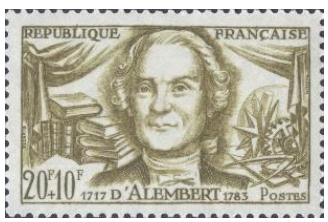
JEAN-ÉTIENNE was taught classical languages at the college. Thanks to his exceptional linguistic talent, he later found it easy to learn other languages. It is said that he had a solid command of Italian, English, Dutch, and German.

PÈRE LAURENT BÉRAUD's teaching in mathematics and astronomy (at the school's own observatory) was outstanding, a fact gratefully confirmed by students of subsequent years, including the engineer and author of the mathematical articles in the *Encyclopédie,* CHARLES BOSSUT (1730-1814), and the astronomer JOSEPH JÉRÔME LEFRANÇOIS DE LALANDE (1732-1807).

JEAN-ÉTIENNE was still a schoolboy when his father died and he came into the care of his grandmother. When she also died in 1745, the 20-year-old MONTUCLA moved to Toulouse to study law (which was not possible in Lyon) and then on to Paris to complete his studies. There he was a regular attendee of the scholarly soirées of the bookseller CHARLES ANTOINE JOMBERT, who would later become the publisher of his books.

At these meetings, MONTUCLA also met and befriended DENIS DIDEROT and JEAN BAPTISTE LE ROND D'ALEMBERT. These two scholars had begun publishing the *Encyclopédie in 1751* (Subtitle: *Dictionnaire raisonné des sciences, des arts et des métiers* – literally: Comprehensive Dictionary of Sciences, Arts and Professions). By 1780, 35 volumes had been published with a total of over 70,000 articles.





MONTUCLA himself wrote articles for the *Gazette de France*, a journal of literature and science. It is unknown when he first became involved with the history of mathematics.

However, JOMBERT had already received the *Privilège du roi* for such a work in 1754 and received permission to print, with a simultaneous prohibition of reprinting by other publishers for a period of nine years. However, it took another four years before MONTUCLA's main work, *Histoire des mathématiques,* was published.

However, it was not only the abundance of material that had to be reviewed and organised for this work that was the problem. Rather, there were two other publications on which MONTUCLA was working. In 1754 the book *Histoire des recherches sur la quadrature du cercle* (History of Research on Squaring the Circle) was published anonymously, and in 1756 a collection of documents on the advantages of smallpox vaccination (together with the physician PIERRE JOSEPH MORISOT-DESLANDES).

Already in his book on squaring the circle, with an appendix on angle trisection and cube doubling (subtitle: *Uvrage propre à instruire des découvertes réelles faites sur ce problême célèbre, et servir de preservatif contre de nouveaux efforts pour le resoudre* – a work intended to teach the actual knowledge of this famous problem and to act as a warning against new attempts to solve it), MONTUCLA demonstrates his extensive historical knowledge and professional competence. On over 300 quarto pages, he deals with the numerous unsuccessful attempts made over the centuries to solve the problem, including those by people "without the slightest knowledge of geometry or the necessary methods". He also laments the stubbornness of those "*quadrateurs"* who, although they understood something about geometry, "got lost in a labyrinth of fallacies" without the insight that they had made mistakes.

His conclusion*: Les Géomètres admettent aujourd'hui d'une commune voix que la quadrature … du cercle est impossible* (Mathematicians today agree that squaring the circle is impossible).

He acknowledges ARCHIMEDES' achievement in determining the ratio of the circumference of a circle to its diameter with such accuracy that the interval ($3\frac{1}{7} < \pi < 3\frac{10}{71}$) is smaller than $\frac{1}{497}$. This value had only been improved in the preceding century.

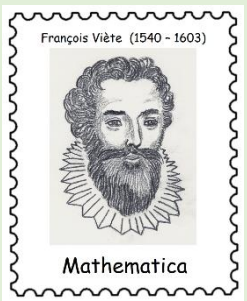
MONTUCLA also describes various approximation constructions and points to methods for determining the number π by infinite sums or products (FRANÇOIS VIÈTE, JOHN WALLIS, JAMES GREGORY, GOTTFRIED WILHELM LEIBNIZ, WILLIAM BROUNCKER), but also clarifies that these ingenious methods have nothing to do with a *construction* that is actually being sought.

