# Mathematics in the Historical Collections of École Polytechnique
## Part I

Frédéric Brechenmacher (École Polytechnique, Palaiseau, France)

A product of the French Revolution and the Age of Enlightenment, École Polytechnique has a rich history that spans over 220 years.[1] The École Polytechnique library was created, along with the school, in 1794 [Thooris, 1999]. Issued from revolutionary deposits, collections have been enriched through regular acquisitions and outstanding contributions. Since its creation, the library has been encyclopaedic, with a very strong dominance in the basic sciences. Its historic, scientific and artistic collections form a rich heritage ensemble.

This diverse ensemble, preserved within the library by its Historical Resources Centre[2] offers the possibility of consulting archives, ancient instruments, successive editions of scientific works and any form of iconography relating to the polytechnique or its students. The Historical Resource Centre also offers online resources (databases, digitalisations, a virtual museum and exhibitions)[3] and organises events throughout the year, including exhibitions, colloquia and loans of objects.

École Polytechnique has recently given birth to a museum, the mus'x, which unveils to the public a large selection of the collections.[4] A full interpretative offering is set up around these works; this includes not only visitor circuits punctuated with multimedia devices but also workshops, lectures and film screenings. The mus'x also offers seasonal exhibitions; for 2018, the inaugural exhibition is devoted to the mathematician Gaspard Monge.

The patrimonial collections of École Polytechnique offer a unique testimony to the evolution of interactions between science and society. They consist of collections of scientific instruments (measurement, hydrostatics, heat, electricity, acoustics, optics and chemistry), archives (institutional archives of the school, as well as collections transferred by individuals documenting scientific developments, techniques, education, economics, military, business, politics, etc.), as well as iconographic collections (paintings, drawings, engravings and photographs) and museography (sculptures, medals, furniture, etc.) and an historical library of works published from the 15th century onwards. These collections are therefore far from being limited to mathematics; they actually provide crucial historical resources for investigating the intertwined developments of mathematics, science, technology, pedagogy, economy, industry and politics. The patrimonial collections of Ecole Polytechnique are organised into three main section:

**Gaspard Monge by Alexandre Colin, Paris, 1863. © Collections École polytechnique.**

- The reserve of ancient books, which is encyclopaedic but with a dominance of scientific books.
- The diverse but coherent museum collection: scientific objects, medals, busts, uniforms, iconography, etc.
- The historical, administrative and scientific archives of École Polytechnique.

This article is divided into two parts. In this part, we shall first discuss the role of mathematics in the reserve of ancient books and in the museum collection, while a second paper, to be published in the next issue of the EMS Newsletter, will be devoted to the archives of École Polytechnique.

### The reserve of ancient books

The reserve of ancient books contains about 17,000 volumes dating from 1456 to 1850. The historical collections of École Polytechnique were created alongside the school itself. In 1793, the war that set revolutionary France in opposition to a coalition of European nations disorganised the schools of instruction and teaching.[5] In 1794, Jacques-Élie Lamblardie, Director of the École des Ponts et Chaussées, who lost a great number of his pupils,

[1] For the history of École polytechnique, see [Belhoste, 2003] and [Belhoste et al., 1994].

[2] The mission of the Historical Resource Center is the preservation and enhancement of the archives, the historical library and the heritage of the School. See https://www.polytechnique.edu/bibliotheque/en/historicalresource-center.

[3] The École Polytechnique heritage numerical portal presents a selection of the historical collections, as well as studies and works developed by students in the course of teaching the history of science or technology (https://www.polytechnique.edu/bibliotheque/en/heritage-portal). For accessing the (large) section of the collections that has been inventoried, see the database: https://bibli-aleph.polytechnique.fr.

[4] See https://www.polytechnique.edu/bibliotheque/fr/le-musx-un-musée-à-lécole-polytechnique.

