

THE HISTORICAL COLLECTION OF PHYSICS INSTRUMENTS AND THE MUSEUM SYSTEM OF THE UNIVERSITY OF PALERMO

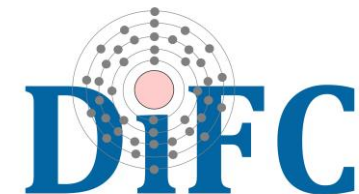
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UNIVERSITÀ
DEGLI STUDI
DI PALERMO

MUSEIUNIPA
Sistema Museale dell'Università degli Studi di Palermo



ABSTRACT

In 2011, the University of Palermo instituted the University Museum System (Sistema Museale di Ateneo, SiMuA), in order to coordinate all the museum activities with the aim to pursue common goals, to foster the development of their activities and making them accessible to the public at large. The SiMuA coordinates 6 Museums and 13 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” and the “Specola”, the latter housed in the Astronomical Observatory founded in 1790; the Museum of Radiology and the Museum of Engines and Mechanisms. The Collections mainly concern single disciplines of science and technology.

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

The SiMuA, combining the development of the individual museum institutions with a more general University's policy that tends to protect them and their enrichment, promote the enhancement of this heritage through a better coordination between its facilities and the organization of events, exhibitions, conferences, etc. A large effort has been devoted to the *Virtual Tour*, online interactive 360° panoramic photos; it ensures an immersive feeling and high user's involvement. One can freely wander through the museum halls or the open spaces of the Botanical Garden as well.

I will describe the Museum System of the University of Palermo and in particular the Historical Collection of the Physics Instruments, with more attention to the activities carried out in collaboration 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 coordinate all the museum activities to foster the development of their activities and making them accessible to the public at large.

The SiMuA coordinates 6 Museums and 13 Collections

www.musei.unipa.it

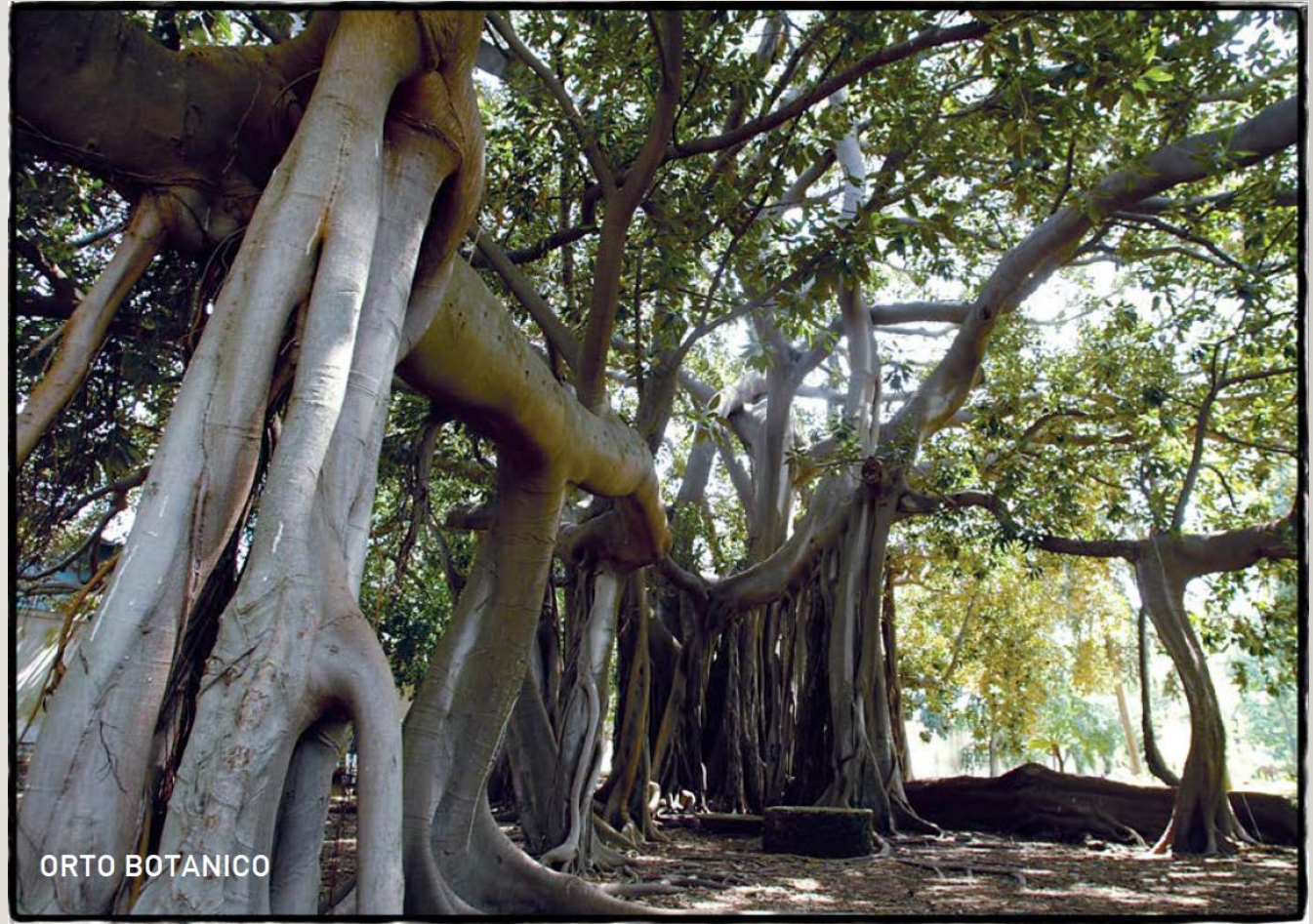
- The Museum of Zoology “P. Doderlein”
- The Botanical Garden
- The Museum of Geology “G. G. Gemmellaro”
- The “Specola” and the Astronomical Observatory
- The Museum of Radiology
- The Museum of Engines and Mechanisms



THE MUSEUM OF ZOOLOGY "P. DODERLEIN"



THE BOTANICAL GARDEN



THE MUSEUM OF GEOLOGY "G.G. GEMMELLARO"



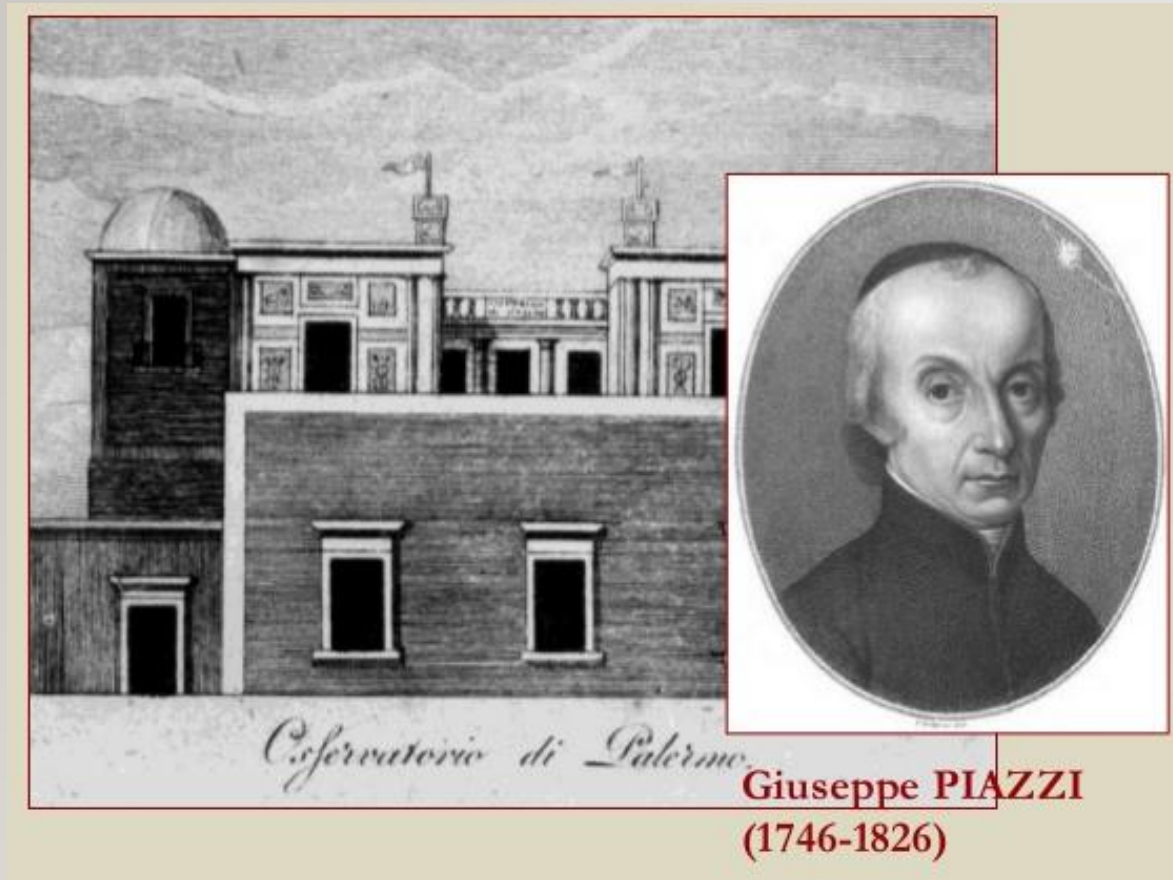
Thea, a prehistoric human of Sicily.



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 1786 under the Bourbons.



