

Associazione Italiana Studenti di Fisica (AISF)

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THE HISTORICAL COLLECTION OF PHYSICS INSTRUMENTS OF PALERMO UNIVERSITY



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 sites.google.com/site/aurelioagliologallitto/collezione-storica



UNIVERSITÀ
DEGLI STUDI
DI PALERMO



Dipartimento di Fisica e Chimica - Emilio Segrè



ABSTRACT

In 2011, the **University of Palermo** instituted the University Museum System (Sistema Museale di Ateneo, SiMuA), to promote the cultural heritage. **SiMuA coordinates 6 museums and 14 collections.** The **Botanical Garden**, founded in 1789, with its richness of cultivated flora, is the “flagship” of European living museums and the cradle of botany in Sicily; the **Museum of Zoology “P. Doderlein”**; the **Museum of Geology “G. G. Gemmellaro”**; the “Specola”, housed in the **Astronomical Observatory** founded in 1790 under the Bourbons; the **Museum of Radiology** and the **Museum of Engines and Mechanisms**. The collections mainly concern single disciplines.

The **Historical Collection of the Physics Instruments** is on display at the **Department of Physics and Chemistry - Emilio Segrè**, in the historical building of via Archirafi 36. The oldest instruments date back to the early 19th century, when experimental Physics began to be taught in the University, by using instruments and apparatus during lectures. The equipment grows considerably after Domenico Scinà got the chair of Experimental Physics, in 1811, at the old “Gabinetto di Fisica” of the “Regia Università degli Studi”. **The collection today consists of more than 500 items**, reflecting the scientific research carried out in Palermo from 19th century onward.

Here, I will describe some interesting instruments, with more attention to the activities carried out with secondary schools, emphasizing the possibility to utilize laboratory activities connected with historical instruments, for an inquiry-based science education.

THE MUSEUM SYSTEM OF THE UNIVERSITY OF PALERMO

In 2011, the University of Palermo instituted the University Museum System (SiMuA) to foster the development of the museum activities and making them accessible to the public at large.

- The Museum of Zoology “P. Doderlein”
- The Botanical Garden
- The Museum of Geology “G. G. Gemmellaro”
- The “Specola” and the Astronomical Observatory
- The Museum of Radiology
- The Museum of Engines and Mechanisms

**SiMuA coordinates 6 Museums and
14 Collections**

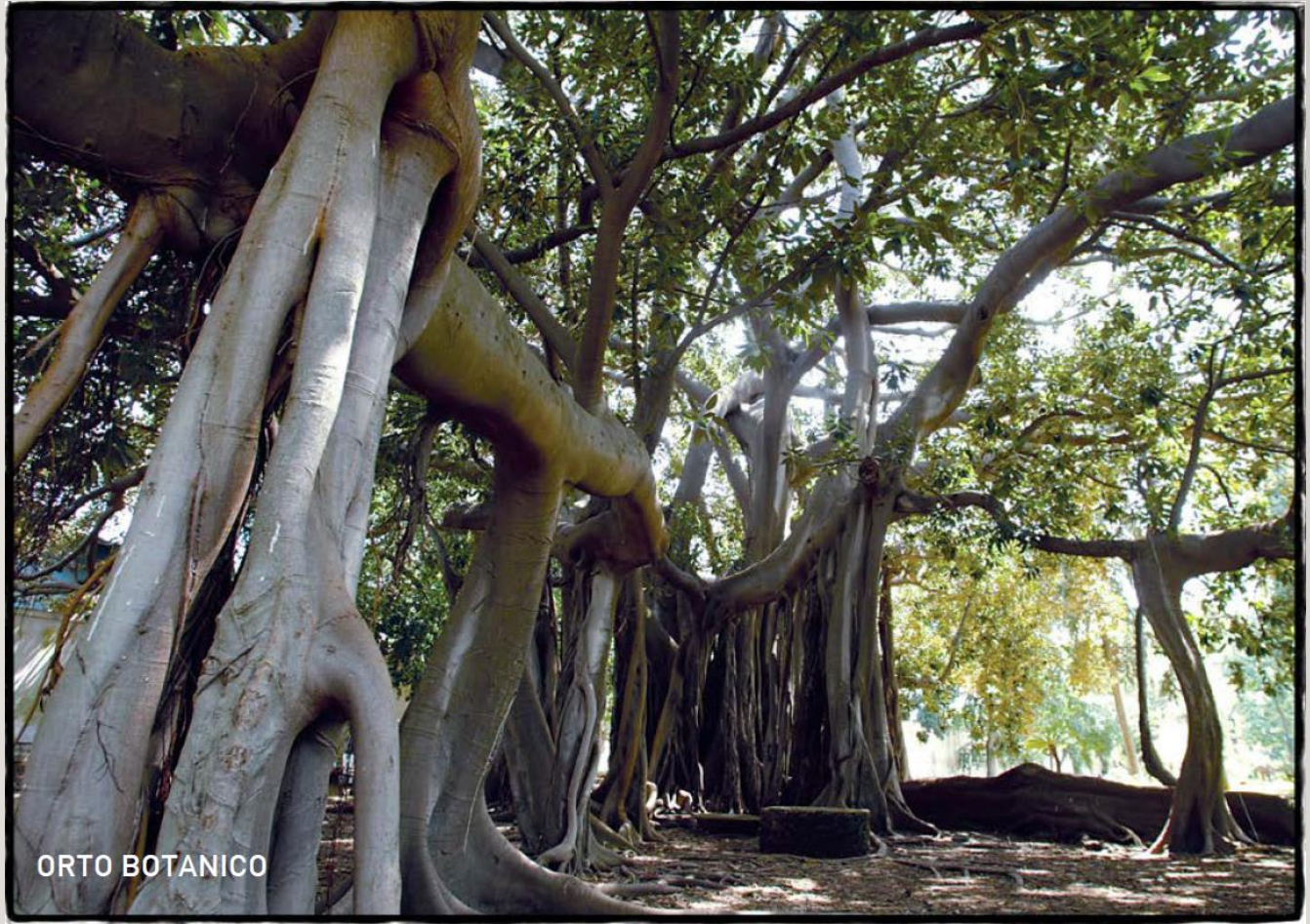


www.musei.unipa.it

THE MUSEUM OF ZOOLOGY “P. DODERLEIN”



THE BOTANICAL GARDEN



THE MUSEUM OF GEOLOGY "G.G. GEMMELLARO"



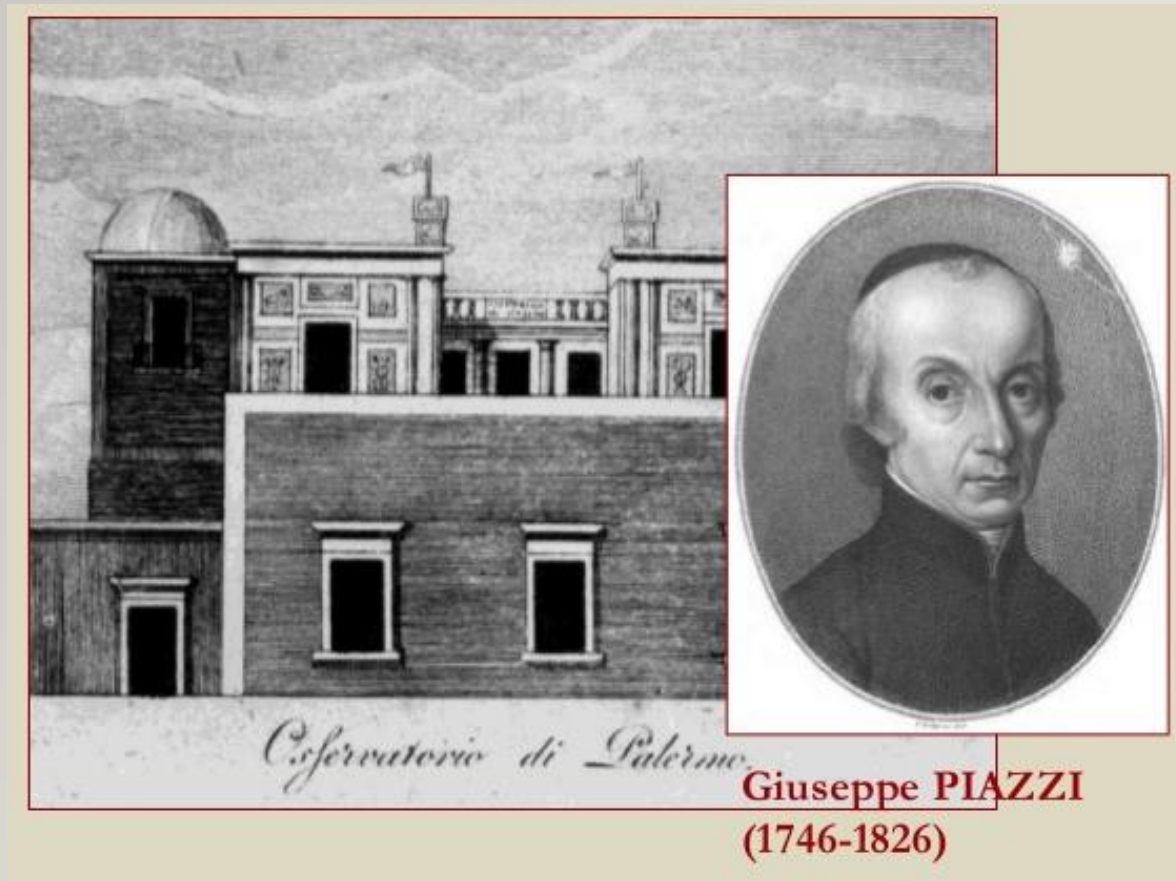
Thea, a prehistoric human of Sicily.



The dwarf elephants lived in Sicily between 500 and 120 thousand years ago.



THE MUSEUM OF SPECOLA AND THE ASTRONOMICAL OBSERVATORY



The Astronomical Observatory at the top of the Tower Pisana, founded in 1790 under the Bourbons.



The great astronomical circle of 1789 that Jesse Ramsden built for the Observatory of Palermo.



THE MUSEUM OF RADIOLOGY



The **Museum of Radiology** was inaugurated in **1995** during the celebrations of the centennial of the **discovery of the X-ray in 1895** by **Wilhelm Conrad Roentgen (1845 – 1923)**.

THE MUSEUM OF ENGINES AND MECHANISMS



THE HISTORICAL ISTITUTO DI FISICA



- R. Corrao, *Architettura e Costruzione nella Palermo tra le due Guerre*. Aracne 2012, pp. 19-28

In 1920, the Rector Francesco Spallitta instructed prof. Antonio Zanca to study the possibility of building the university city in a large area between via Archirafi and via Lincoln.

The building was completed in 1928 and occupied in 1934.

When Emilio Segrè arrived in Palermo, in 1936, he found:
«very large rooms, waste space, and instruments and tools of the previous century or missing at all».

E. Segrè, *Autobiografia di un fisico*, Bologna 1995

THE HISTORICAL ISTITUTO DI FISICA



THE ISTITUTO DI FISICA AND ITS HISTORICAL COLLECTION

The Historical Collection of Physics Instruments is on display at the Department of Physics and Chemistry - Emilio Segrè in the historical building of via Archirafi 36.

The oldest instruments date back to the early 19th century, when experimental Physics began to be taught in the University by using instruments and apparatus.

The Collection today consists of more than 500 items.