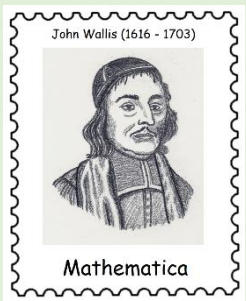
VIÈTE: $\frac{2}{\pi} = \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{2+\sqrt{2}}}{2} \cdot \frac{\sqrt{2+\sqrt{2+\sqrt{2}}}}{2} \cdot \ldots$

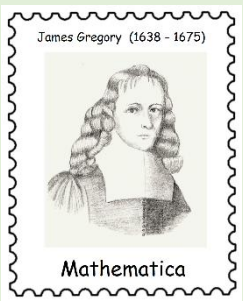
WALLIS: $\frac{\pi}{2} = \frac{2 \cdot 2}{1 \cdot 3} \cdot \frac{4 \cdot 4}{3 \cdot 5} \cdot \frac{6 \cdot 6}{5 \cdot 7} \cdot \frac{8 \cdot 8}{7 \cdot 9} \cdot \ldots$

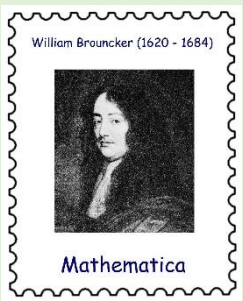
GREGORY-LEIBNIZ: $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \ldots$

BROUNCKER: $\frac{4}{\pi} = 1 + \cfrac{1^2}{2 + \cfrac{3^2}{2 + \cfrac{5^2}{2 + \cfrac{7^2}{2 + \ldots}}}}$

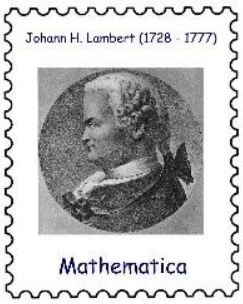








MONTUCLA's work on the history of squaring the circle was quickly recognised, though not by the *Académie des Sciences*, but by the *Royal Academy of Berlin*, which appointed MONTUCLA a member as early as 1755.



Despite MONTUCLA's warning that it was pointless to continue investigating the squaring of the circle, the *Académie* continued to receive proposals for alleged solutions. After JOHANN HEINRICH LAMBERT proved in 1767 that π is an *irrational* number, the *Académie* announced that it would no longer consider any submissions on the subject (nor on cube doubling and angle trisection, nor on *perpetual motion*).

The promised *Histoire des mathématiques* was published in 1758 in two volumes, covering the period from antiquity to 1700 – a work entirely in the spirit of the Enlightenment: mathematics as a product of human reason. It is the first comprehensive attempt to systematically present the history of mathematics. However, due to the limited source material, it contains gaps and – *from today's perspective* – some misplaced emphasis. Much is viewed from an overly Eurocentric perspective, and the importance of individual figures is overstated.

The first volume is divided into three chapters: *History of mathematics from the beginning to the end of the Byzantine Empire* (336 pages), *Mathematics among the peoples of the Orient: Arabs, Persians, Jews, Chinese, Indians* (67 pages) and *Mathematics in the West up to the beginning of the 17th century* (233 pages).

The second volume addresses developments in mathematics in three of its nine chapters; the remaining chapters deal with areas that were traditionally considered subfields of mathematics at that time.

I.	Geometry and classical mathematics (including SNELLIUS, NAPIER, KEPLER, GULDIN, CAVALIERI, ROBERVAL, PASCAL)
II.	Cartesian geometry and analysis (including HARRIOT, WALLIS, GIRARD, DESCARTES, FERMAT, ROBERVAL, VAN SCHOOTEN, HUDDE, HUYGENS)
III.	Optics (including KEPLER, SNELLIUS, DESCARTES, FERMAT)
IV.	Astronomy (KEPLER, GALILEO, SCHEINER, RICCIOLI)
V.	Mechanics (STEVIN, GALILEI, GASSENDI, TORRICELLI, DESCARTES, PASCAL)
VI.	Advances in geometry and analysis (including WALLIS, BROUNCKER, BARROW, NEWTON, GREGORY, LEIBNIZ, JACOB BERNOULLI, DE L'HÔPITAL, VARIGNON)
VII.	Mechanics (WALLIS, HUYGENS, ROBERVAL, NEWTON, including the treatment of clocks and special curves such as brachistochrone, catenary, cycloid)
VIII.	Astronomy (including HUYGENS, CASSINI, RÖMER, HOOKE, WREN, FLAMSTEED, HALLEY, NEWTON , founding of the *Royal Society* and the *Académie des Sciences*, construction of the observatories in Paris and Greenwich)
IX.	Optics (including GREGORY, BARROW, NEWTON, HALLEY)