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

Source: MEDIA INAF



Rome, 18 May 2017

THE MUSEUM OF RADIOLOGY



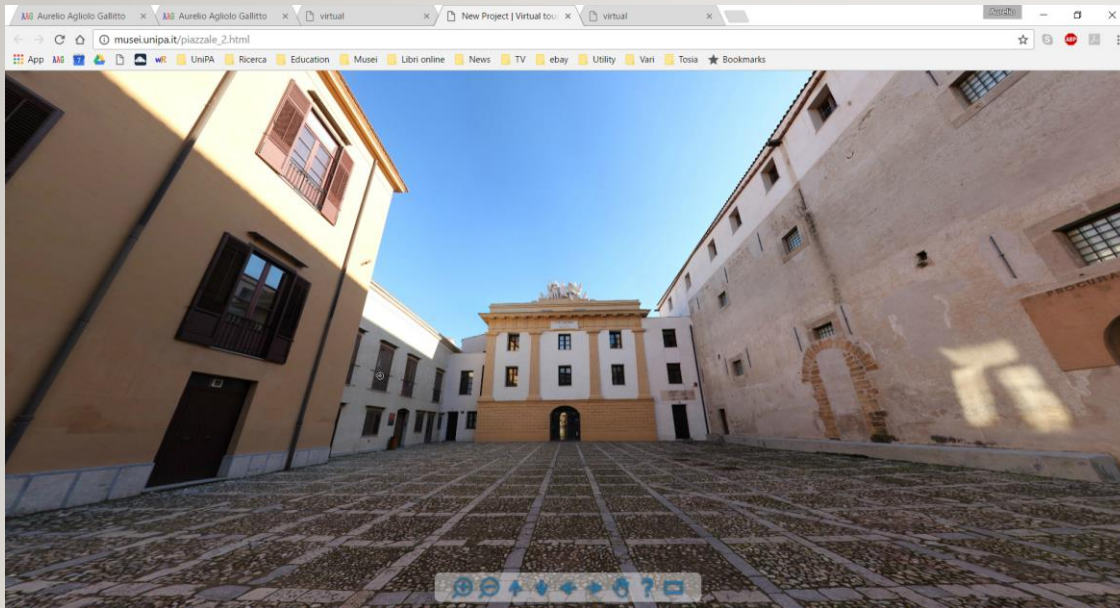
The **Museum of Radiology** was inaugurated in **1995** during the celebrations of the centennial of the **discovery of the X-ray in 1895** by **Wilhelm Conrad Roentgen (1845 – 1923)**.

THE MUSEUM OF ENGINES AND MECHANISMS

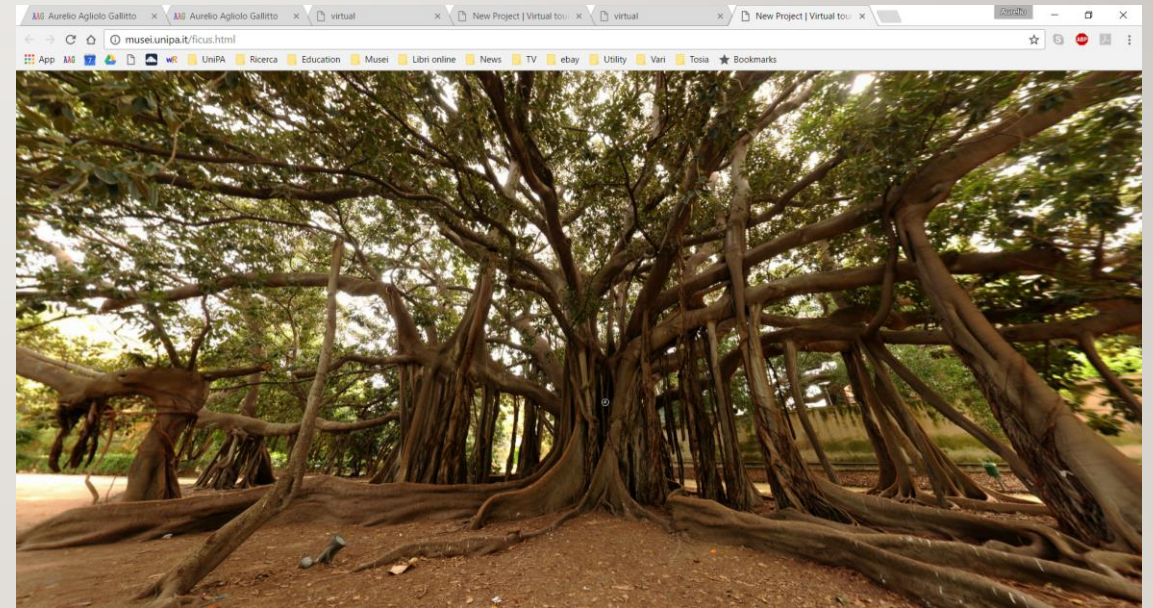


SOME ACTIVITIES OF THE MUSEUM SYSTEM: VIRTUAL TOURS

A large effort has been devoted to the realization of *Virtual Tours*: online interactive 360° panoramic photos, to ensures an immersive feeling and high user's involvement.



musei.unipa.it/piazzale_2.html



musei.unipa.it/ficus.html

THE ISTITUTO DI FISICA AND ITS HISTORICAL COLLECTION

The Historical Collection of Physics Instruments is displayed at the Department of Physics and Chemistry 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.



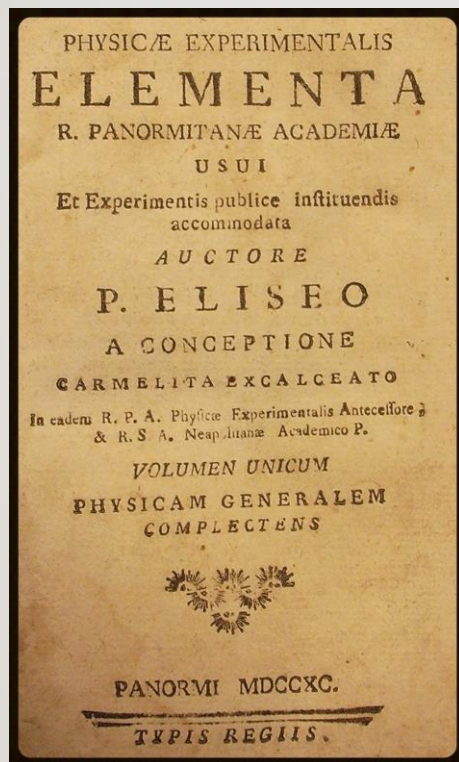
The historical building of the Istituto di Fisica of via Archirafi 36

THE ISTITUTO DI FISICA AND ITS HISTORICAL COLLECTION (2)

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.

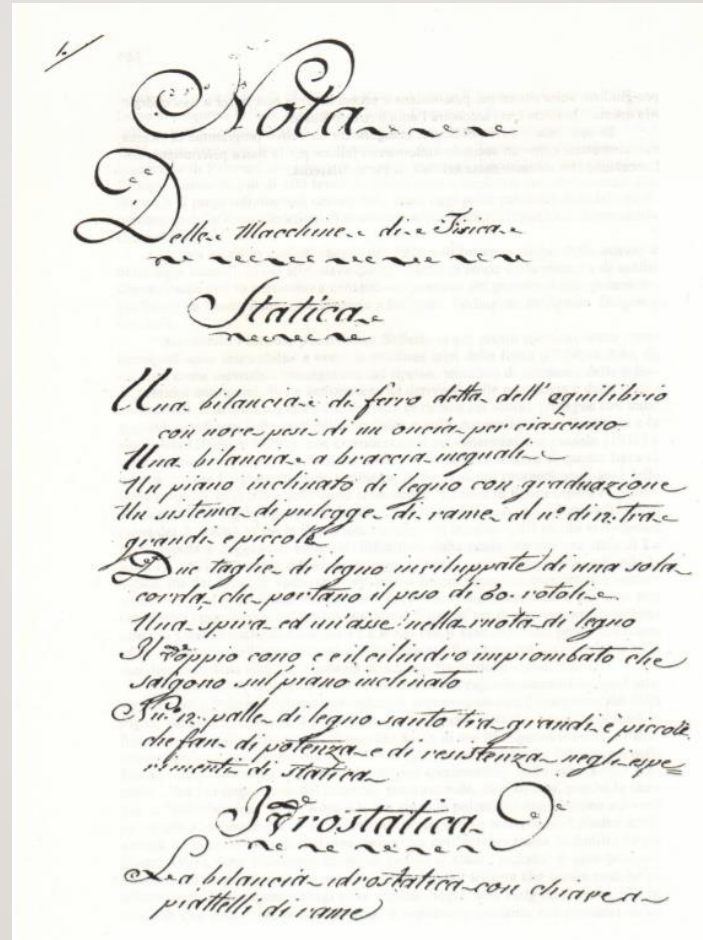
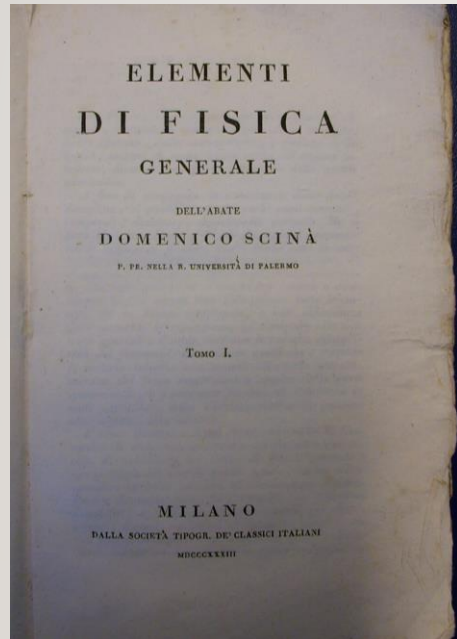
Titolare della cattedra di Fisica Sperimentale dal 1786 fino al 1811. Si occupò di ricerca sperimentale nel campo della chimica pneumatica, la respirazione e la dottrina dei nuovi gas con quella del flogisto. Partecipò, come cartografo, alla spedizione in Calabria dopo il terremoto del 1783.