[5] Among other references, see [Dhombres and Dhombres, 1989], [Gillispie, 2004].

thought of creating a preparatory school for bridges and roads, and then for all engineers. Gaspard Monge, a former professor at the School of Military Engineering at Mezieres, was enthusiastic about this idea and convinced several members of the Comité de Salut Public (French Public Welfare Committee) and the Convention. Under the support of people such as the chemist François Fourcroy, a decree of 11 March 1794 created the Central School of Public Works, which would be renamed École Polytechnique one year later, on 1 September 1795. Its mission was to provide its students with a well-rounded scientific education with a strong emphasis in mathematics, physics and chemistry, and to prepare them upon graduation to enter the national institutes of public works, such as École d'Application de l'Artillerie et du Génie (School of Artillery and Engineering Applications), École des Mines and École Nationale des Ponts et Chaussées (National School of Bridges and Roadways). The Comité de Salut Public entrusted Monge, Lazare Carnot and several other scholars with enlisting, by means of a competitive recruitment process, the best minds of their era and teaching them science for the benefit of the French Republic.

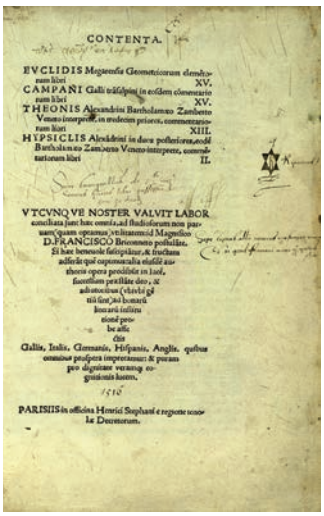
**Mathematics in the reserve of ancient books. © Collections École polytechnique.**

The content of the first plan of instruction was elaborated by Monge on two axes: the mathematics and the physics acquired by experiment in laboratories. This plan required both a library and a collection of scientific instruments. Both were initially constituted from property seizures that had been taken under the exigencies of revolution in three waves from 1789 to 1793, especially from private library collections of the aristocracy and clergy.

The property seizures started in 1789 when all the possessions of monastic communities were "put at the disposal of the Nation". As a result, the École Polytechnique library acquired in 1794 Vatani Florimondo Puteano's Latin edition of Euclid's *Elements*, printed in Paris in 1612 and belonging to the Collège of Bernardins, a Cistercian college founded in the 13th century that had served until the French Revolution as the residence for Cistercian monks and students at the University of Paris. It also acquired an earlier Latin edition of the *Elements* by Campanus of Novara, dating from 1537 and seized from the English Jesuit College at Leyden, as well as a first edition of François Viete's *Opera mathematica*, edited by Frans van Schooten in Leiden in 1646 and belonging to the English Jesuit College at Liège.

In 1792, a second wave of seizures confiscated the possessions of individuals, both laymen and clerics, who had left France as "emigrés" or "déportés". Amongst other volumes, Polytechnique's library acquired a first edition of Thomas Fincke's 1583 *Geometria rotundi* and

**Euclidis, *Elementorum geometricorum lib. XV, cum expositione Theonis in priore XIII a Bartholomaeo [Zamberto], Veneto, latinitate donata, Campani in omnes,…*, Basileae : apud Johannem Hervagium, 1537. © Collections École polytechnique.**




**The 1516 edition of Euclid's *Elements* by the French humanist Jacques Lefèvre d'Étaples (also known as Jacobus Faber). © Collections École polytechnique.**

Luca Valerio's 1606 edition of Archimedes' *Quadrature of the Parabola*, both gorgeously bound with the arms of Jacques Auguste de Thou, later belonging to the Earl Étienne Bourgevin Vialart de Saint Maurice who emigrated during the Revolution.

**The white vellum gilded bounding of Fincke's 1583 *Geometria rotundi*, with the arms of Jacques Auguste de Thou. © Collections École polytechnique**

**The citrus veal gilded bounding of a 1606 edition of Archimedes' *Quadrature of the Parabola*, with the arms of Jacques Auguste de Thou and of his second wife Gasparde de La Chastre. © Collections École polytechnique.**

The third wave of property seizures in 1793 targeted the possessions of the abolished royal institutions, such as universities, academies and corporations. The École Polytechnique library acquired about 500 volumes from École Royale du Génie de Mézières, a royal military engineering school that was suppressed in 1794 but nevertheless played a model role for the plan of instruction of the new École Polytechnique, established by Monge, a former professor of the Mézière school.