The historical building of the former *Istituto di Fisica* of via Archirafi 36

THE ISTITUTO DI FISICA AND ITS HISTORICAL COLLECTION

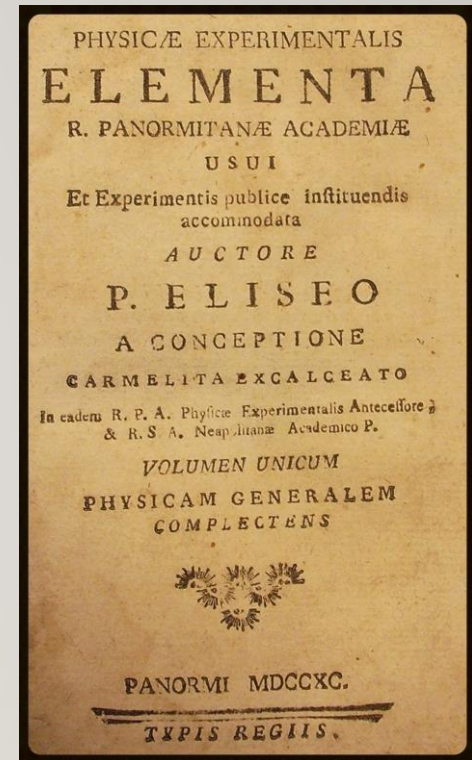


Showcases containig instruments

Padre Eliseo della Concezione (1725 - 1809)

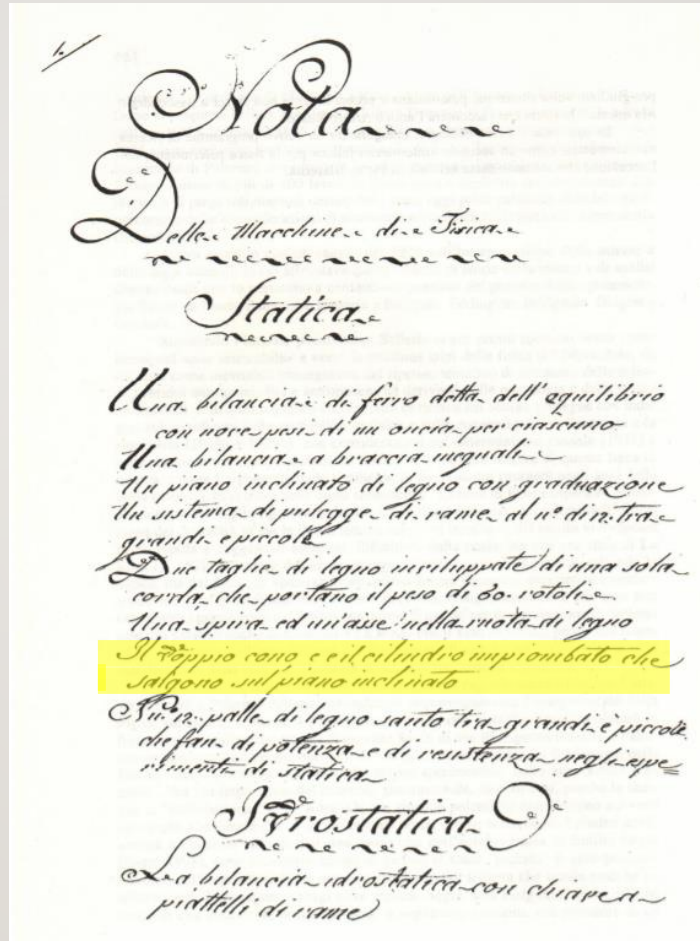
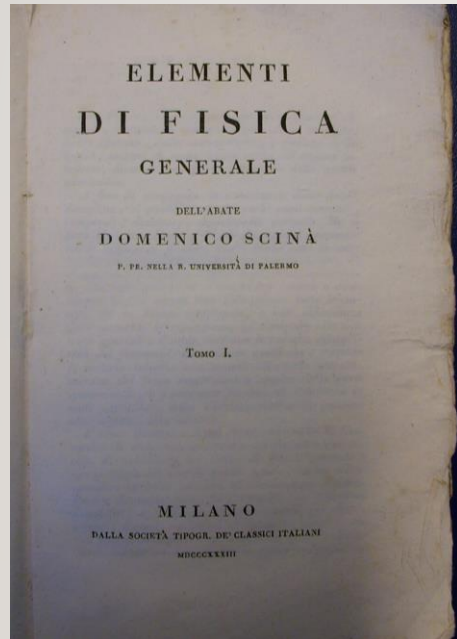
He holds the Chair of Experimental Physics from 1786 to 1811. He was involved in experimental research in the field of pneumatic chemistry, respiration and the theory of new gases with the phlogiston theory. He participated as a cartographer in the expedition in Calabria after the earthquake of 1783.

Titolare della cattedra di Fisica Sperimentale dal 1786 fino al 1811. Si occupò di ricerca sperimentale nel campo della chimica pneumatica, la respirazione e la dottrina dei nuovi gas con quella del flogisto. Partecipò, come cartografo, alla spedizione in Calabria dopo il terremoto del 1783.



MECHANICS: DOMENICO SCINÀ

The equipment grows considerably after Domenico Scinà got the chair of Experimental Physics, in 1811, at the old “Gabinetto di Fisica” of the “Regia Università di Palermo”.



MECHANICS: IL DOPPIO CONO E IL CILINDRO IMPIOMBATO

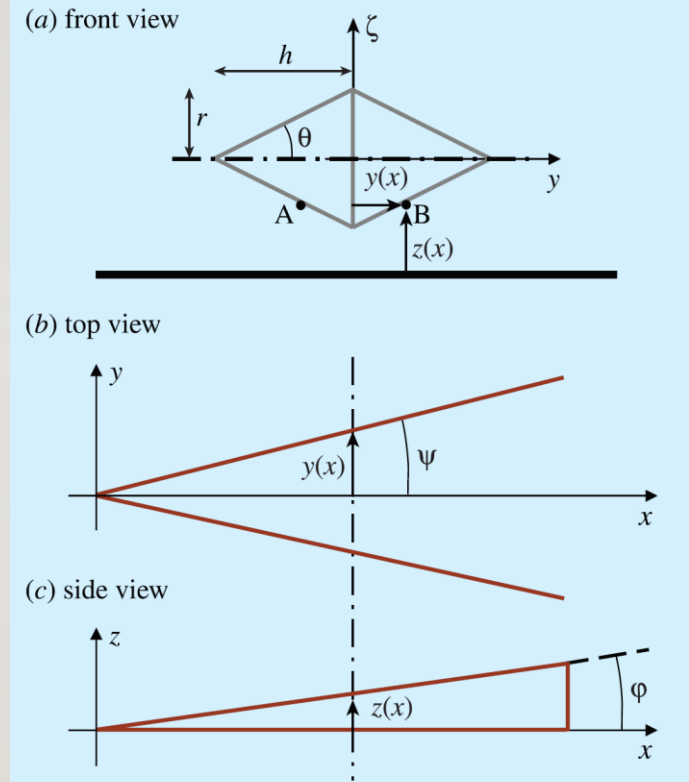
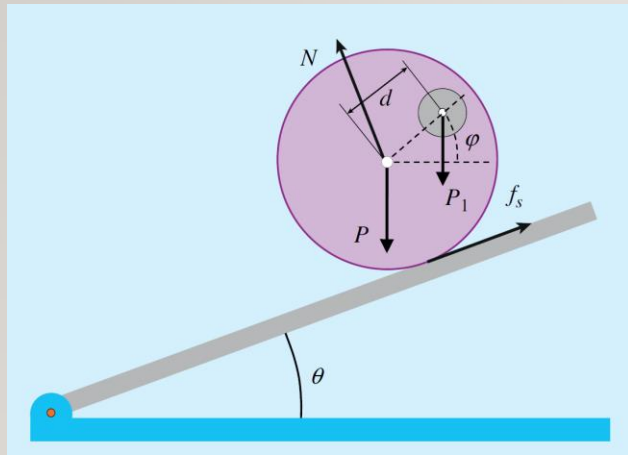


Figure 2. Schematic perspectives of the double cone and the rails: (a) front view of the double cone, (b) top view of the rails and (c) side view of the rails.

• Aglione, Phys Educ **48** (2013) 137

• Agliolo, Phys Educ **46** (2011) 682

OPTICS: DOMENICO RAGONA AND ROSARIO CARUSO



Newton's coloured rings (1841)



Refractometer (1843)

The Refractometer was built at Palermo in 1843 by the technician **Rosario Caruso** on the indication of **Domenico Ragona** (1820-1892) to demonstrate the laws of refraction and the limit angle.

Domenico Ragona (1820-1892)



www.astropa.inaf.it

OPTICS: WORK IN PROGRESS...