Showcases containig instruments

MECHANICS

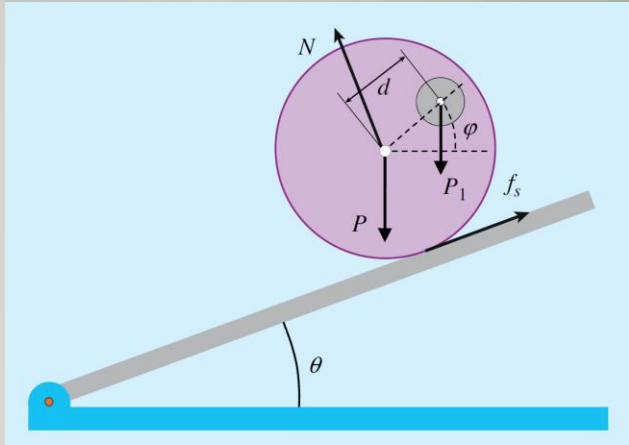
The equipment grows considerably after Domenico Scinà got the chair of Experimental Physics, in 1811, at the old “Gabinetto di Fisica” of the “Reale Università di Palermo”.



MECHANICS (2)



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



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

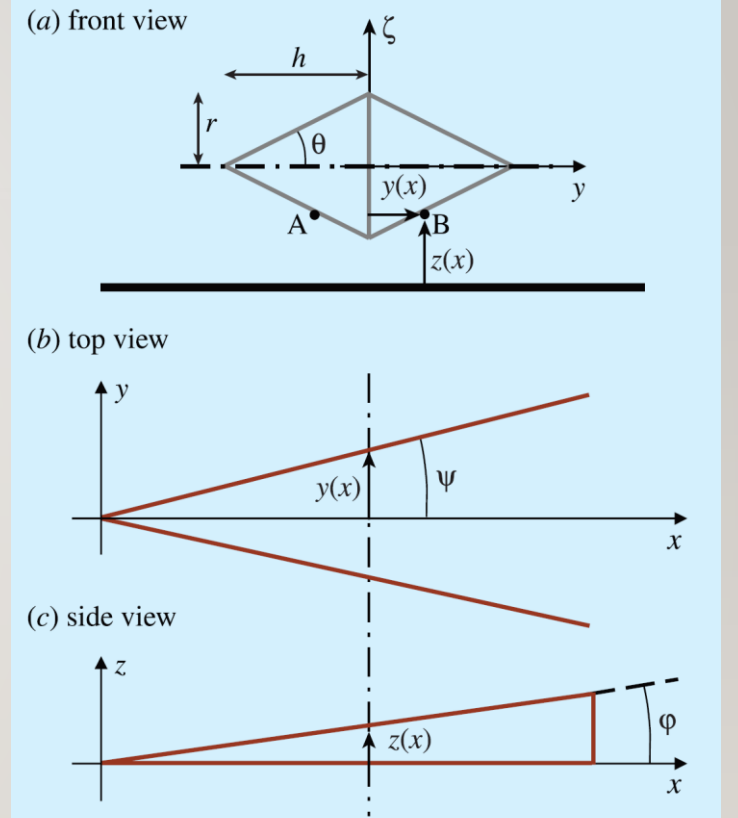


Figure 2. Schematic perspectives of the double cone and the rails: (a) front view of the double cone, (b) top view of the rails and (c) side view of the rails.

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 of the limit angle.

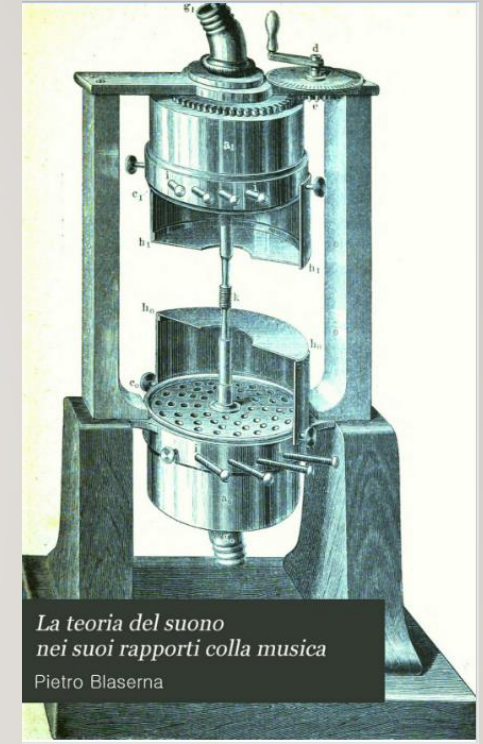
PIETRO BLASERNA AND THE ACUSTICAL INSTRUMENTS



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).

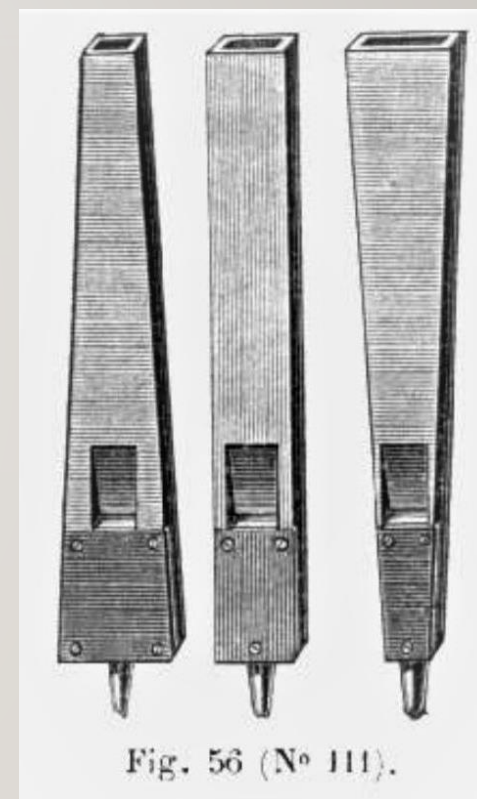
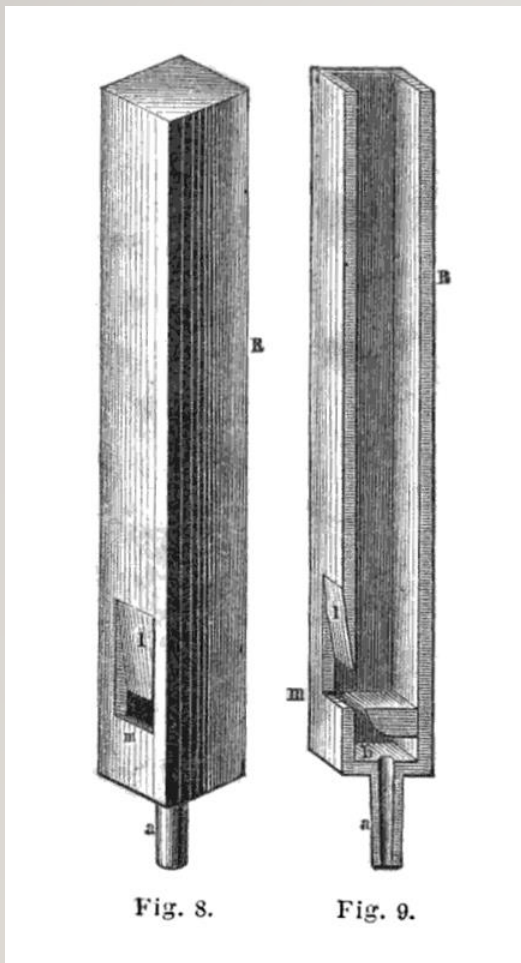
Nell'aprile del 1863, Pietro Blaserna fu nominato Professore di Fisica sperimentale all'Università di Palermo. Qui pubblicò vari lavori sull'elettricità, ottica, tra cui uno sulla polarizzazione della corona solare osservata in Augusta durante l'eclisse totale del 22 dicembre 1870 (Il Nuovo Cimento 6,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