These various waves of seizures eventually resulted in the creation of the first library of École Polytechnique,

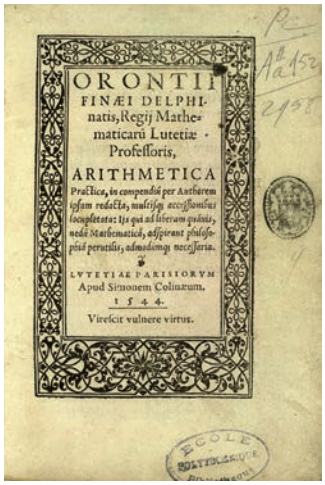
with 564 volumes, including 76 books of mathematics.[6] The first book mentioned in the very first inventory is Leonhard Euler's 1768 *Institutiones calculi differentialis*. The second catalogue, established in 1799, amounted to 7555 volumes dating from the 15th century to the 18th century, including five incunabla printed during the earliest period of typographic printing in Europe, as well as a collection of periodical journals from the 17th and 18th centuries, among them the complete collections of the *Philosophical transactions of the London Royal Society* and the *Mémoires de l'Académie des Sciences* since their creation in 1664 and 1677 respectively. The first librarian was Pierre Jacotot, a physicist, assisted by François Peyrard, a professor of mathematics, who is especially remembered for his translations and commentaries of Euclid and Archimedes.[7]

This encyclopaedic collection covers all fields of knowledge in the sciences, the humanities and the arts. Its selection of mathematical volumes is therefore a testimony to a place attributed to mathematics in a classical culture rooted in the heritage of Greek antiquity and Renaissance humanism. The collection especially contains a great number of ancient editions of classical Greek works in which philosophy, poetry, dramaturgy and history sit alongside several Latin and French editions of Euclid's *Elements*, as well as works of Archimedes, Appolonius and Pappus ranging from the 16th century to the 18th century.


**Christopher Clavius' edition of the 15th book of Euclid's *Elements*, printed in Cologne in 1591. © Collections École polytechnique.**

The collections from the Renaissance contain the first 1543 edition of Copernicus' *De revolutionibus*, accompanied by the contemporary 1541 edition of Ptolemy's *Opera omnia*, along with first editions of several works that have played a key role in the development of algebra in Italy and in Europe: Luca Pacioli's *Divina proportione*, printed in Venice in 1509 with engravings of polyhedra by Leonardo da Vinci, Girolamo Cardano's *Opera omnia*, printed in 1663, Niccolo Fontana Tartaglia's 1556 *General trattato di numeri e misure*, Raphaël Bombelli's 1579 *Algebra opera*, Petrus Ramus' 1569 *arithmeticae*, Jacques Peletier's 1578 *Arithmeticae praticae*, Guillaume Gosselin's 1578 *L'arithmétique de Nicolas Tartaglia Brescia*, Christophorus Clavius' 1608 *Algebra*, and several works on arithmetic and geometry published from 1556 to 1585 by Orontius Finaeus, the first professor of mathematics of the Collège Royal (which would become the Collège de France) and one of the originators of Renaissance mathematics in France. These mathematical publications are part of a more general collection of works from Renaissance humanism, including treatises on religion, grammar, rhetoric, poetry, history, moral philosophy and the arts. Publications on the art of engineering include several treatises on mathematics, such as Jacob Köbel's 1551 *Astrolabii* or Jacques Besson's 1594 *Théâtre des instrumens mathématiques & méchaniques*. Historical treatises include works on the history of mathematics, such as Pierio Valeriano's 1556 investigation on the representation and symbolism of numbers in Ancient Egypt and Johannes Meursius' 1598 *De vita Pythagorae*.