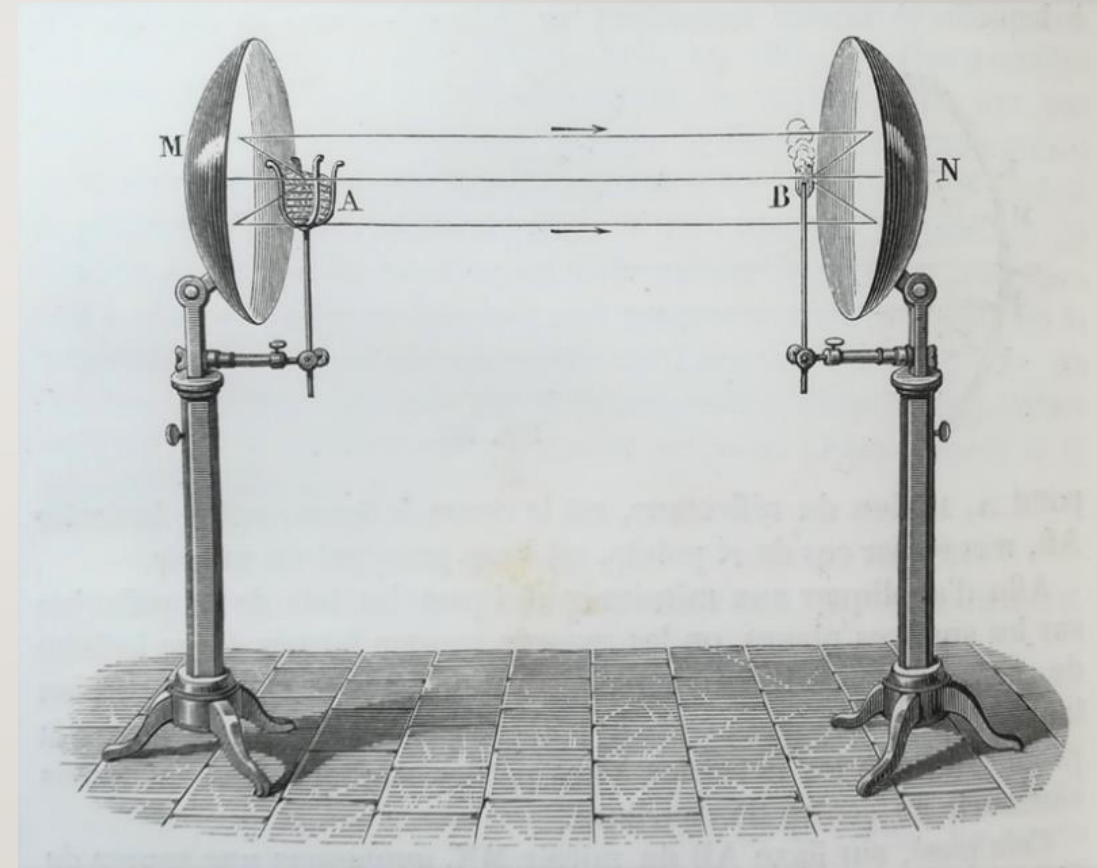
Convex mirror
Early XIX century



Burning mirrors
Middle XIX century



Burning mirrors



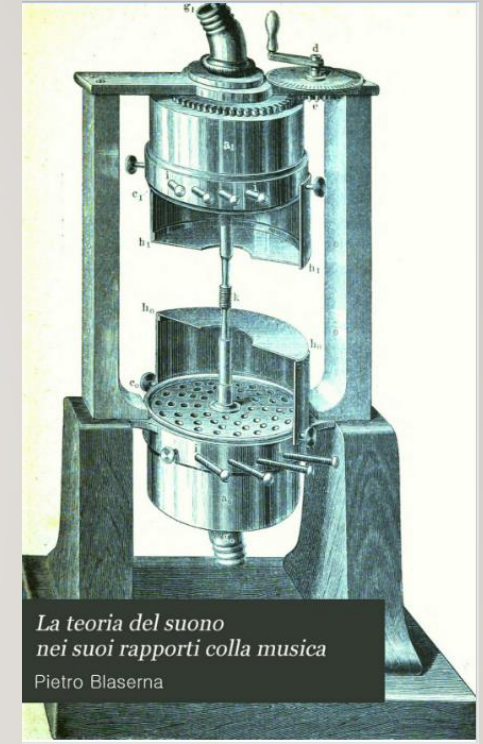
PIETRO BLASERNA AND THE ACUSTICAL INSTRUMENTS



Pietro Blaserna (1836 - 1918)

In April 1863, Pietro Blaserna was appointed Professor of Experimental Physics at the University of Palermo. Here he published several works on electricity, optics, including one on the polarization of the solar corona observed in Augusta during the total eclipse of December 22, 1870 (*Il Nuovo Cimento* 6, 1871), and on heat (*Dynamic Heat Theory*, 1872).

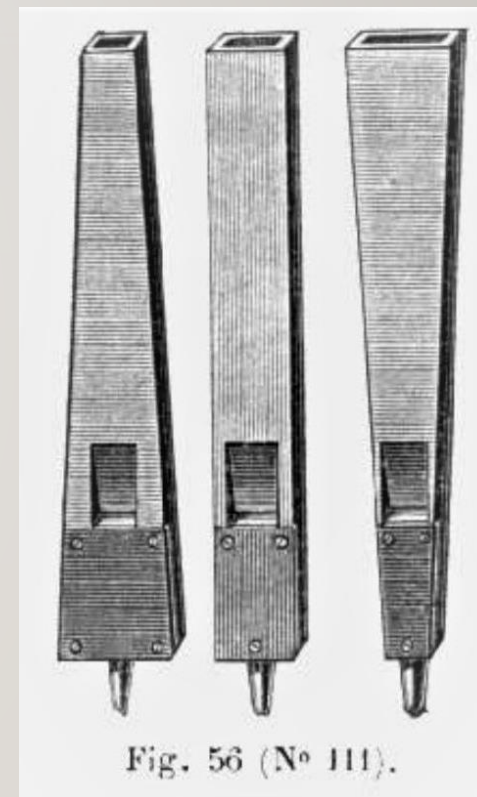
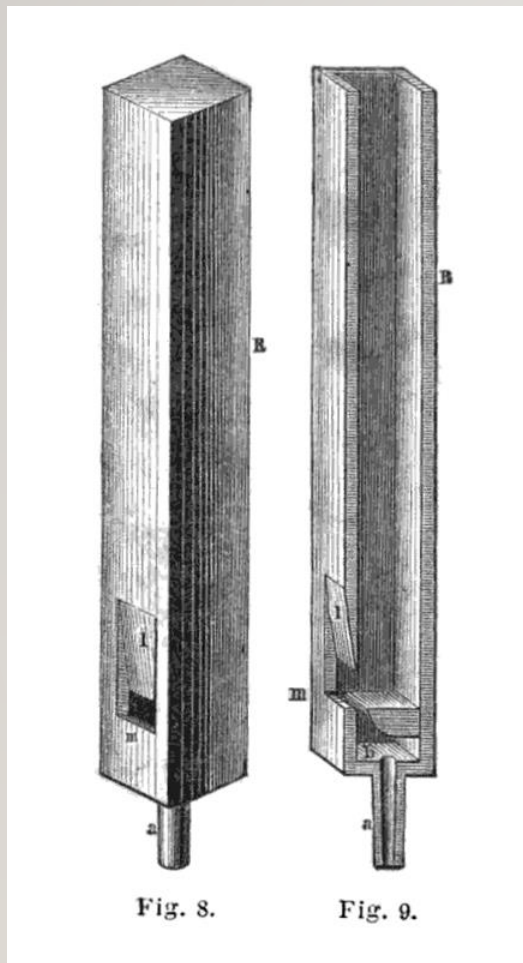
Nell'aprile del 1863, Pietro Blaserna fu nominato Professore di Fisica sperimentale all'Università di Palermo. Qui pubblicò vari lavori sull'elettricità, ottica, tra cui uno sulla polarizzazione della corona solare osservata in Augusta durante l'eclisse totale del 22 dicembre 1870 (Il Nuovo Cimento 6, 1871), e sul calore (Teoria dinamica del calore, 1872).



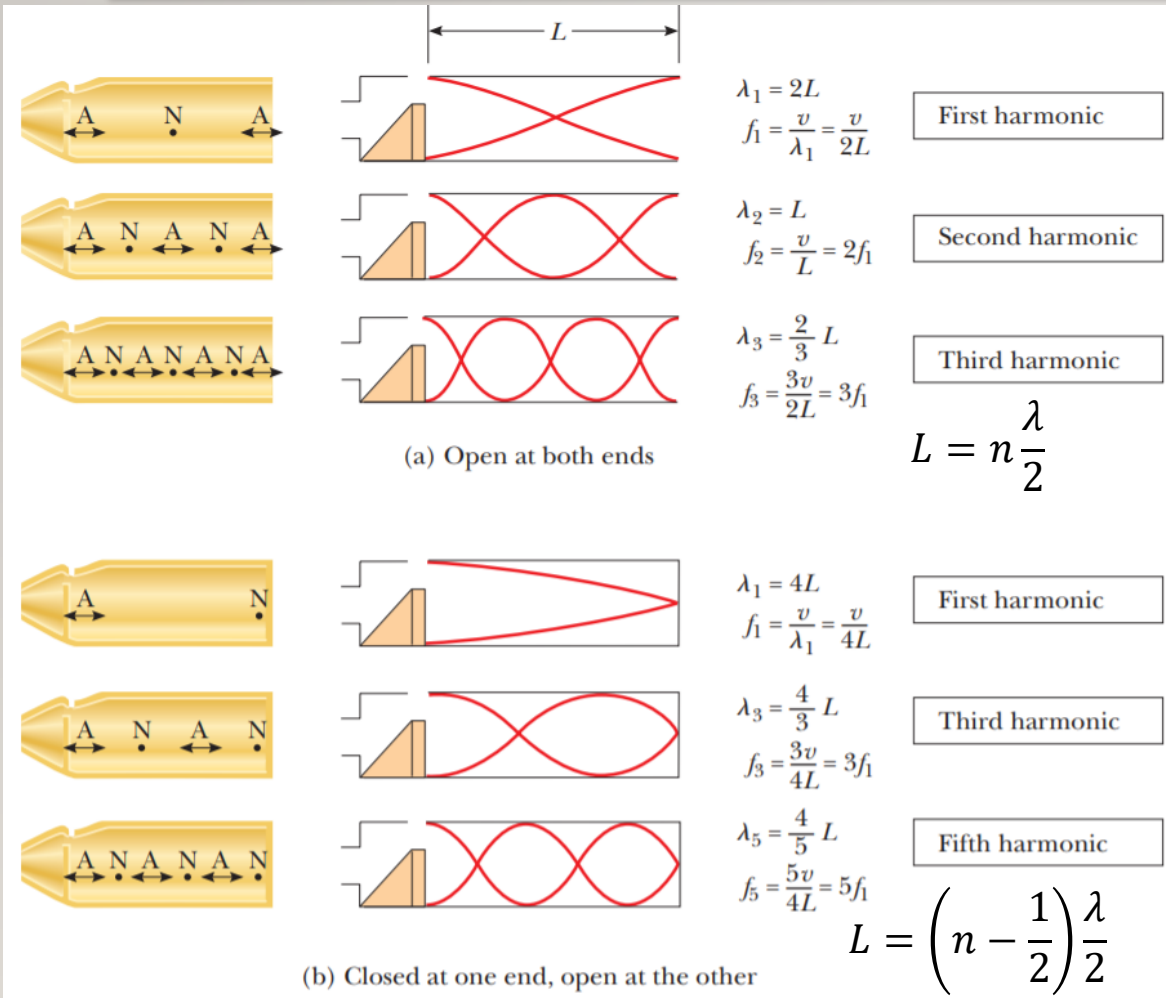
*La teoria del suono
nei suoi rapporti colla musica*
Pietro Blaserna

P. Blaserna, *The theory of sound in its relation to music*, H.S. King & Co. London 1876

ACOUSTICS: ORGAN PIPES



ACOUSTICS: SOUND VIBRATIONS GENERATED BY PIPES



$$v = \lambda f$$

[$v = 344 \text{ m/s @ } 20^\circ\text{C}$]