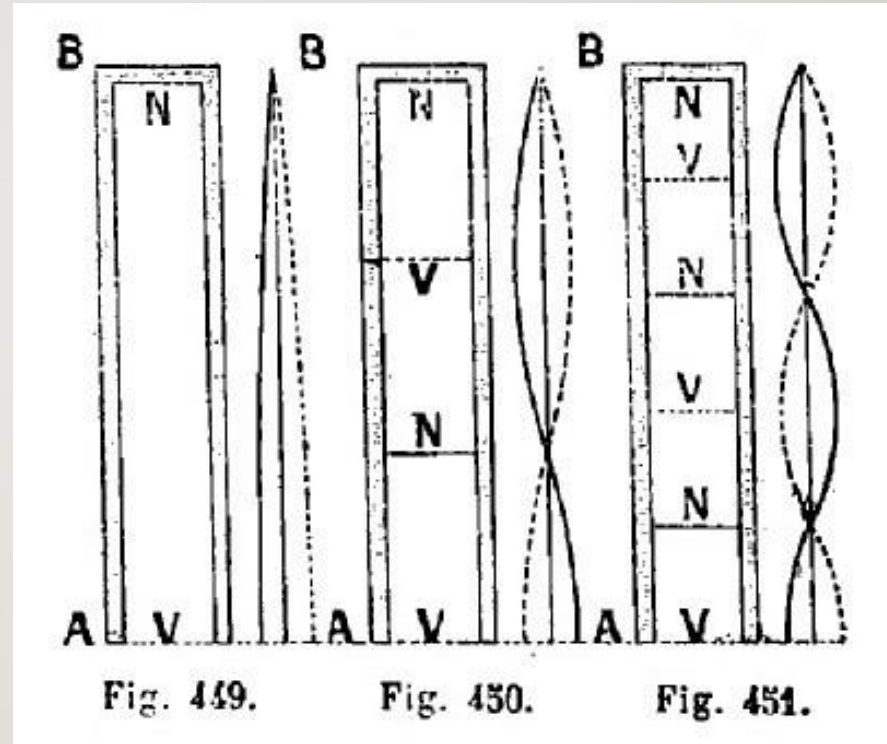
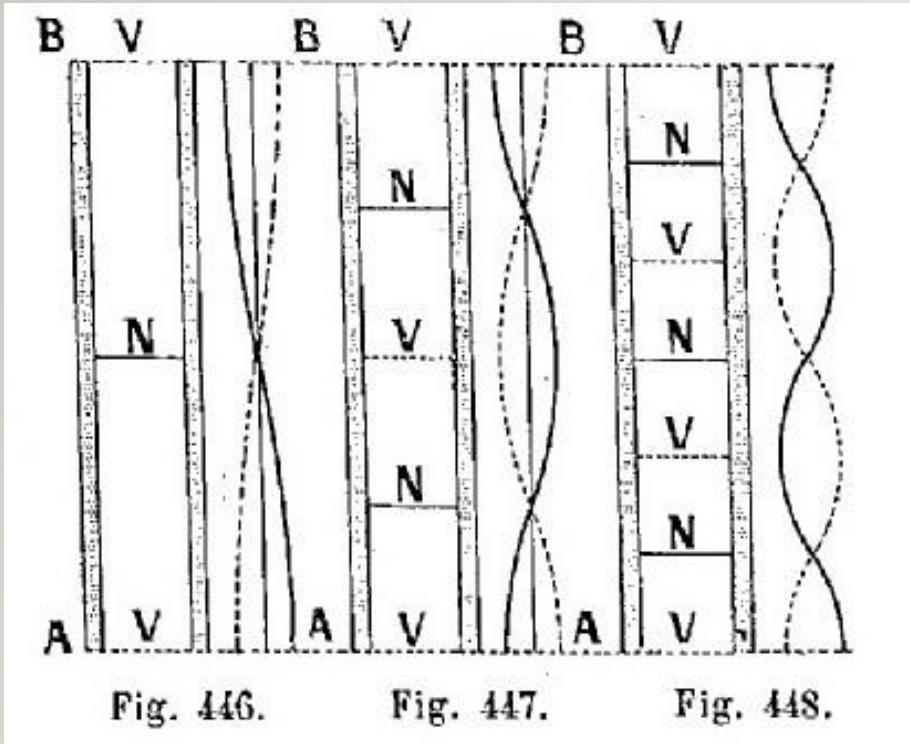
*La teoria del suono
nei suoi rapporti colla musica*
Pietro Blaserna

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



$$l = n \frac{\lambda}{2}$$

$$v = \lambda f$$

$$l = \left(n - \frac{1}{2} \right) \frac{\lambda}{2}$$

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

ACOUSTICS: THE VISUALIZATION OF SOUND VIBRATIONS

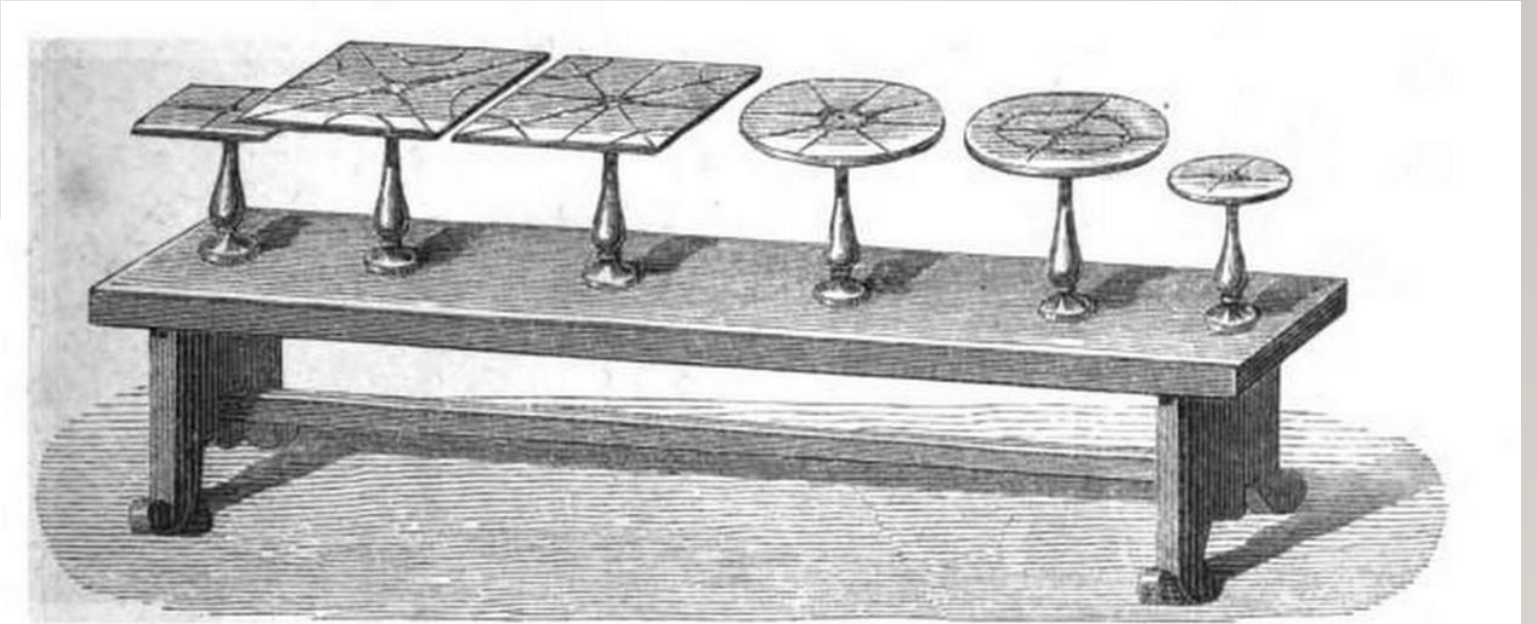
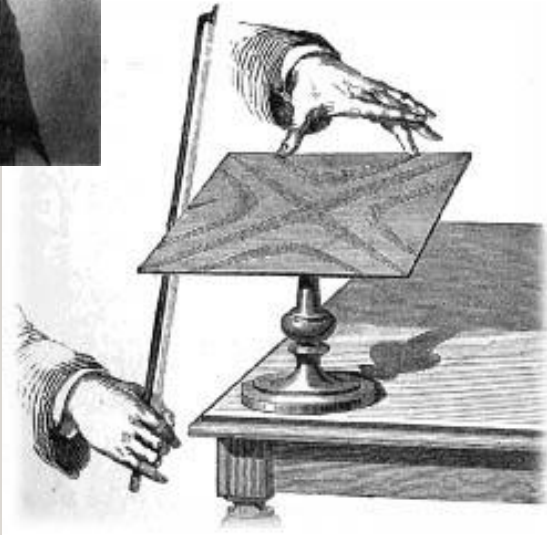
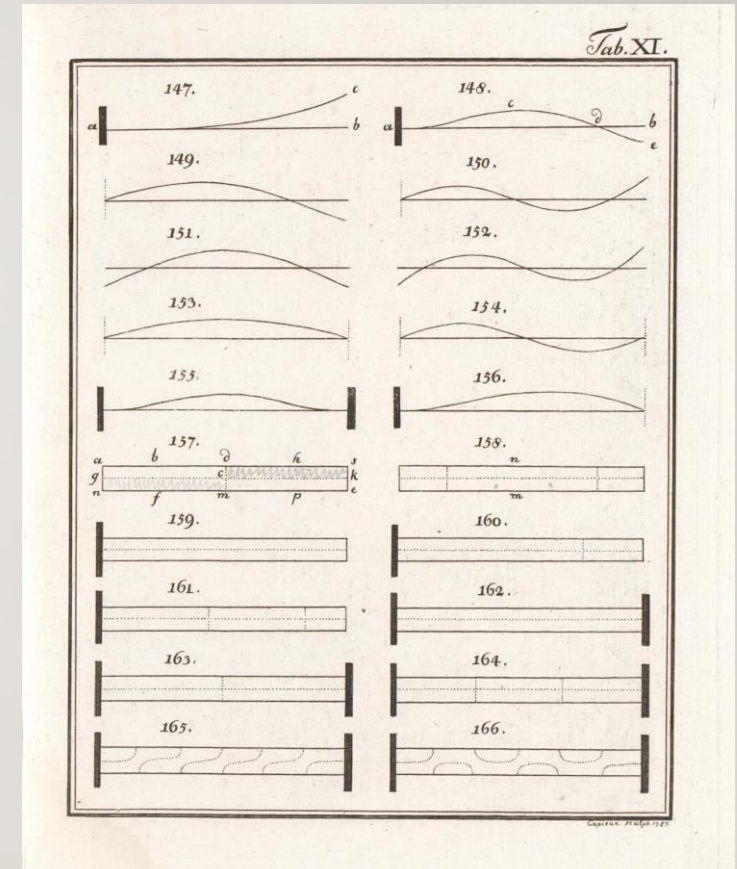
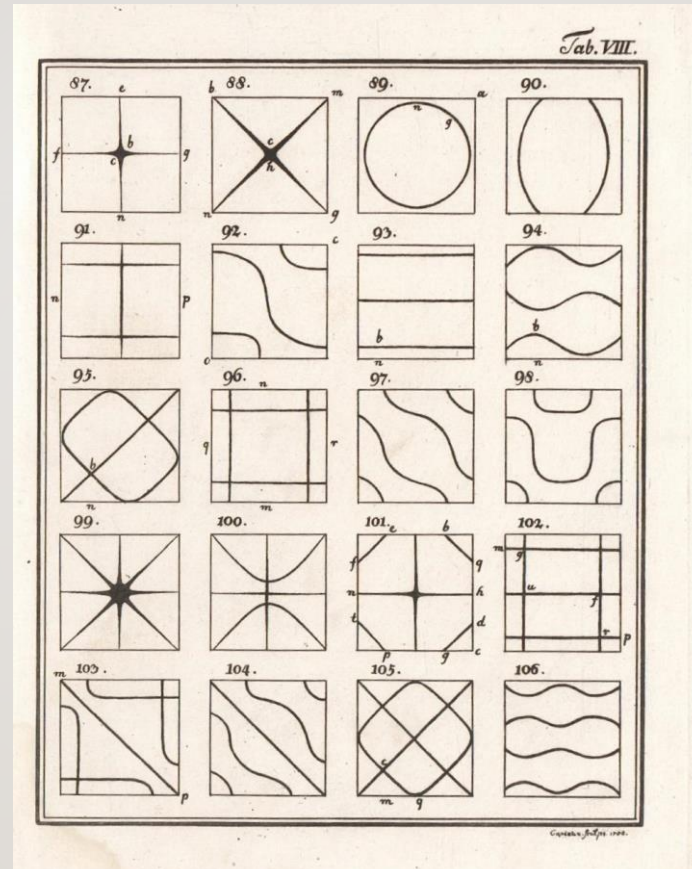
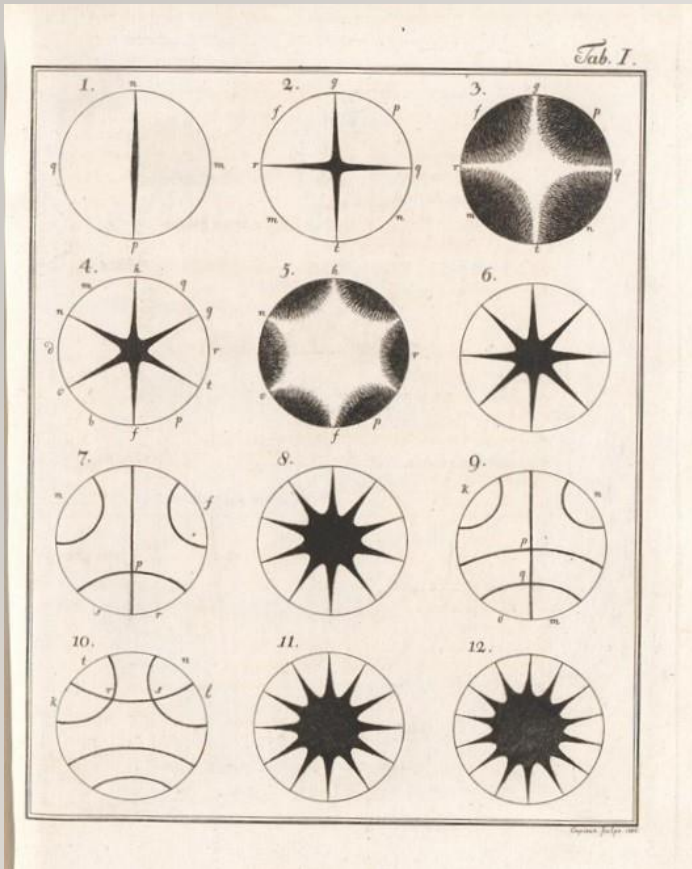