**Orontius Finaeus, *Quadrans astrolabicus, omnibus Europae regionibus inserviens…*, Parisiis: apud S. Colinaeum, 1534. © Collections École polytechnique.**



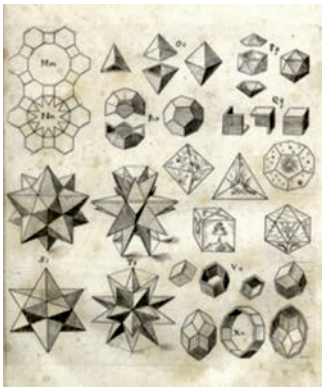

**Orontius Finaeus, *Arithmetica practica, libris quatuor absoluta… Ex novissima authoris recognitione… emendatior facta. Aeditio tertia*, Parisiis: ex officina Simonis Colinae, 1542. © Collections École polytechnique.**

The collection of books published in the 17th and 18th centuries presents quite a comprehensive panorama of the evolution of mathematics and especially the emergence of calculus, with first editions of the works of Joannes Kepler, Galileo Galilei, François Viète, William Oughtred, Pierre de Fermat, René Descartes, Marin Mersenne, Blaise Pascal, Frans van Schooten, John Neper, Christiaan Huygens, Guillaume de L'Hospital, Isaac Newton, Gottfried Wilhelm Leibniz, Johann Bernoulli, Leonhard Euler, Jean-Étienne Montucla, Étienne Bézout, Joseph-Louis Lagrange, Nicolas de Condorcet and Gaspard Monge. This collection also includes books devoted to what would nowadays be designated "applied mathematics", such as the Jesuit Georges Fournier's 1667 hydrographical investigations into practical and theoretical navigation, Nicolas Bion's 1752 treatise on the mathematical instruments used for navigation, artillery, fortifications, etc., as well as various tables of logarithms, such as the ones published by John Neper and Henry Briggs in 1628, and the decimal tables of logarithms published in the context of the definition of the metric system in 1800

[6] The inventory of the first collection of the École polytechnique library was established by Pierre Jacotot on 19 january 1795 (30 nivôse AN III), see [Rochas d'Aiglun, 1890].

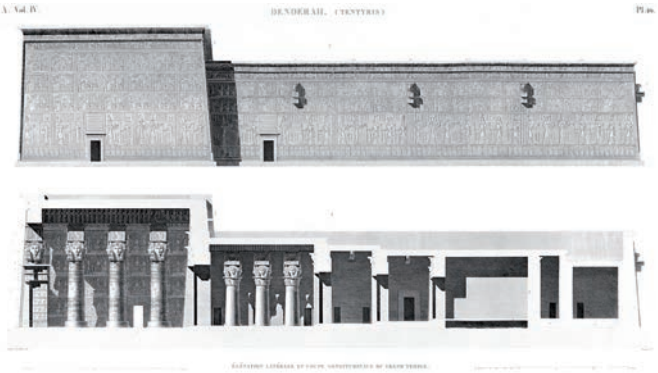
[7] For information on the works of Peyrard at the Polytechnique library, see [Langins, 1989].

by Jean-Charles Borda, Gaspard Prony, Joseph-Louis Lagrange, Pierre-Simon Laplace and Joseph Delambre.



**Joannis Keppleri, *Harmonices mundi*, libri V, Lincii Austriae: sumptibus Godofredi Tampachii, 1619. © Collections École polytechnique.**

From 1795 to 1802, about 10,000 new volumes were selected in the revolutionary deposits that had been constituted through the property seizures. The library collections also benefited from Napoléon's military campaigns. During the Italian campaigns of the French Revolutionary Wars, Monge was sent to Rome in 1798 and returned to France with about 100 books on architecture, including an edition of Vitruve printed in 1511 with a superb green leather binding made for Thomas Mahieu, a counsellor of Catherine de Médicis.