RE

LA

R. A. Serway, J. S. Faughn and C. Vuille
College Physics, 7th ed., Brooks/Cole
 Publishing Co. 2006

ACOUSTICS: THE VISUALIZATION OF SOUND VIBRATIONS

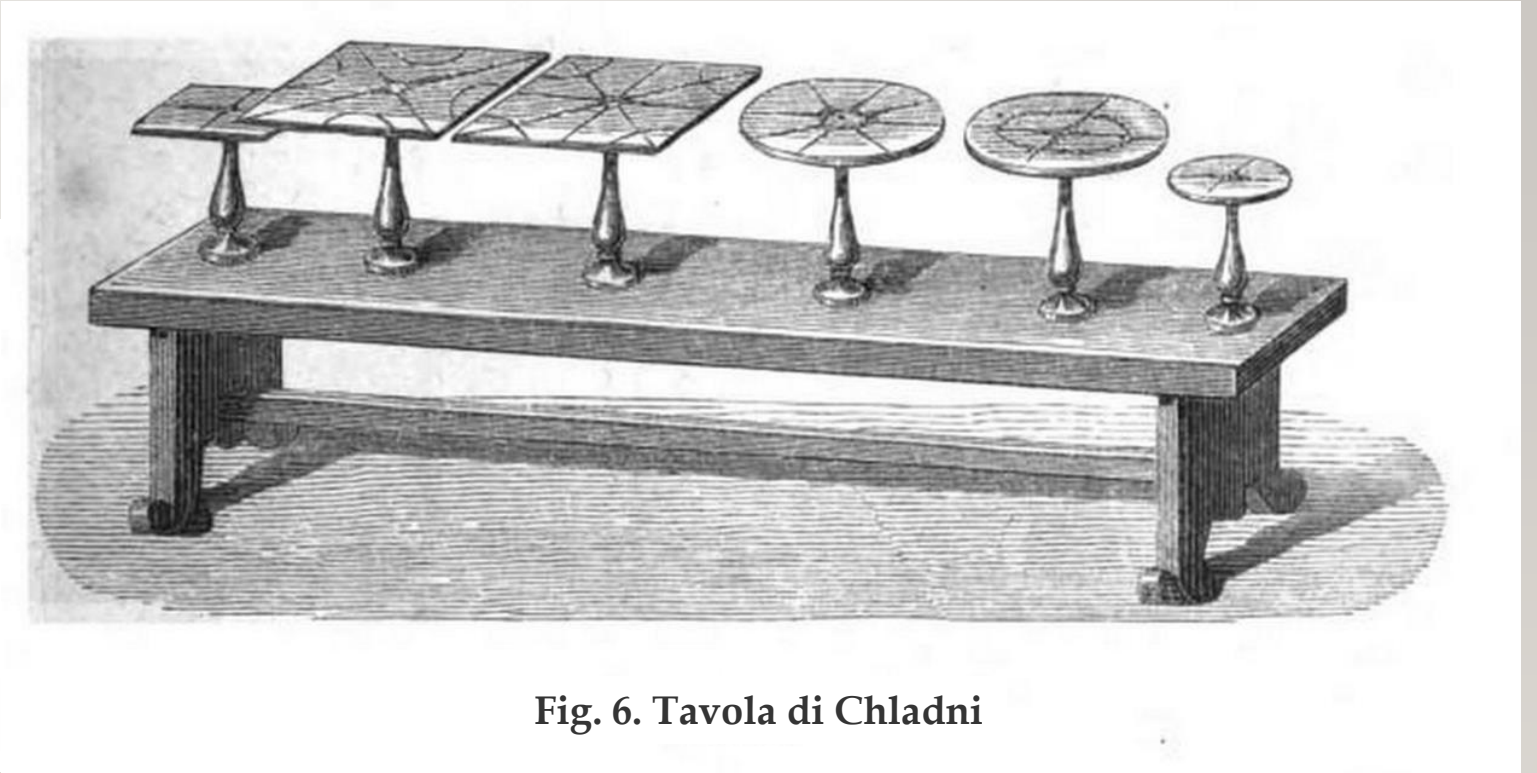
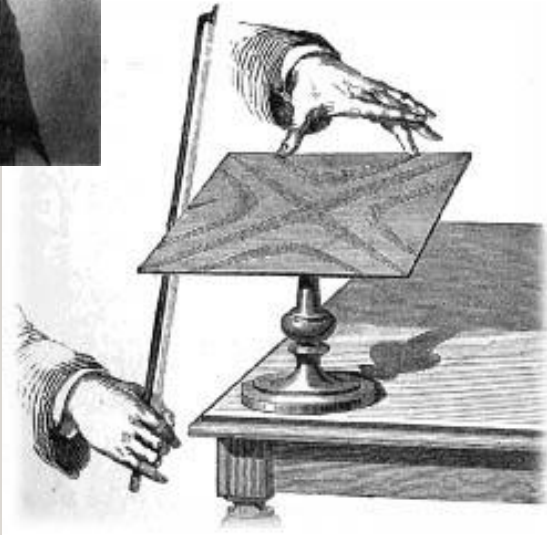
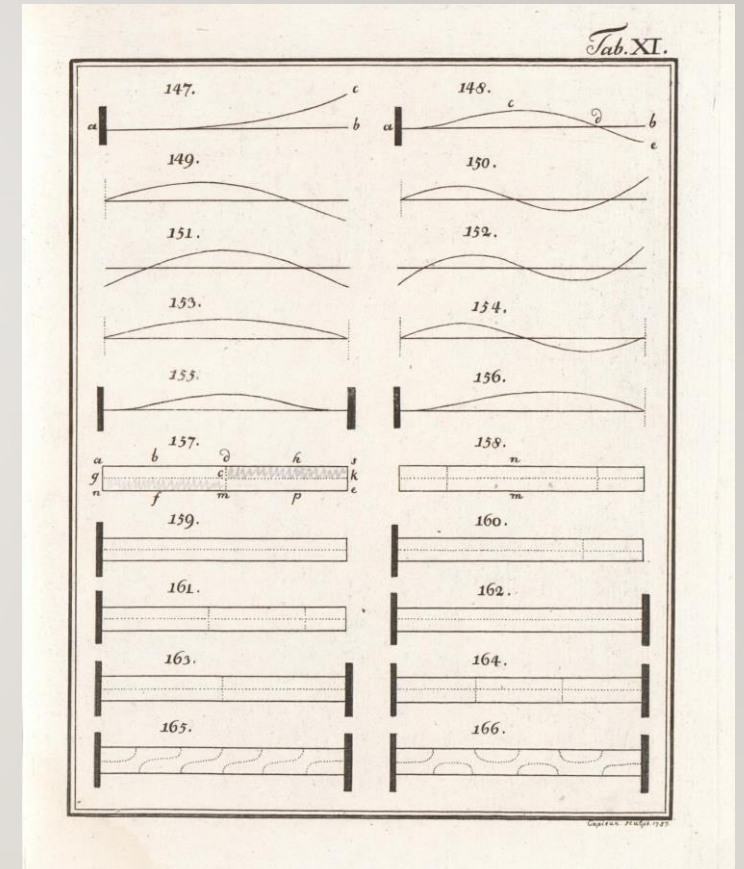
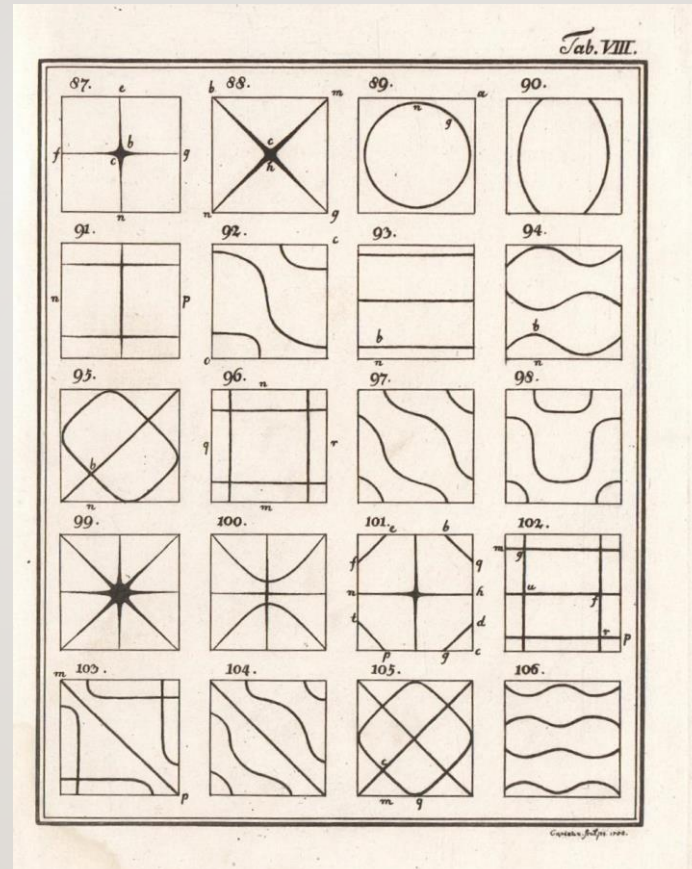
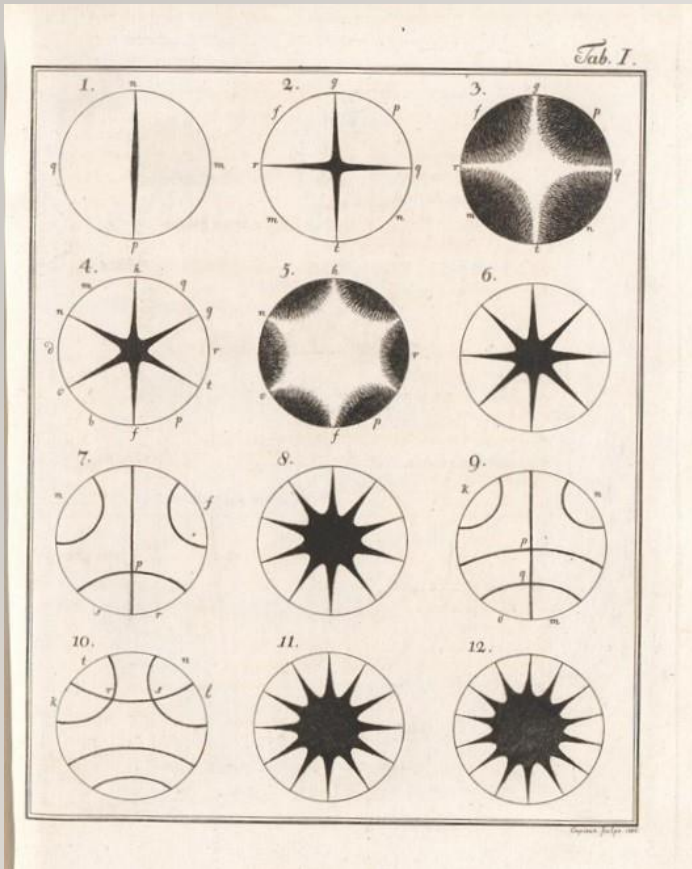


Fig. 6. Tavola di Chladni

Ernst Florens Friedrich Chladni (1756 - 1827)

ACOUSTICS: CHLADNI'S FIGURES



E. F. F. Chladni, *Entdeckungen über die Theorie des Klanges*, Weidmanns Erben und Reich, Leipzig 1787

ACOUSTICS: CHLADNI'S PLATES BUILT BY RUDOLPH KOENIG IN 1864

Rudolph Koenig (1832-1901)