Fig. 6. Tavola di Chladni

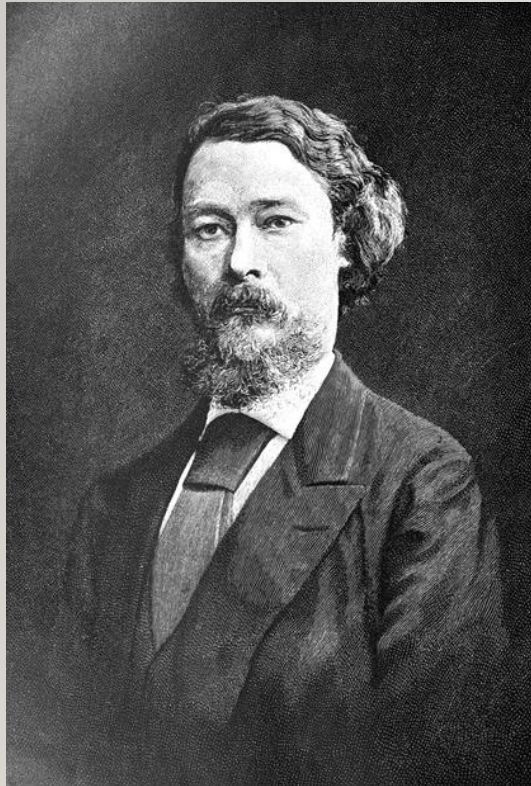
Ernst Florens Friedrich Chladni (1756 - 1827)

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



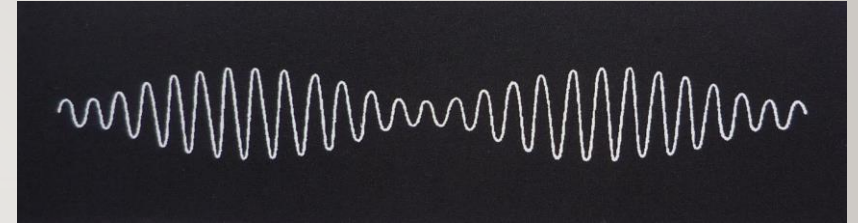
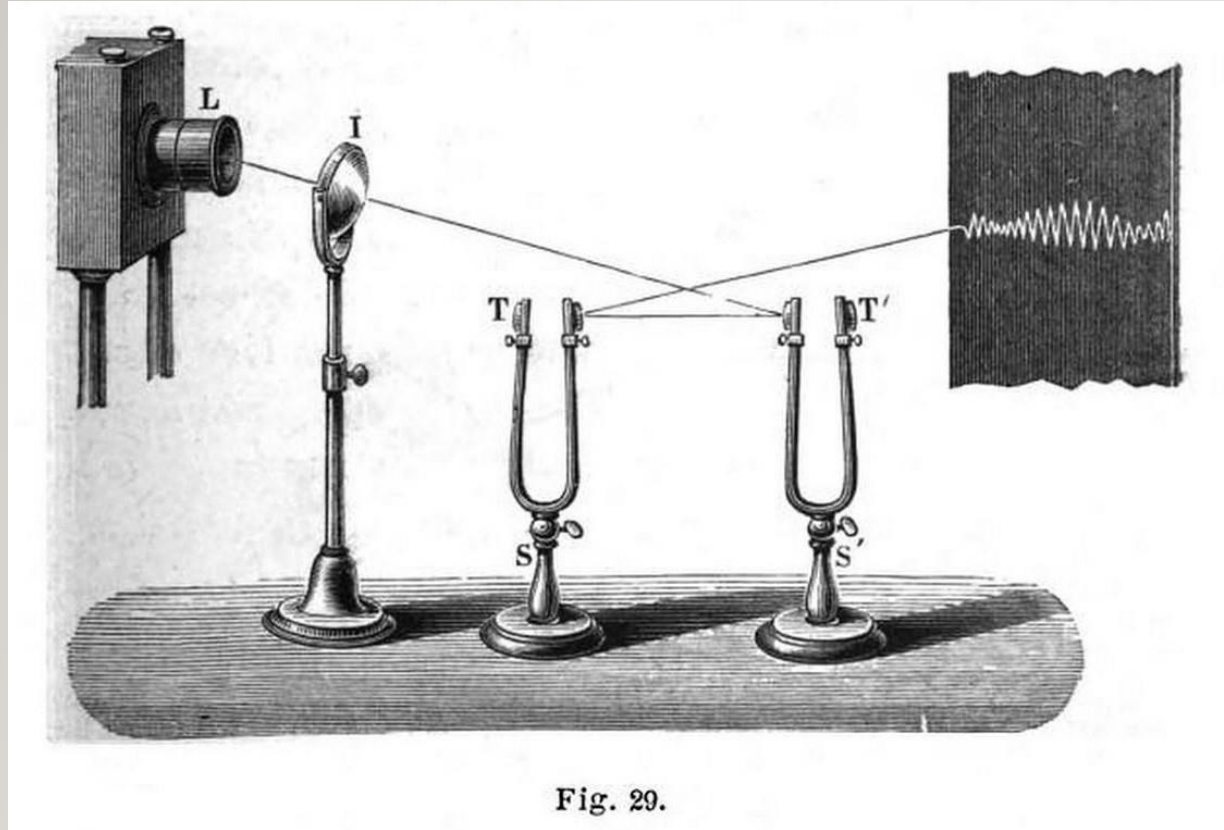
Rudolph Koenig
27, Quai d'Orléans.



«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



Rudolph Koenig à Paris, 1870 ca.