**Lateral elevation and longitudinal cut of the great temple of Denderah by Édouard de Villiers du Terrage, an early student of École polytechnique in 1794. © Collections École polytechnique.**

The French Campaign in Egypt and Syria (1798–1801) included an enormous contingent of scientists and scholars ("savants") assigned to the invading French force (167 in total). These scholars included several founding members of École Polytechnique such as Monge and the chemist Claude Louis Berthollet, as well as professors of the school, such as the mathematician Joseph Fourier, and many early students, such as the mathematician Étienne Malus and Pierre-François-Xavier Bouchard, who discovered the Rosetta Stone in July 1799. They founded the Institut d'Égypte with the aim of propagating Enlightenment values in Egypt through interdisciplinary work. The young polytechnicians applied Monge's descriptive geometry for establishing fortifications in Cairo, mapping the cartography of Egypt and describing the monuments of Ancient Egypt, which gave rise to a fascination of Ancient Egyptian culture in Europe and the birth of Egyptology. In addition to the many sections and elevations of ancient monuments the polytechnicians produced, François Edme Jomard established a correspondence between the various ancient measurement system and the new metric system. Even though many of the antiquities collected by the French in Egypt were seized by the British Navy and ended up in the British Museum, the scholars' research in Egypt gave rise to the monumental *Description de l'Égypte*, published on Napoleon's orders between 1809 and 1821. The first volumes were given by Napoléon himself to École Polytechnique in 1815.

**Napoléon donating the *Description de l'Égypte* to École polytechnique in 1815. Drawn and engraved by Peronard. © Collections École polytechnique.**

At the beginning of the First French Empire in 1804, Napoleon Bonaparte had granted École Polytechnique its military status and had also given the school its motto: "Pour la Patrie, les Sciences et la Gloire" (For the Nation, for Sciences and for Glory). The school was relocated from Palais Bourbon to the site of the former College of Navarre on Mount Sainte-Geneviève in Paris, providing enough space for the students to be housed on campus.

During the Bourbon restoration, the Duke of Angoulême became the protector of the school (from September 1816). Thanks to the friendship between the duke and Ambroise Fourcy (the director of the library from 1818 to 1842), École Polytechnique received a great many donations, including rare maps and medals edited by the Monnaie de Paris, as well as precious bindings for the library's ancient books and for the publication of the school's lectures, decorated with the arms of École Polytechnique.[8]

**The front gate of École polytechnique on Mount Sainte-Geneviève: the encyclopaedic vocation of the school is represented on the right with the symbols of geometry, mechanics, navigation, cartography, astronomy, the humanities, the arts, etc. The mathematician Joseph-Louis Lagrange is represented on the first medallion in the top right corner.**

## The museum collection

This collection has the same origin as the reserve of ancient books.[9] The creation of the school in 1794 was marked by strong ideals that had developed during the Enlightenment on the role that the teaching of science should play in education. Mathematics was placed at the core of the instruction programme of École Polytechnique because it was considered to provide results

[8] See [Thooris, 1997] and [Thooris, 2006].
[9] For the history of this collection, see [Thooris, 1997].



CHAPITRE XII.

*Des Séries récurrentes.*

§ 1.er *Considérations générales sur les Séries récurrentes.*

Une série

(1) $a_0, a_1 x, a_2 x^2, \ldots\ldots a_n x^n, \&c.\ldots,$

ordonnée suivant les puissances ascendantes et entières de la variable $x$, est appelée *récurrente*, lorsque dans cette série, considérée à partir d'un terme donné, le coefficient d'une puissance quelconque de la variable s'exprime en fonction linéaire des coefficiens des puissances inférieures pris en nombre fixe; en sorte qu'il suffise de *recourir* aux valeurs de ces derniers coefficiens pour en déduire celui que l'on cherche. Ainsi, par exemple, la série

(2) $1, 2x, 3x^2, \ldots\ldots (n+1)x^n, \&c.\ldots$

est récurrente, attendu que, si l'on fait

$$a_n = n + 1,$$

on aura constamment pour des valeurs de $n$ supérieures à l'unité

(3) $a_n = 2a_{n-1} - a_{n-2}.$

**Augustin Louis Cauchy, *Cours d'analyse de l'École royale polytechnique*, 1822. © Collections École polytechnique.**

closer to the truth than any other science. Education in mathematics therefore had a moral value: practising such a science aimed to ensure the continuation of progress not only in science and technology but also in the morality of the younger generations. Furthermore, the ideal of universality associated with mathematics was at the core of the creation of the system of competitive exams for entering the "grandes écoles" such as École Polytechnique and École Normale. This system aimed to replace hereditary privileges with individual value, to be proved by solving mathematical problems. These strong ideals went along with the goal to create a new pedagogy that would promote both theoretical and practical knowledge. On the model of the recent pedagogical innovations that had been made in mining schools such as Schemnitz's school in Hungary, the founders of École Polytechnique aimed to promote science activities and experiments. This ambition required the creation not only of a library of theoretical treatises but also a collection of scientific instruments that could be used for practical experiments.