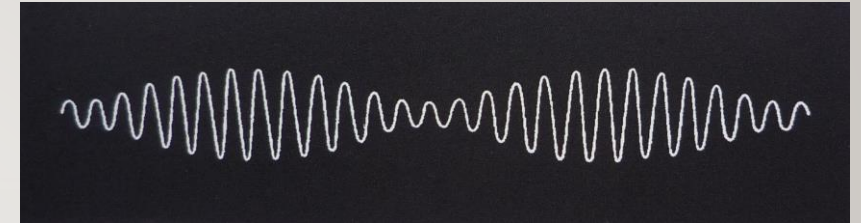
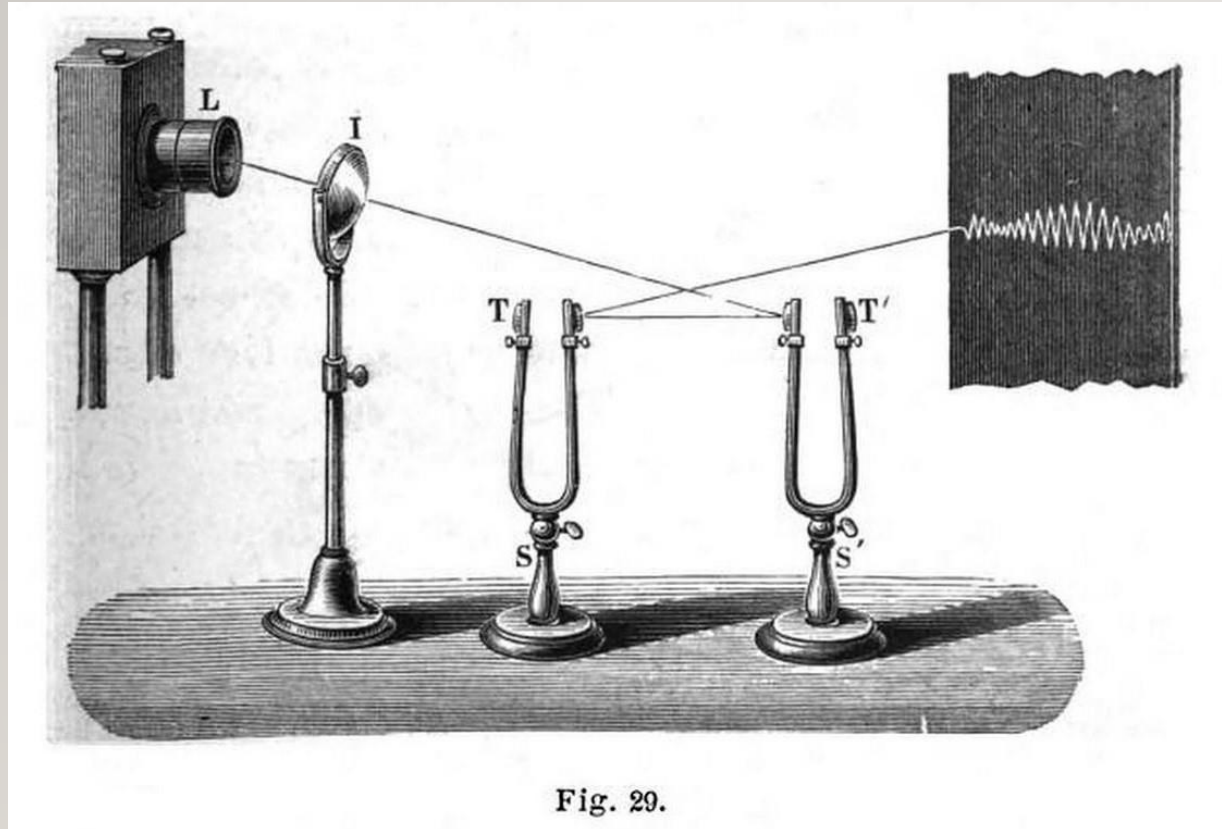
Rudolph Koenig
27, Quai d'Orléans.



«RUDOLPH KOENIG, the most distinguished living inventor and mechanic in the domain of acoustics»

W. Le Conte Stevens, *Sketch of Rudolph Koenig*, *Popular Science Monthly* 37 (1890) 545

ACOUSTICS: INTERFERENCE AND BEATS



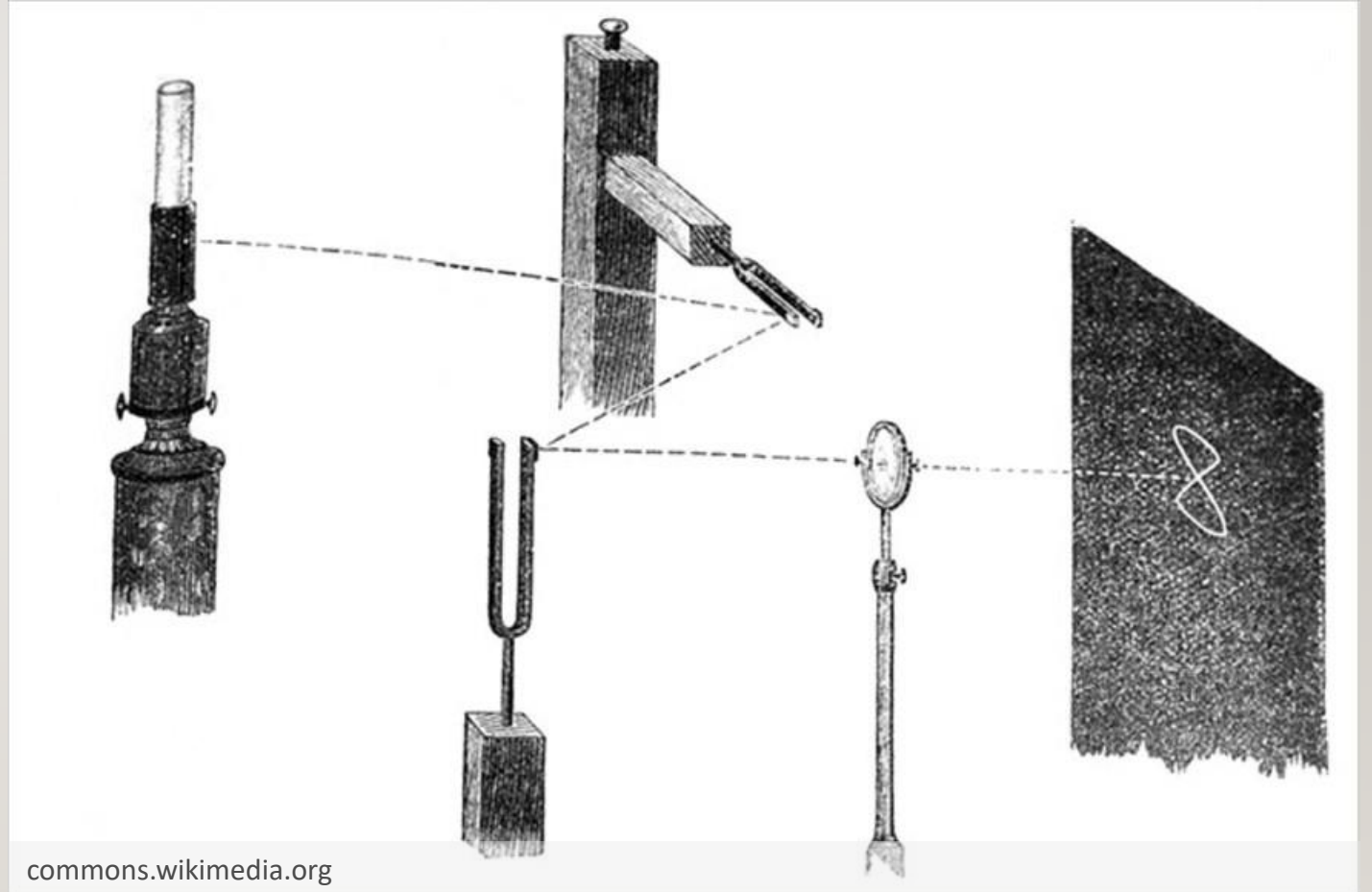
- Agliolo *et al.*, *Exploring historical scientific instruments by using mobile media devices*. *The Physics Teacher* (2021), in press

LISSAJOUS FIGURES

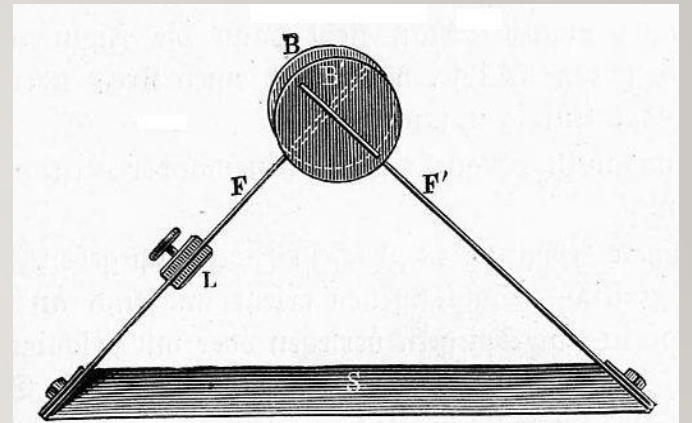
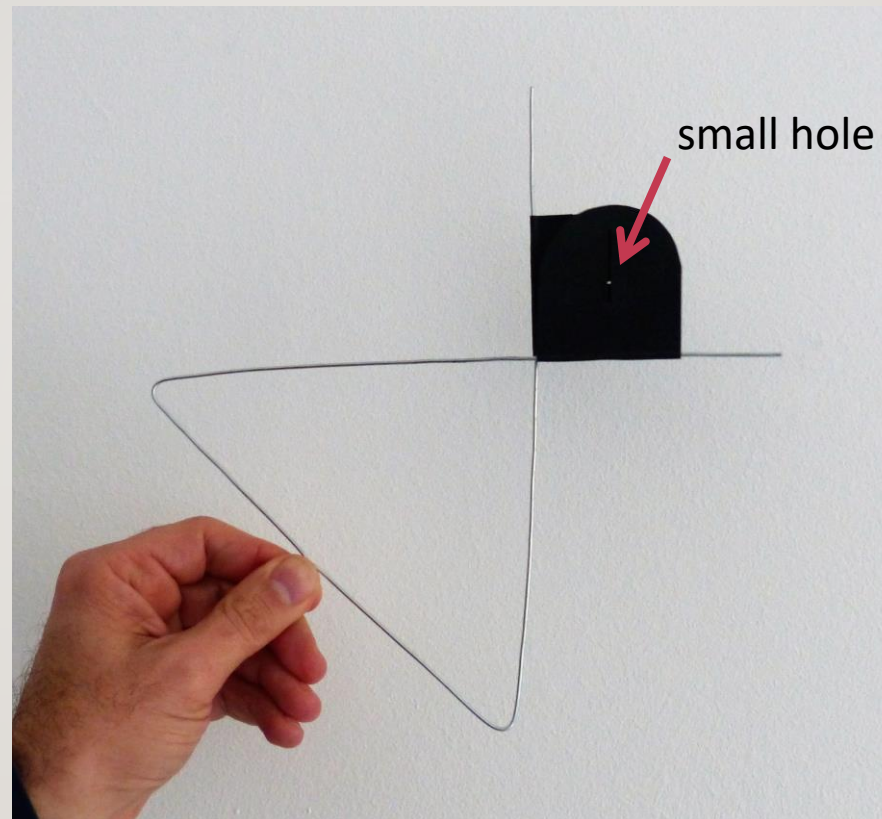
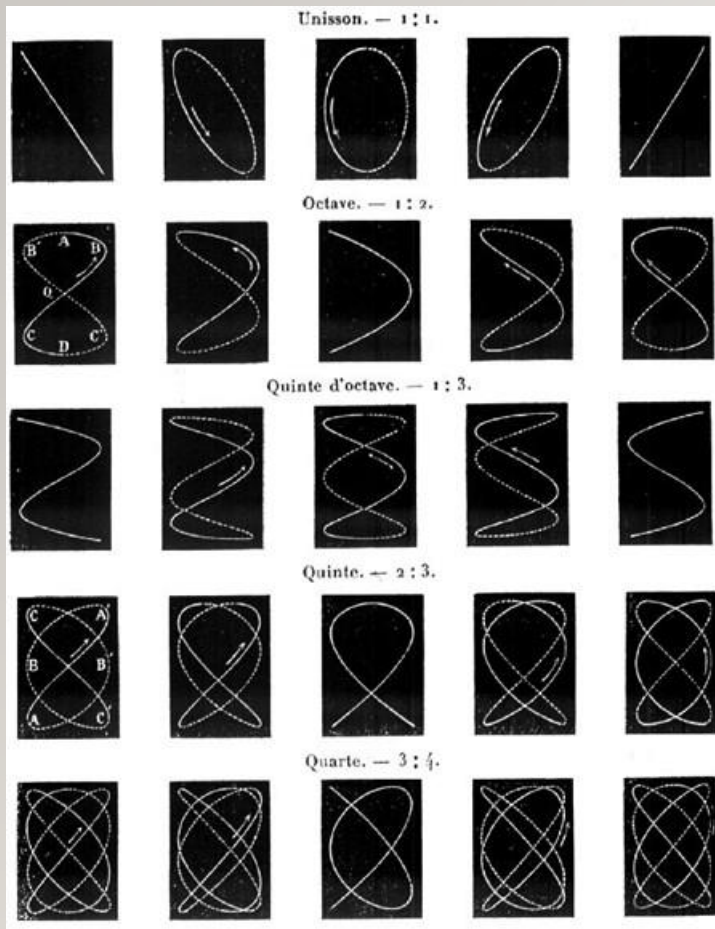


In 1857, Jules Antoine Lissajous (1822 - 1880) thought of a method of reflecting a light beam from the arms of two vibrating tuning fork perpendicularly to each other.