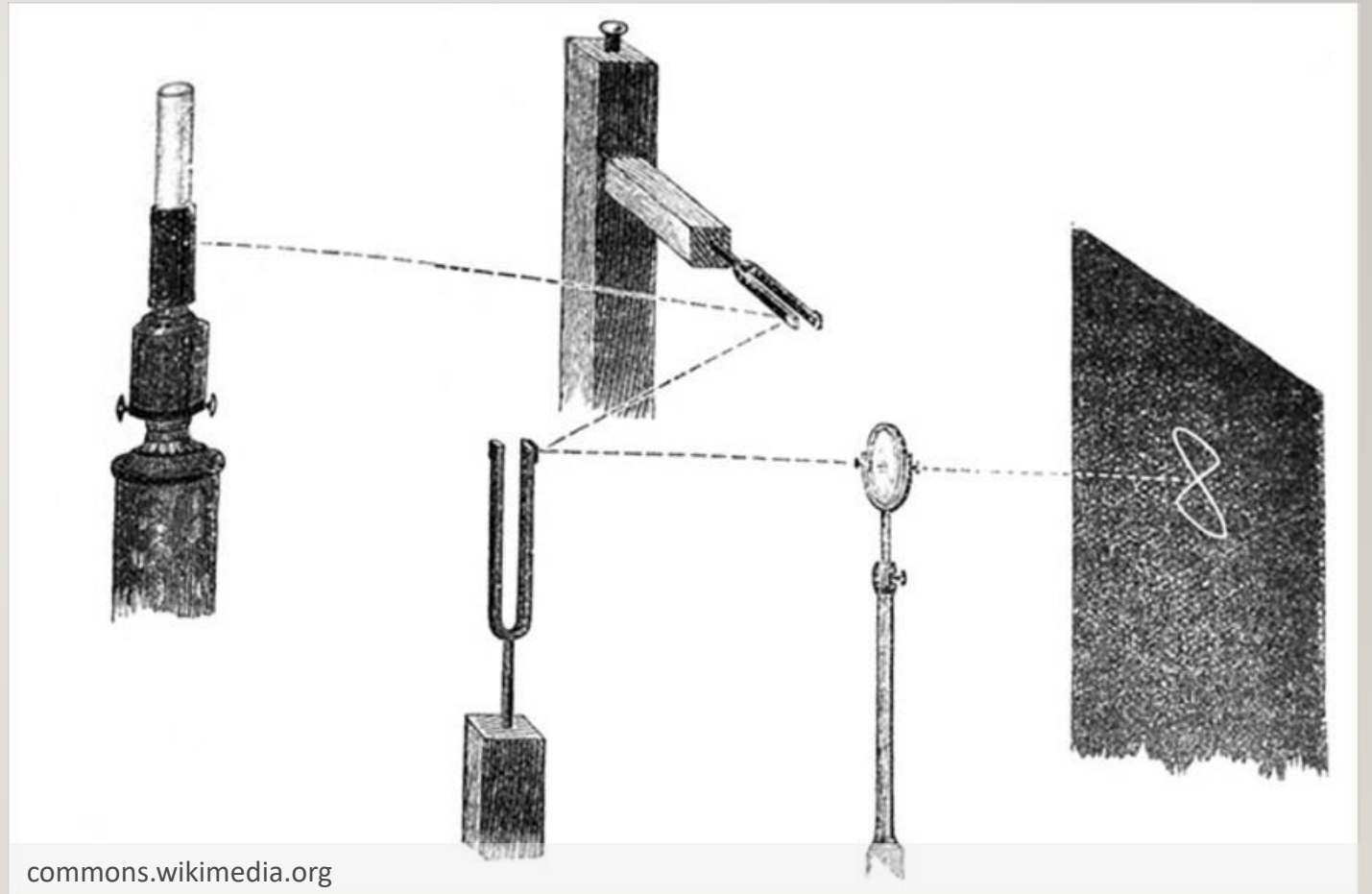


LISSAJOUS FIGURES

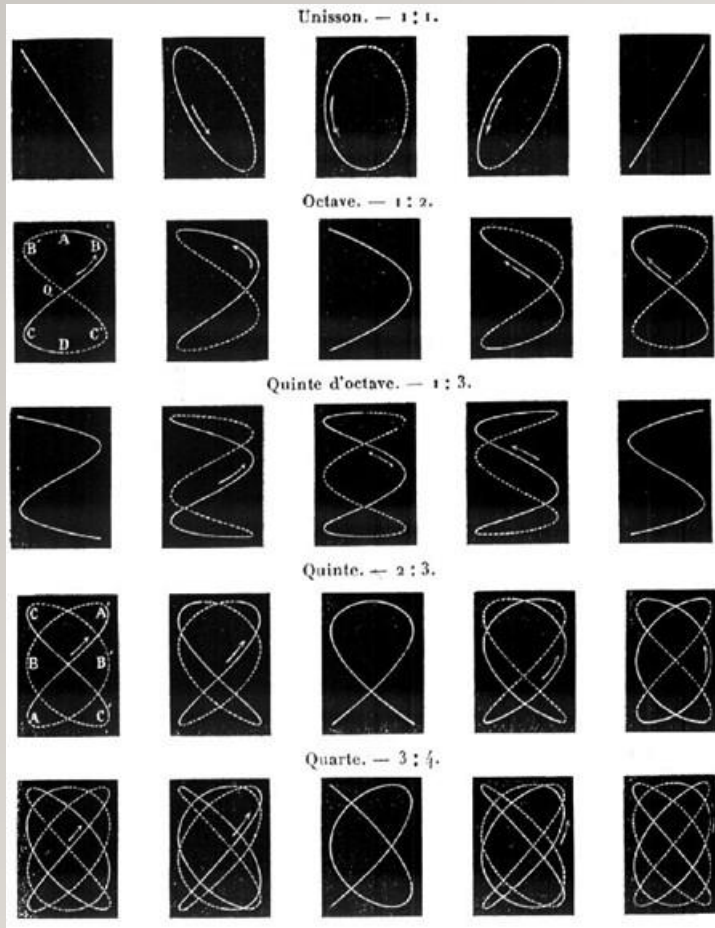


In 1857, Jules Antoine Lissajous (1822 - 1880) thought of a method of reflecting a light beam from the arms of two vibrating tuning fork perpendicularly to each other.

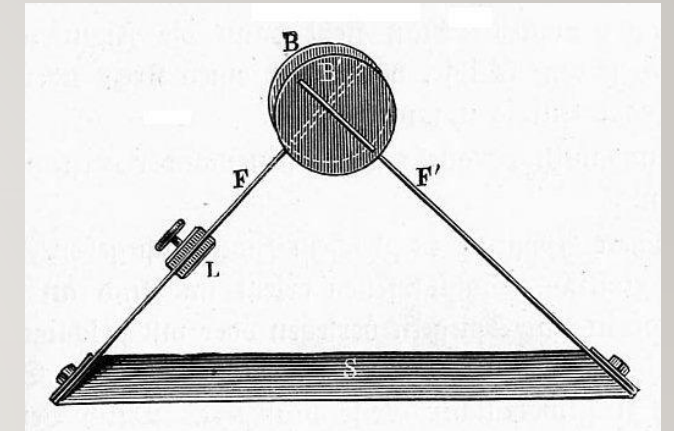
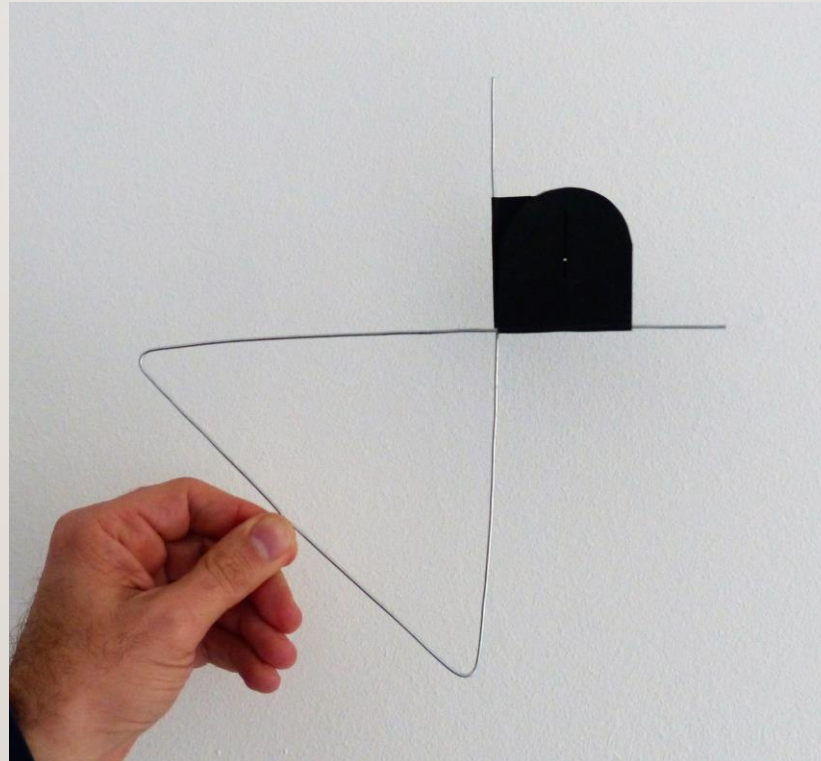
Nel 1857, Jules Antoine Lissajous (1822 - 1880) ha pensato un metodo per fare riflettere un fascio luminoso dai rebbi di due diapason vibranti perpendicolarmente l'uno dall'altro.



LISSAJOUS FIGURES (2)



By this way, it was possible to visualize musical chords!