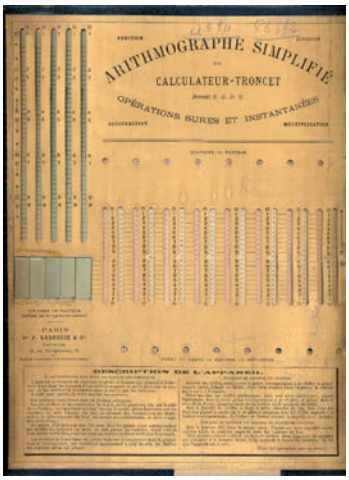
The first scientific objects were taken from the revolutionary deposits. This collection quickly expanded with the new apparatus that was invented by the professors (often alumni of the polytechnique) for their teaching and for their research. The Historical Resources Centre retains more than 400 ancient scientific objects, of which 87 have been the subject of a procedure for classifying historic monuments. These objects are classified in categories: measurement, hydrostatics, heat, electricity, acoustics, optics and chemistry.

The measurement section includes the first prototype metre bar. Several of the founders and first professors of École Polytechnique actively participated in the meridional definition of the metre and, more generally, in the decimal-based metric system for length, mass and time. Lagrange, in particular, was a strong advocate for extending the metric system to decimal time, which was officially used for about a year from the beginning of the Republican Year III (22 September 1794) to 18 Germinal of Year III (7 April 1795).


**The prototypes of the metre bar and the decalitre. © Collections École polytechnique.**

**Thomas' arithmometer. © Collections École polytechnique.**

The measurement collection also includes several calculating devices such as Thomas' arithmometer, Troncet's arithmograph and a Curta calculator. Thomas' arithmometer was the first digital mechanical calculator reliable enough to be used daily. It could add and subtract two numbers and could perform long multiplications and divisions effectively by using a movable accumulator for the result. This calculator was patented in France by Thomas de Colmar in 1820 and manufactured from 1851 to 1915. The device in the collection of École Polytechnique is not the original model conceived by Thomas de Colmar but a model improved by his son Thomas de Bojano in 1876.



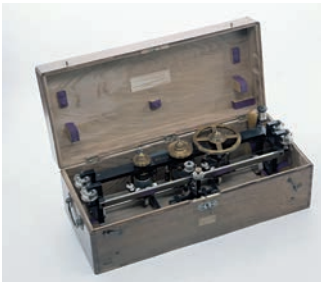

**Troncet's arithmograph. © Collections École polytechnique**

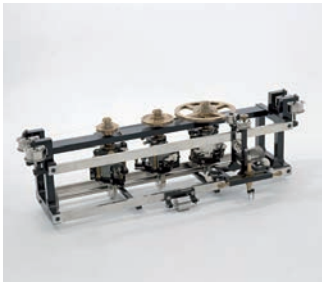
The arithmograph introduced by Louis Troncet in 1889 was a simple, cheap and popular mechanical add/subtract calculator. It is composed of sheet-cardboard sliders inside a cardboard envelope and is manipulated by a stylus, with an innovative carry mechanism, doing subtract ten, carry one with a simple stylus movement. This mechanism was later improved into metallic apparatuses, including the Addiators manufactured in Berlin by Addiator Gesellschaft from 1920 to 1982. A model of a small pocket Addiator from the 1960s is also retained in the collections of École Polytechnique.

The Curta is a small mechanical calculator developed by Curt Herzstark. The Curta's design is a descendant of Gottfried Leibniz's Stepped Reckoner and Thomas' arithmometer, accumulating values on cogs, which are added or complemented by a stepped drum mechanism. It has an extremely compact design: a small cylinder that fits in the palm of the hand. About 140,000 models of the Curta were produced from 1948 to 1972.