Nel 1857, Jules Antoine Lissajous (1822 - 1880) ha pensato un metodo per fare riflettere un fascio luminoso dai rebbi di due diapason vibranti perpendicolarmente l'uno dall'altro.



LISSAJOUS FIGURES



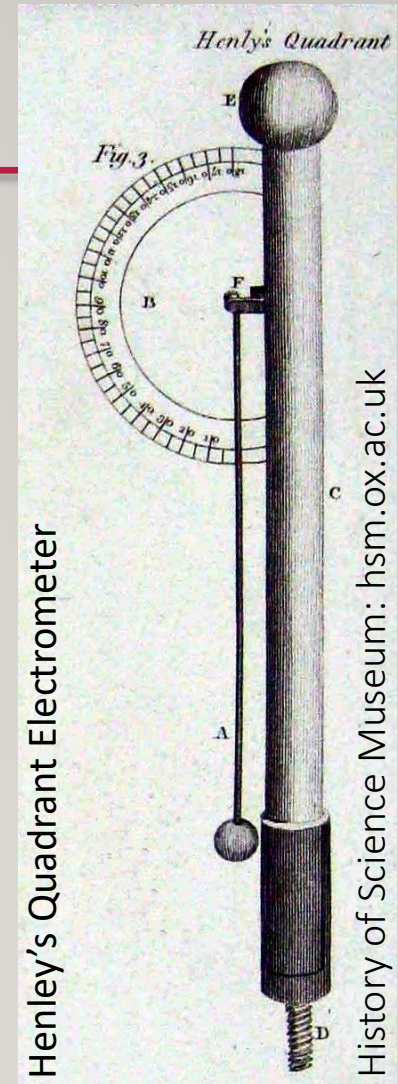
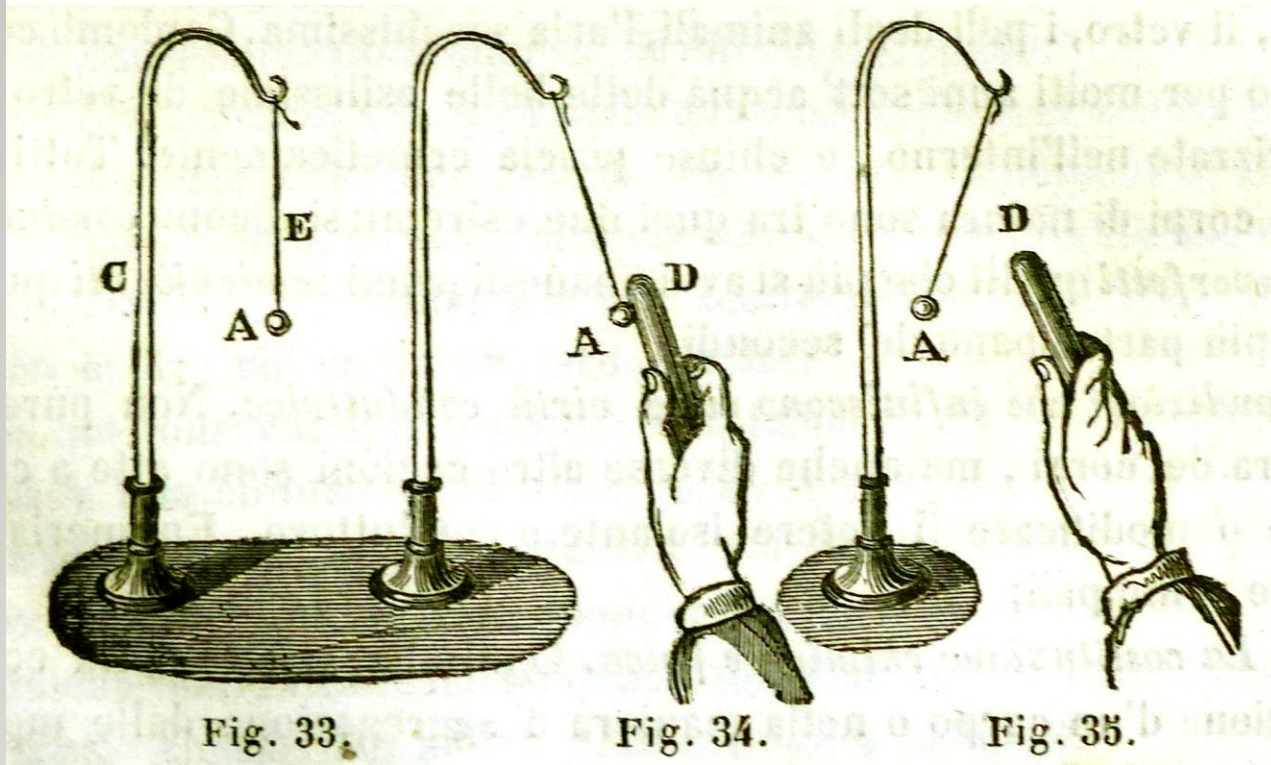
Pfaundler's plate-spring vibrator, 1888
physik.uibk.ac.at/museum

Leopold Pfaundler (1839 - 1920)
Austrian physicist and chemist.

ELECTROSTATICS: PENDOLINO ELETTRICO

Elder marrow electric pendulum

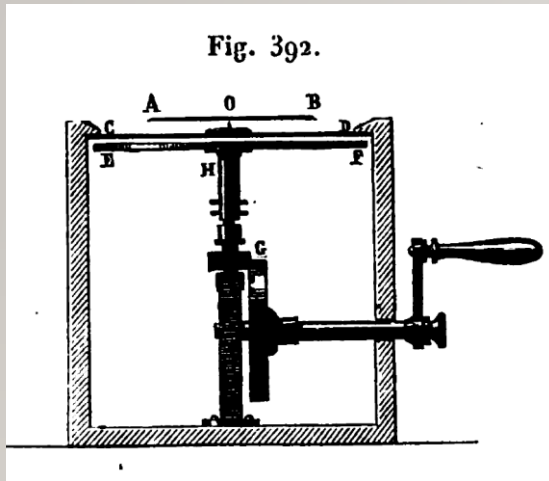
Pendolino elettrico di midollo di sambuco



- G. Giordano, *Trattato elementare di fisica sperimentale e di fisica terrestre*, 1862

- www.coe.ufrj.br/~acmq/hvmeasurements/

ELECTROMAGNETISM: ARAGO'S DISK

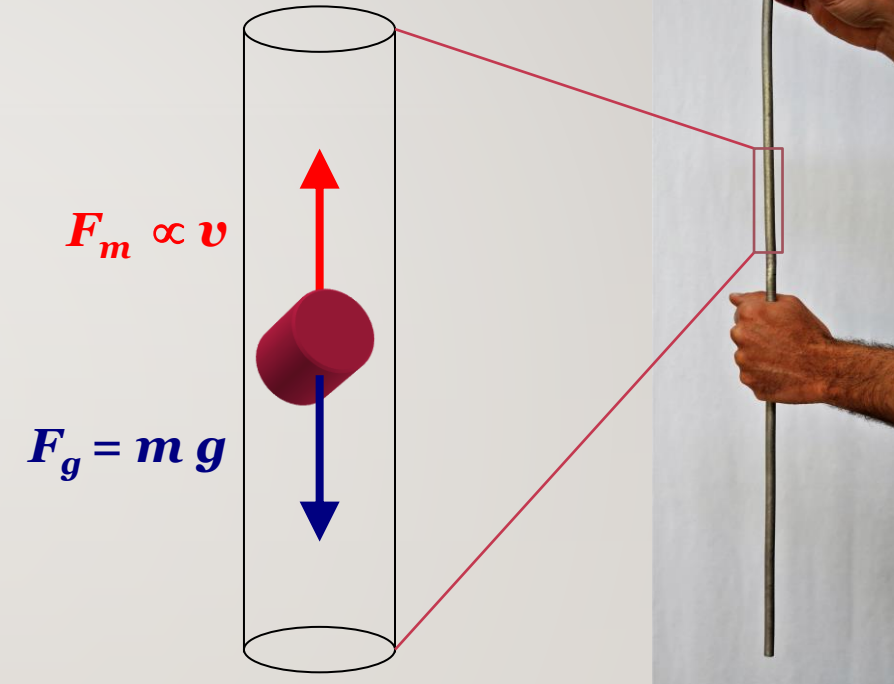


Arago's disk, Ruhmkorff 1868



- J. Jamin, *Petit traité de physique*, Gauthier, Paris 1870, p. 414

Lenz-law experiment

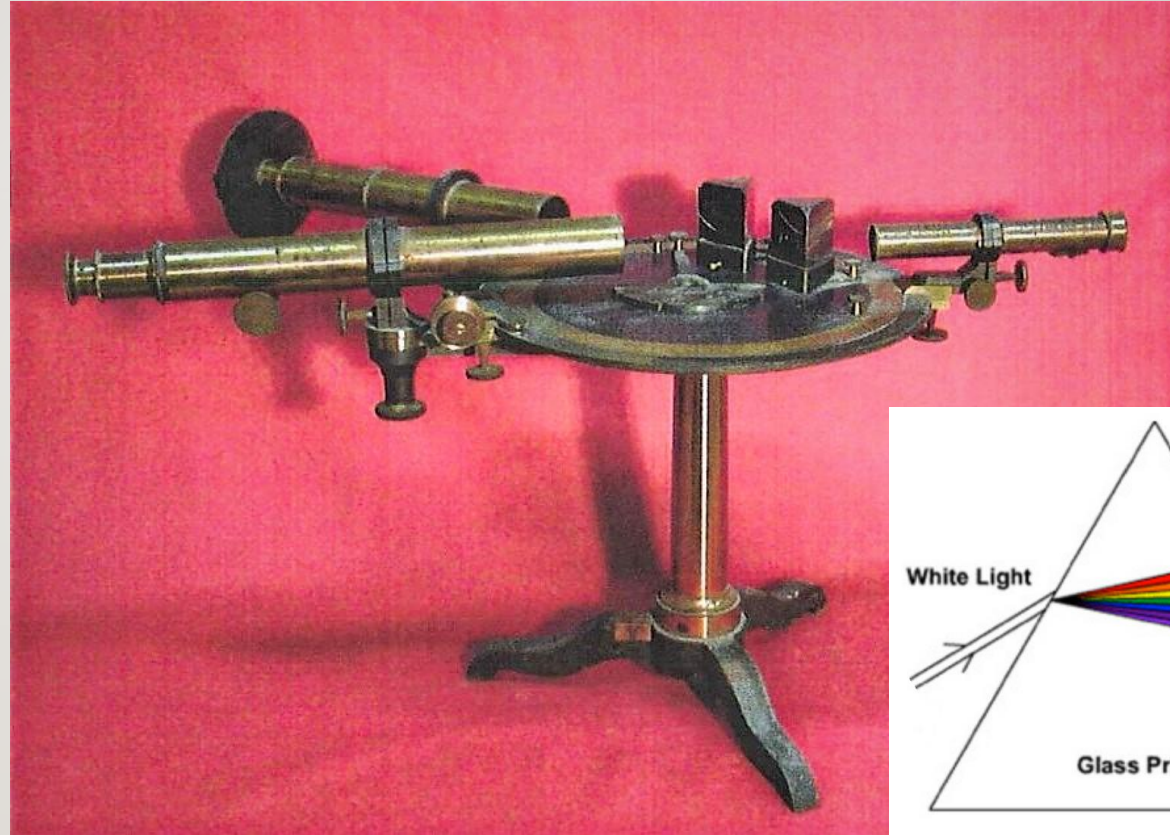


- J. Priest, B. Wade, *A Lenz Law Experiment*, Phys. Teach. 30 (1992) 106
- A. Sconza, G. Torzo, *Il freno elettromagnetico: un altro esperimento sulla legge di Lenz*, LFnS XXXV (2002) 132