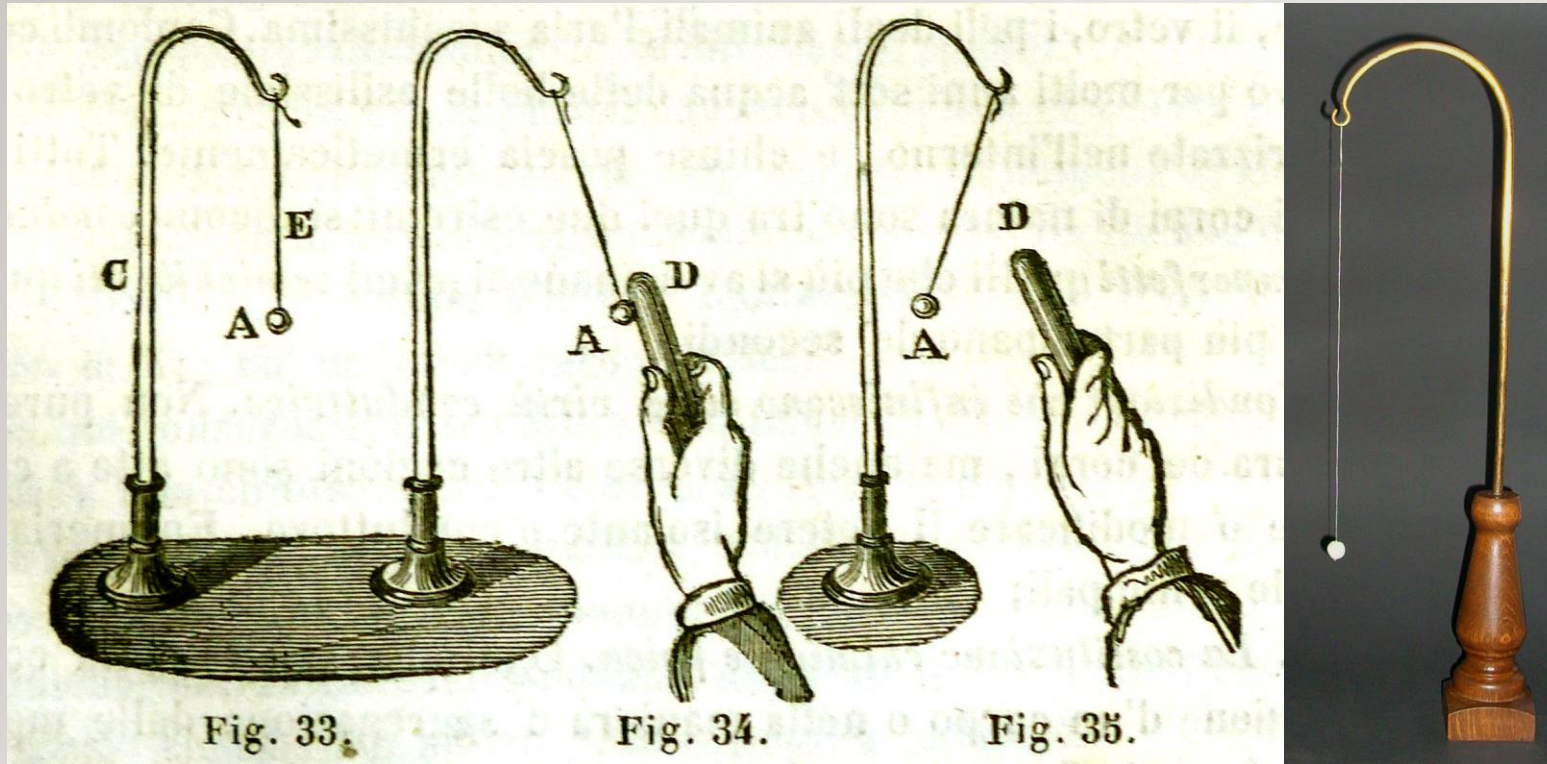
Pfaundler's plate-spring vibrator, 1888

physik.uibk.ac.at/museum

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

ELECTROSTATICS

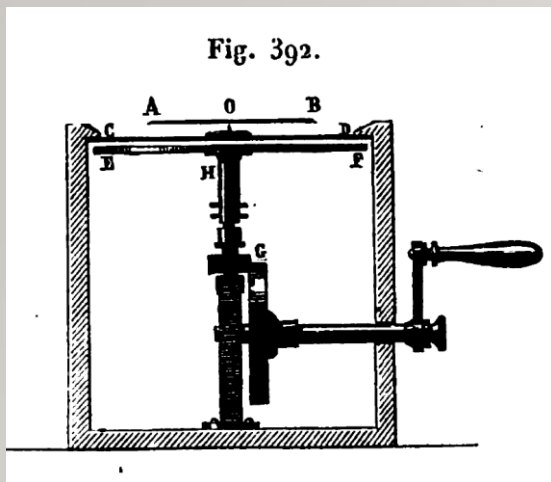
Elder marrow electric pendulum



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



ELECTROMAGNETISM

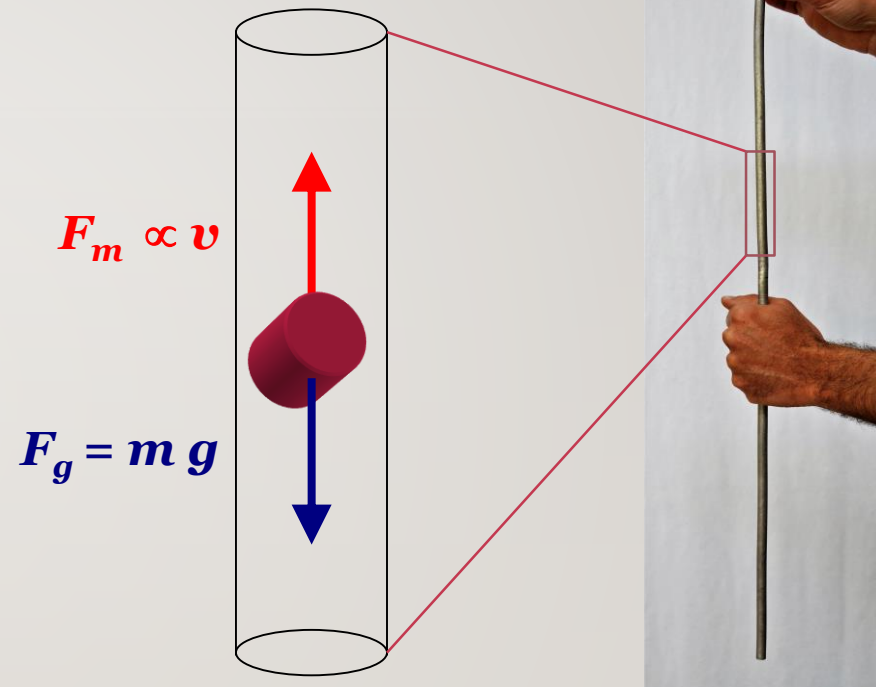


Arago's disk, Ruhmkorff 1868



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

Lenz Law Experiment

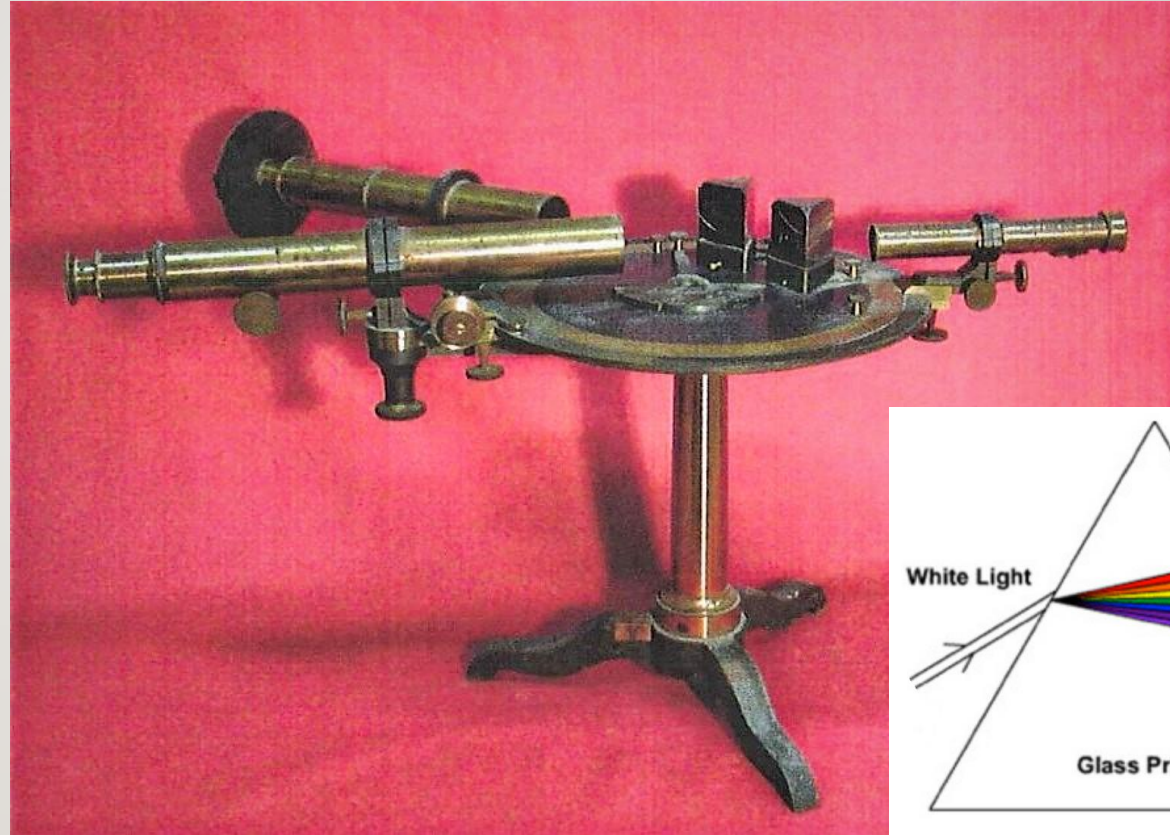


- J. Priest, B. Wade, *A Lenz Law Experiment*, Phys. Teach. 30 (1992) 106
- A. Sconza, G. Torzo, *Il freno elettromagnetico: un altro esperimento sulla legge di Lenz*, LFnS XXXV (2002) 132