**The Curta calculator. © Collections École polytechnique.**

The acoustic section includes an harmonic analyser from 1933. This analyser was designed by Olaus Henrici of London in 1894 for determining the fundamental and harmonic components of complex sound waves. It was then developed and mechanically constructed by G. Coradi of Zurich. The analyser consists of multiple pulleys and glass spheres, called rolling-sphere integrators, connected to measuring dials. The image of a curve (for example, a tracing of a sound wave) is placed under the device. The user moves a mechanical stylus along the curve's path, tracing out the wave form. The resulting readings on the dials give the phase and amplitudes of up to ten Fourier harmonic components.

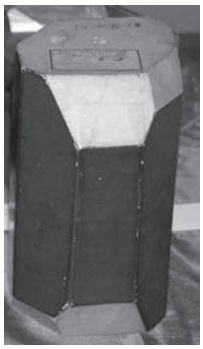




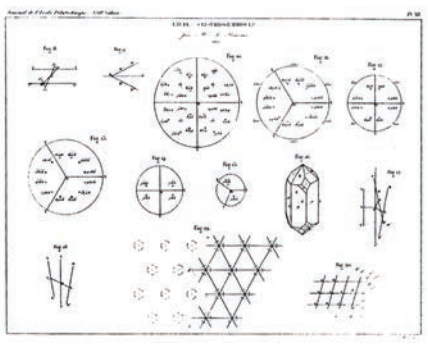
**The Coradi analyser. © Collections École polytechnique.**

In addition to the objects used for mathematical operations or investigations, several other scientific instruments retained in the collection of École Polytechnique shed light on the changing interactions between mathematics and other sciences and are therefore very relevant for investigations in the history of mathematics. To give just one example, the collections of minerals, polyhedra cardboard models and goniometers highlight intimate connections between crystallography, geometry, mechanics, optics (especially Augustin Fresnel's theory of light) and algebra with the emergence of group theory in the works of the polytechnicians Louis Poinsot, Augustin Louis Cauchy, Auguste Bravais, Joseph Bertrand, Camille Jordan and Henri Poincaré.

The collection of scientific objects is still expanding today thanks to donations of alumni, professors and researchers, and objects purchased by alumni associations.

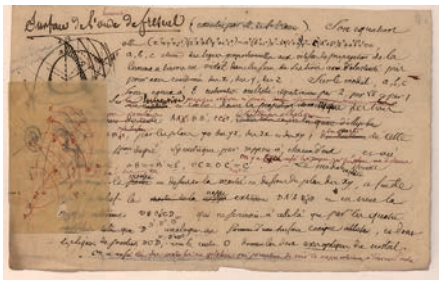


**Cardboard cristal model. © Collections École polytechnique.**



**Bravais' cristallographic investigations in the *Journal de l'École polytechnique* in 1850.**

**Fresnel polyprism. © Collections École polytechnique.**



**A manuscript by Adhémar Barré de Saint-Venant on the Fresnel wave surface, 1855. © Collections École polytechnique.**

Very recently, in June 2018, the collection received a specimen of a herpolhodographer that was used for experimental works in mechanics to trace herpolhodes, i.e. surfaces created by the rotation of a rigid body around its centre of gravity.[10] This instrument was conceived by the mathematicians Gaston Darboux and Gabriel Koenigs in the early 1890s; it was constructed by Château Père et Fils in Paris in 1900 and presented to the Exposition Universelle in Paris, the world fair that hosted the International Congress of Mathematicians in which David Hilbert presented his famous list of problems.

In addition to scientific instruments, the museum collection of École Polytechnique also contains a variety of other types of objects, such as drawings, engravings, paintings, busts, medals, uniforms, stained glasses and photographs. When the school was founded, a number of master drawings from the 18th century were taken from revolutionary deposits for the teaching of drawing by imitation. For instance, the *Bélisaire* drawn in 1779 by Jacques-Louis David was previously in the possession of the Marquis de Clermont d'Amboise, Ambassador of France in Napoli.