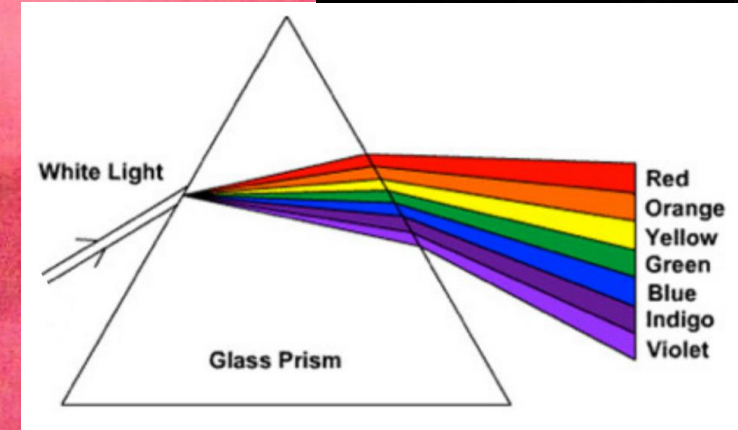
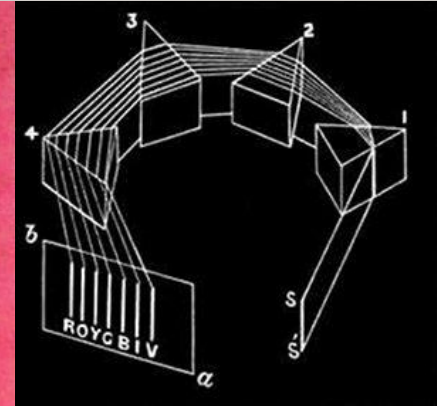
MODERN PHYSICS: SPECTROSCOPY



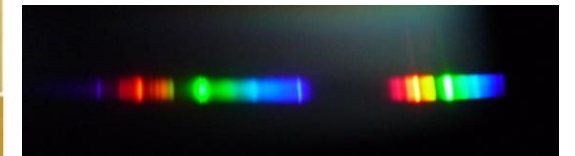
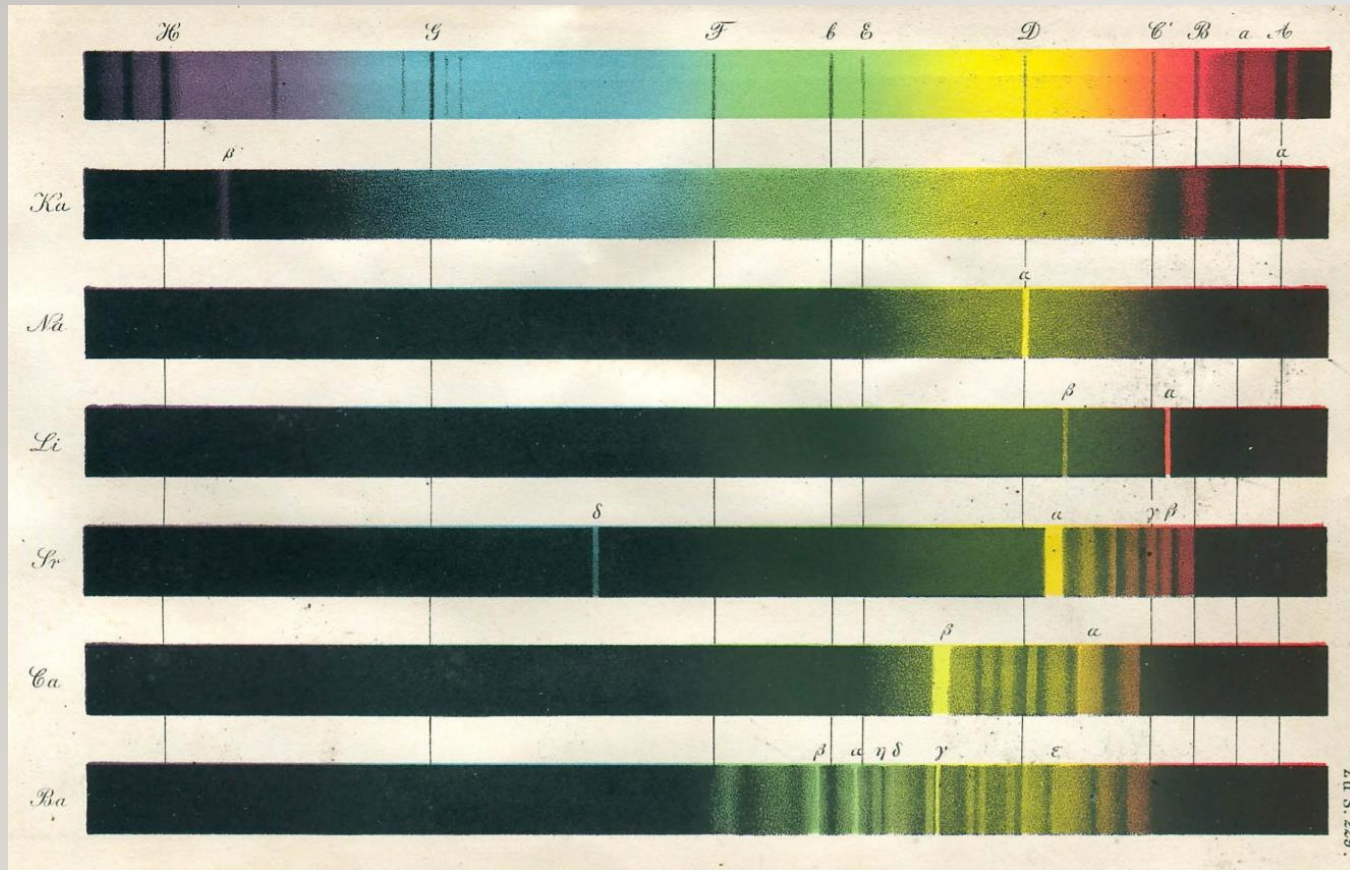
Plücker tubes, 1870 ca.



Four-prism spectroscope, by J. Duboscq of Paris, France, bought at Palermo by Pietro Blaserna in 1867.



MODERN PHYSICS: SPECTROSCOPY



TOYS FROM TRASH

[www.arvindguptatoys.com/
toys/CDspectroscope0.html](http://www.arvindguptatoys.com/toys/CDspectroscope0.html)

Spectra of elements observed by Bunsen and Kirchhoff.

Analyse chimique fondée sur les Observations du Spectre, in *Annales de Chimie et de Physique* 3rd Series, Volume 52, 1861.

MODERN PHYSICS: FLUORESCENCE

Uranium glass
Dubosque, 1871



Figure 5. Blue light emitted by the quinine in commercial tonic water when illuminated with UV light produced by a portable LED torch.

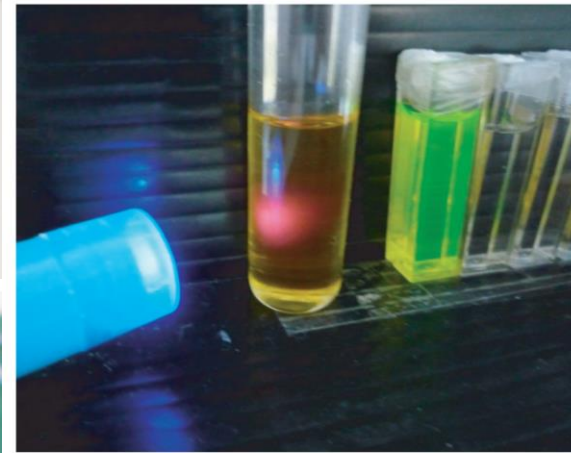
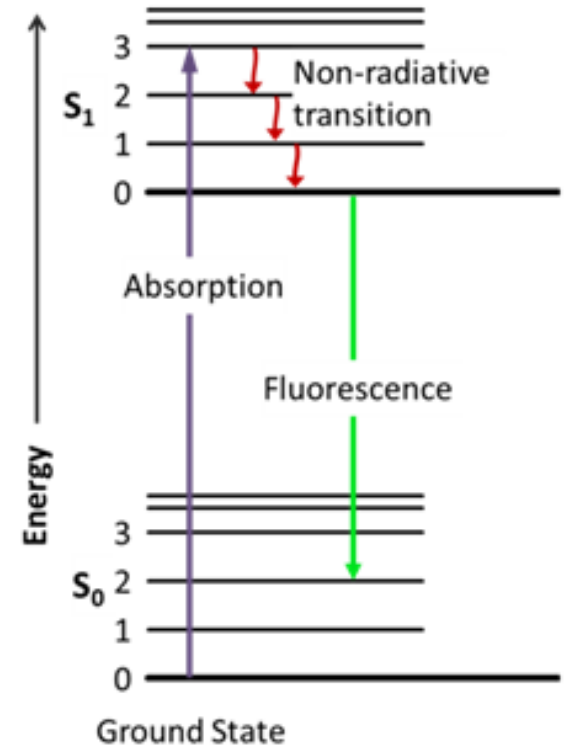


Figure 6. Red light emitted by the extra-virgin olive oil when illuminated with UV light produced by a portable LED torch.



Fluorescent plexiglass

- A. Agliolo Gallitto et al, *Phys. Educ.* **46** (2011) 599
- www.princetoninstruments.com/applications/fluorescence-phosphorescence-photoluminescence

DAMIANO MACALUSO (1845-1932) E LA SCUOLA DI FISICA PALERMITANA



Allievo di Blaserna, il centro dell'attività di Macaluso fu l'insegnamento e la formazione dei giovani studiosi, tra i quali ricordiamo **Orso Mario Corbino**, **Michele Cantone**, **Michele La Rosa** e **Giovan Pietro Grimaldi**.