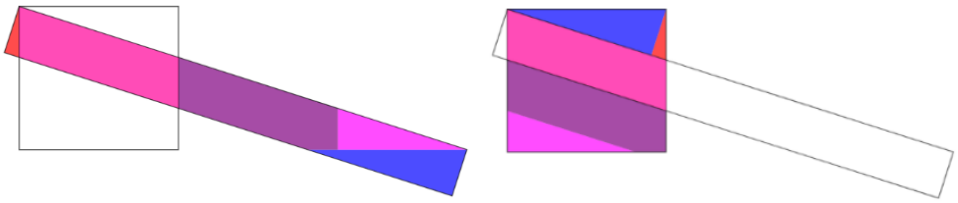
Due to the positive response, MONTUCLA began researching for a third volume, which would deal with developments in the period after 1700.

In 1761 he interrupted this work when the government offered him the position of secretary to the administrator of the Dauphiné, the province in southeastern France (capital: Grenoble).

Here he met MARIE FRANÇOISE ROMAND, whom he married in 1763. A daughter and a son were born to them.

His stay in Grenoble was short-lived: the following year he was ordered to participate in an expedition to South America, officially as *Royal Astronomer.* In reality, however, the undertaking aimed to expand the territory of the French colony of Guiana in South America – as compensation for the loss of French possessions in North America (in the peace treaty following the Seven Years' War). MONTUCLA's task was to create the most accurate map possible of the region using astronomical measurements. Thousands of farmers from Lorraine and Alsace had been recruited to settle in the area around present-day Cayenne, but the experiment ended in disaster due to the harsh climate and unsanitary conditions – only one-fifth of the new settlers survived.

After 15 months, MONTUCLA returned to France; but instead of the hoped-for professorship, he was only offered a position as administrator of the royal buildings in Versailles and as royal censor of mathematical writings.



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In 1778, he published the expanded four-volume edition of JACQUES OZANAM's 1694 *Récréations mathématiques et physiques*, which in turn was based on CLAUDE GASPAR BACHET's *Problèmes plaisants et délectables qui se font par les nombres*. Curiously, his own work was submitted to him for approval as censor, since his name was not mentioned in the imprint. These volumes popularised geometric dissections (*see* illustration above).

Thanks to his government positions, MONTUCLA had a regular income, but this ceased in 1789 with the outbreak of the French Revolution. The 69-year-old retired and resumed his research on the history of mathematics. Due to health reasons, he could not accept a position as a mathematics teacher that had been offered to him. Friends secured him a temporary job at the Ministry of Foreign Affairs, which, however, was insufficient to support himself, and so he also worked at a lottery agency. In 1796, he was rehabilitated, received a state pension, and was finally admitted to the *Académie des Sciences*.

In August 1799, the revised and expanded Volumes I and II of his *Histoire* were published. When he died in December of that year, Volume III (Mathematics, Optics, and Mechanics in the 18th Century) was already partially printed. His friend LALANDE took care of the corrections to the remaining pages, and SYLVESTRE LACROIX added the latest findings on the integration of partial differential equations. In 1802, LALANDE WAS also able to publish Volume IV (Mathematical Methods in Astronomy, Geography, and Navigation), and even the discovery of the asteroid Ceres by GIUSEPPE PIAZZI in 1801 could be included in the volume.

And it took a whole century until MONTUCLA 's Histoire was superseded by MORITZ CANTOR's *Lectures on the history of mathematics*.

In memory of MONTUCLA, the International Commission for the History of Mathematics awards the MONTUCLA Prize every four years to a young author whose article is published in the journal *Historia Mathematica.*

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