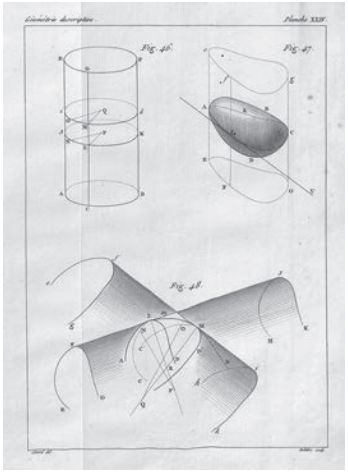
**Herpolhodographer of Gaston Darboux and Gabriel Koenigs. © Collections École polytechnique.**

**Jacques-Louis David, *Bélisaire*, 1779. © Collections École polytechnique.**

At the foundation of the school, the teaching of drawing was very close to that of geometry. Monge's descriptive geometry provided a mathematical formulation for the diversity of graphical techniques

[10] See [Résal, 1895, p.249], and [Appel, 1953, p.192]

that had been developed by engineers for the arts of stone cutting, mapping, building, fortifying, etc. Monge's own pedagogical ideals gave an important role to action-learning through experimentation and drawing. It is known from the archives of École Polytechnique that Monge had created a cabinet of mathematical models that were used as drawing models for the teaching of descriptive geometry, along with other types of models, such as crystallography models and mechanical devices.[11] Yet, because engineers did not always have the adequate conditions to make geometrical drawings rigorous and precise, they also had to master more classical forms of drawing, which they learned by imitating master drawings such as David's *Bélisaire*. Several students of Monge later advocated the use of drawing models in the teaching of descriptive geometry. Among them, Théodore Olivier and Libre Bardin – who both taught descriptive geometry and mathematical drawing – were pioneers in constructing mathematical models in the 1830s and 1840s. In the late 1860s, Olivier's string and metal models and Bardin's plaster models (as edited by Charles Muret, one of Bardin's students) made great impressions on mathematicians such as Félix Klein and Gaston Darboux, who, in turn, played a key role in the emergence of large collections of mathematical models, such as the ones of the Göttingen Mathematisches Institut and the Institut Henri Poincaré in Paris [Brechenmacher, 2017].



**Manuscripts of Monge's lectures on descriptive geometry. © Collections École polytechnique.**

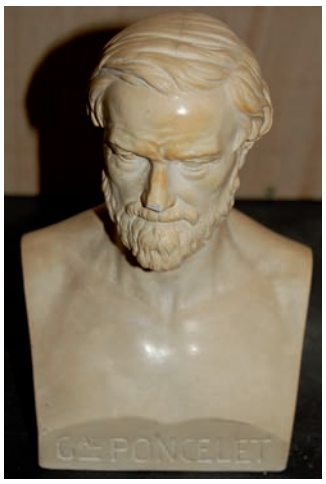
The École Polytechnique museum collection also contains a very large iconographic collection that documents the evolution of mathematician figures, including engravings of the young Lagrange in the mid-18th century, plaster medallions made by David d'Angers and representing Poinsot, Cauchy and Pierre-Simon Laplace, 19th centuries paintings of Lagrange, Laplace and Joseph Bertrand, and busts of Monge, Laplace, Jean-Victor Poncelet, Bertrand, Michel Chasles, Ossian Bonnet, Georges Halphen and Henri Poincaré, as well as 20th century photographs of mathematicians such as Jacques Hadamard, Paul Lévy and Laurent Schwartz.

**Monge.**

**Cauchy.**

**Poinsot.**

[11] For the application of Monge's teaching of descriptive geometry to the drawing of machines, especially by Hachette, see [Dupont, 2000].



**A bust of Jean-Victor Poncelet. © Collections École polytechnique.**


**Henri Poincaré in the picture album of the 1873 promotion of École polytechnique. © Collections École polytechnique.**

**Joseph Bertrand painted by Léon Bonnat in 1896. © Collections École polytechnique.**

**A photograph of Jacques Hadamard from Studio Harcourt. © Collections École polytechnique.**

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*Frédéric Brechenmacher is a professor of the history of science at École Polytechnique. His research activities are devoted to the history of algebra from the 18th century to the 20th century. He recently supervised the creation of a science museum at École Polytechnique: the mus'x.*