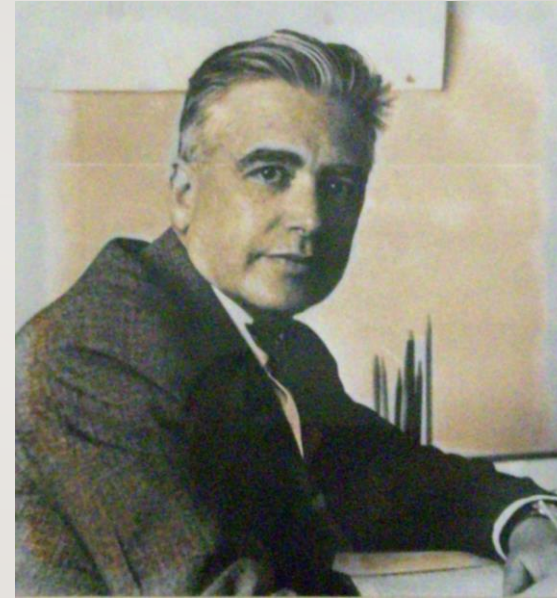
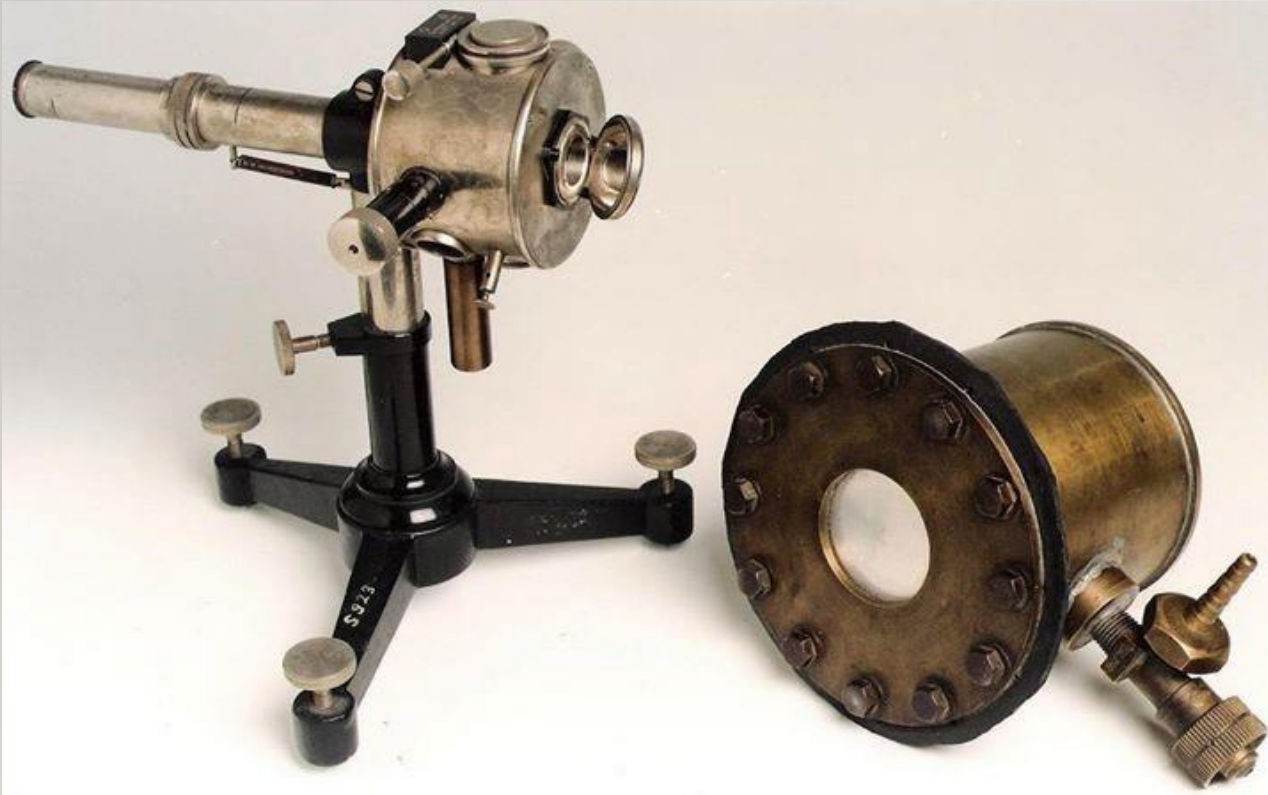
Il suo nome è legato in particolare alle ricerche condotte intorno al 1898 con Corbino sul comportamento della luce polarizzata in un mezzo gassoso assorbente posto in un intenso campo magnetico. Esse portarono a scoprire che il potere rotatorio del vapore di sodio in campo magnetico diventa anomalmente grande in vicinanza delle righe di risonanza (Effetto Macaluso-Corbino).

Ha scritto una *Introduzione allo studio della termodinamica* (1877), che riscosse notevole successo per la sua chiarezza.

Corbino, a sua volta, fondò la famosa scuola romana di via Panisperna, della quale fecero parte i premi Nobel Enrico Fermi ed Emilio Segrè.

- L. Sesta, *In memoria di Damiano Macaluso*, Nuovo Cimento X (1933), 1, pp. 1-2

MODERN PHYSICS: THE DISCOVERY OF ELEMENT 43



Segre and Perrier discovered in Palermo in 1937 the world's first artificial element: the Technetium, ^{43}Tc
Radioactive Isotopes of Element 43, Nature **140** (1937) 193

- A. Bellanca, *Rendiconti della Società Mineralogica Italiana* **5** (1948) 39-43.
- E. Segré, *Autobiografia di un fisico*, Bologna 1995
- R. Zingales, *From Masurium to Trinacrium: The Troubled Story of Element 43*, J. Chem. Educ. **82** (2005) 221



youtu.be/9A2lTiq1wrA

MODERN PHYSICS: THE DISCOVERY OF ELEMENT 43



European Physical Society
EPS Historic Sites, 18.02.2019

On February 18, 2019 the Department of Physics and Chemistry hosted the award ceremony of the plate of "Historic Site" of the European Physical Society, recalling the discovery of the technetium by Emilio Segrè and Carlo Perrier in 1937.



- www.eps.org/page/distinction_sites
- www.primapagina.sif.it/article/911/1937-palermo-the-discovery-of-technetium

THE HISTORICAL COLLECTION ON TV




The armillary sphere in the RaiUno movie "Felicia Impastato" directed by Gianfranco Albano in 2016, with Lunetta Savino.



Armillary sphere (ca 1830), attributed to Henry Dreschler, a pupil of the famous Londoner manufacturer Jesse Ramsden (1735 - 1800).

THE HISTORICAL COLLECTION ON THE WEB

 Cerca youtu.be/sFib48GDPvk



The video player displays a presentation slide with the following content:

- Logos: UNIVERSITÀ DEGLI STUDI DI PALERMO, UNIVERSITÀ MEDITERRANEA DI SIRACUSA, DIFC
- Dipartimento di Fisica e Chimica - Emilio Segrè
- Direttore: Stefana Milioto
- Responsabile scientifico della collezione: Aurelio Agliolo Gallitto
- Image: A photograph of a glass display case filled with various historical physics instruments.
- Text: Collezione Storica degli Strumenti di Fisica dell'Università Via Archirafi, 36, Palermo

0:03 / 1:29

PALERMO
Gli Strumenti di Fisica dell'Università di Palermo

62 visualizzazioni • 24 feb 2021

1 0 CONDIVIDI SALVA

47 B/s 54% 12:34

sites.google.com/site/aurelio



The mobile website screenshot shows the following content:

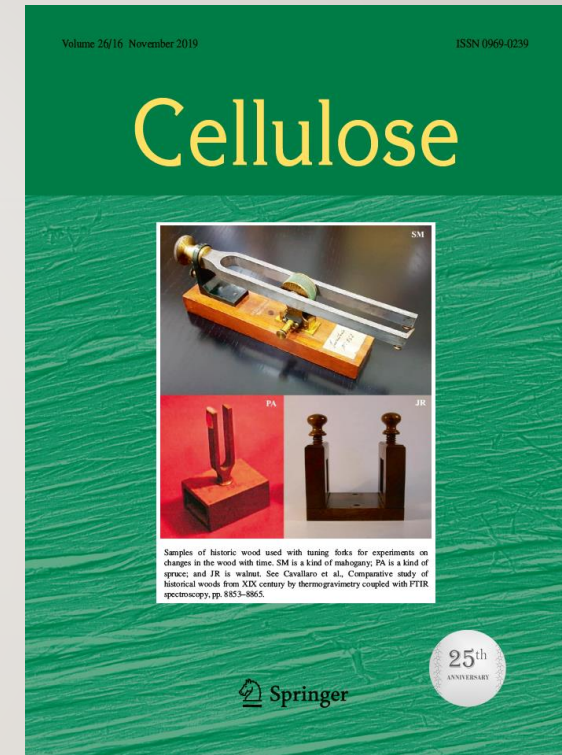
- Header: Università degli Studi di Palermo
- Main Title: Collezione Storica degli Strumenti di Fisica
- Subtitle: Historical Collection of the Physics Instruments
- Image: A photograph of a historical physics instrument, possibly an armillary sphere or a similar celestial model.

sites.google.com/site/aurelioagliologallitto/collezione-storica/

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G. Cavallaro et al, *Comparative study of historical woods from XIX century by thermogravimetry coupled with FTIR spectroscopy*, Cellulose **26** (2019) 8853

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-  A. Agliolo Gallitto, O. R. Battaglia, G. Cavallaro, G. Lazzara, L. Lisuzzo, and C. Fazio, *Exploring historical scientific instruments by using mobile media devices*. *The Physics Teacher* (2021), in press
-  A. Agliolo Gallitto, R. Zingales, O. R. Battaglia, and C. Fazio, *An approach to the Venturi effect by historical instruments*, *Physics Education* **56** (2021) 025007
-  A. Agliolo Gallitto, I. Chinnici, and R. Zingales, *1937: Palermo. The discovery of Technetium*. In Esposito S., Fregonese L., and Mantovani R. (eds) *Proceedings of the XXXVIII Congress of SISFA*, Messina 3-6 October 2018. Pavia University Press 2020, pp. 25
-  G. Cavallaro, A. Agliolo Gallitto, L. Lisuzzo, G. Lazzara, *Comparative study of historical woods from XIX century by thermogravimetry coupled with FTIR spectroscopy*, *Cellulose* **26** (2019) 8853
-  B. Spagnolo, *1937, Palermo: the discovery of technetium*, *SIF PrimaPagina* **62**, febbraio 2019
-  A. Agliolo Gallitto, I. Chinnici, F. Bartolone, *La collezione degli strumenti storici di acustica dell'Università di Palermo*, *Museologia Scientifica* **12** (2018) 48
-  A. Agliolo Gallitto, V. Pace, R. Zingales, *The silver voltameter: an essential instrument for the definition of the unit of electric current*, *Bulletin of the Scientific Instrument Society* **135** (2017) 26
-  A. Agliolo Gallitto, V. Pace, R. Zingales, *Multidisciplinary learning at the university scientific museums: the Bunsen burner*, *Museologia Scientifica* **11** (2017) 103
-  T. Sear, *The Historical Collection of Physics Instruments of Palermo University*, *Bulletin of Scientific Instrument Society* **132** (2017) 32
-  F. Aglione, A. Agliolo Gallitto and E. Fiordilino, *'Naughty cylinder' mechanical paradox*, *Physics Education* **48** (2013) 137
-  A. Agliolo Gallitto and E. Fiordilino, *The double cone: a mechanical paradox or a geometrical constraint?*, *Physics Education* **46** (2011) 682

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- Onofrio Rosario Battaglia
- Claudio Fazio

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THANKS!