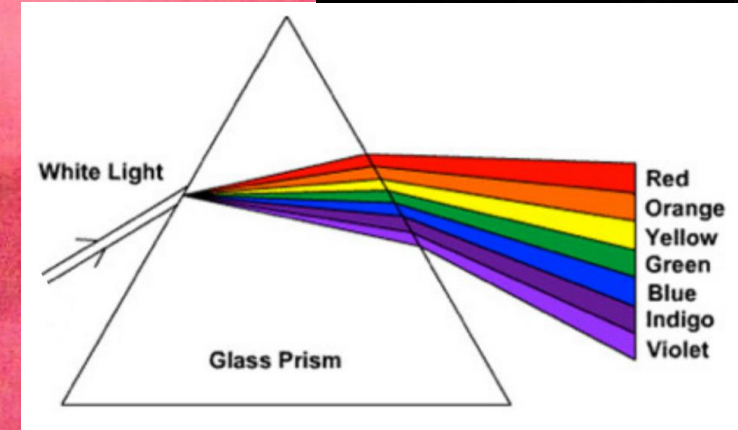
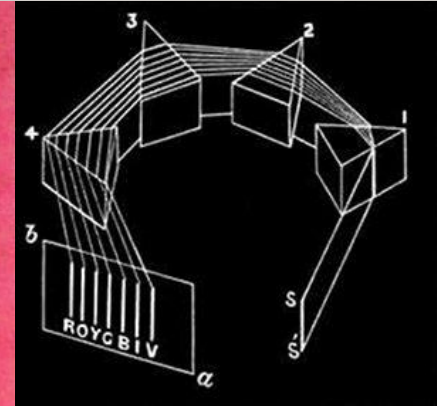
MODERN PHYSICS: SPECTROSCOPY



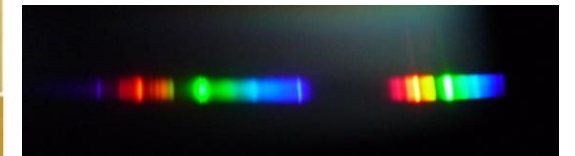
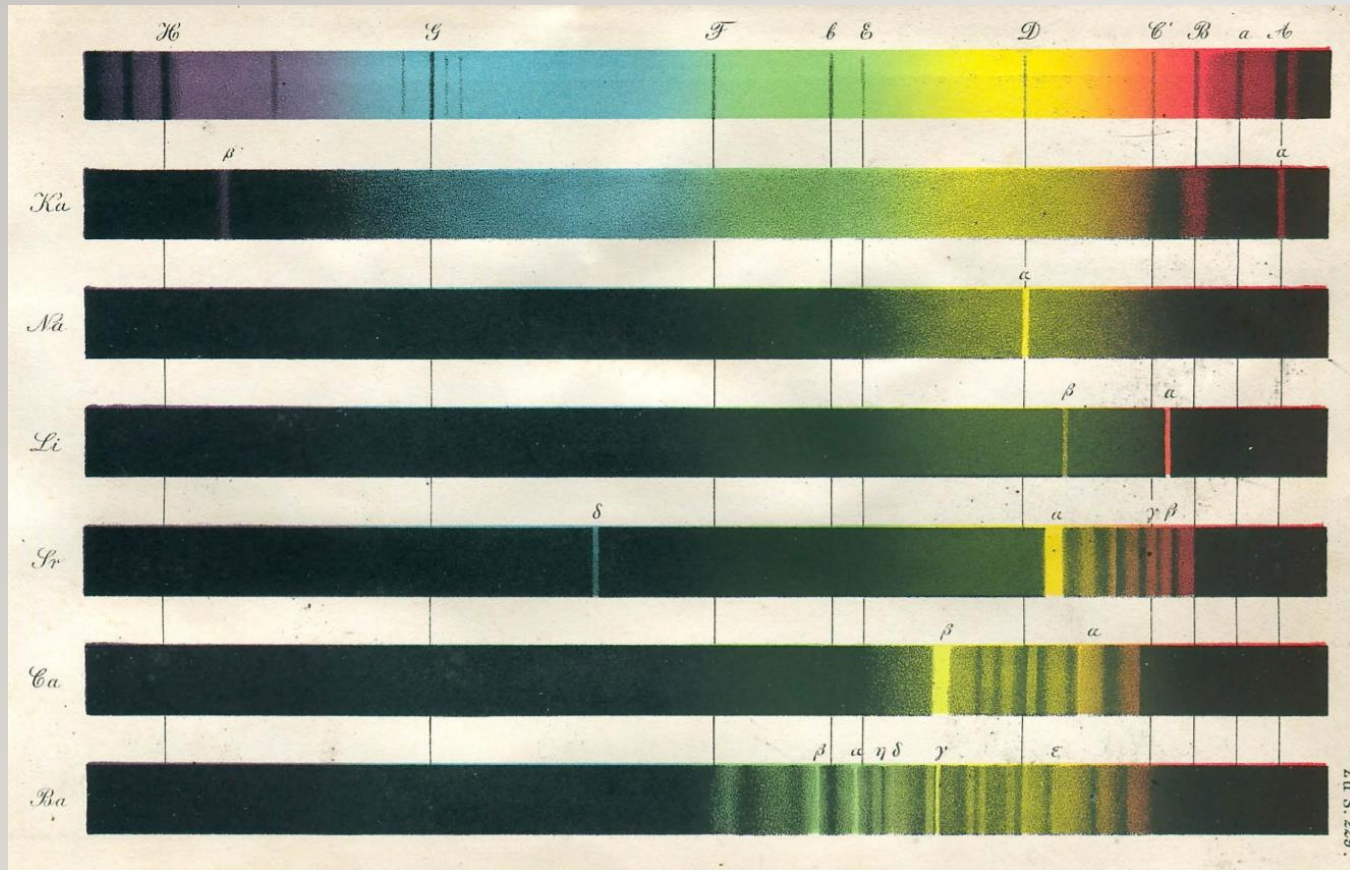
Plücker tubes, 1870 ca.



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



MODERN PHYSICS: SPECTROSCOPY (2)



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.

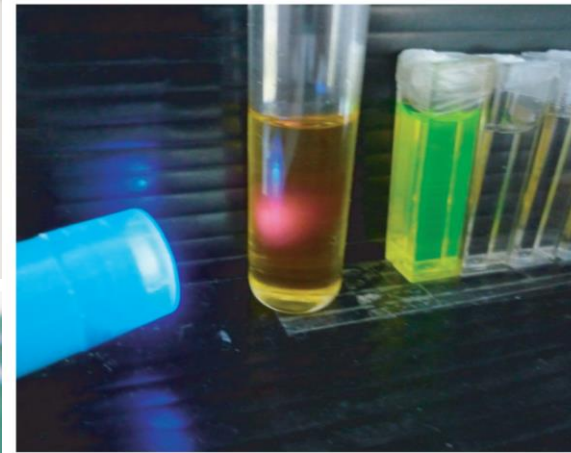
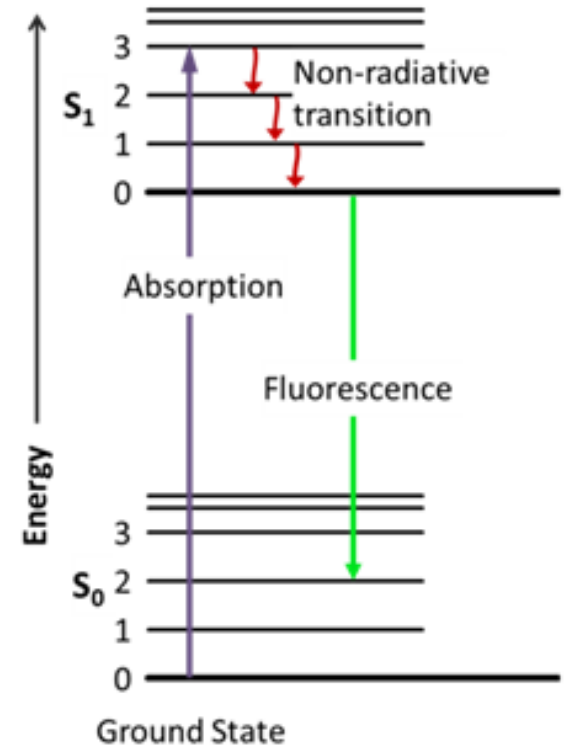


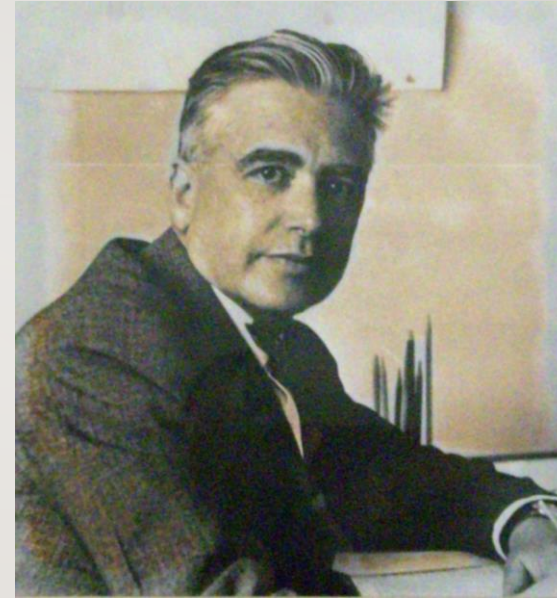
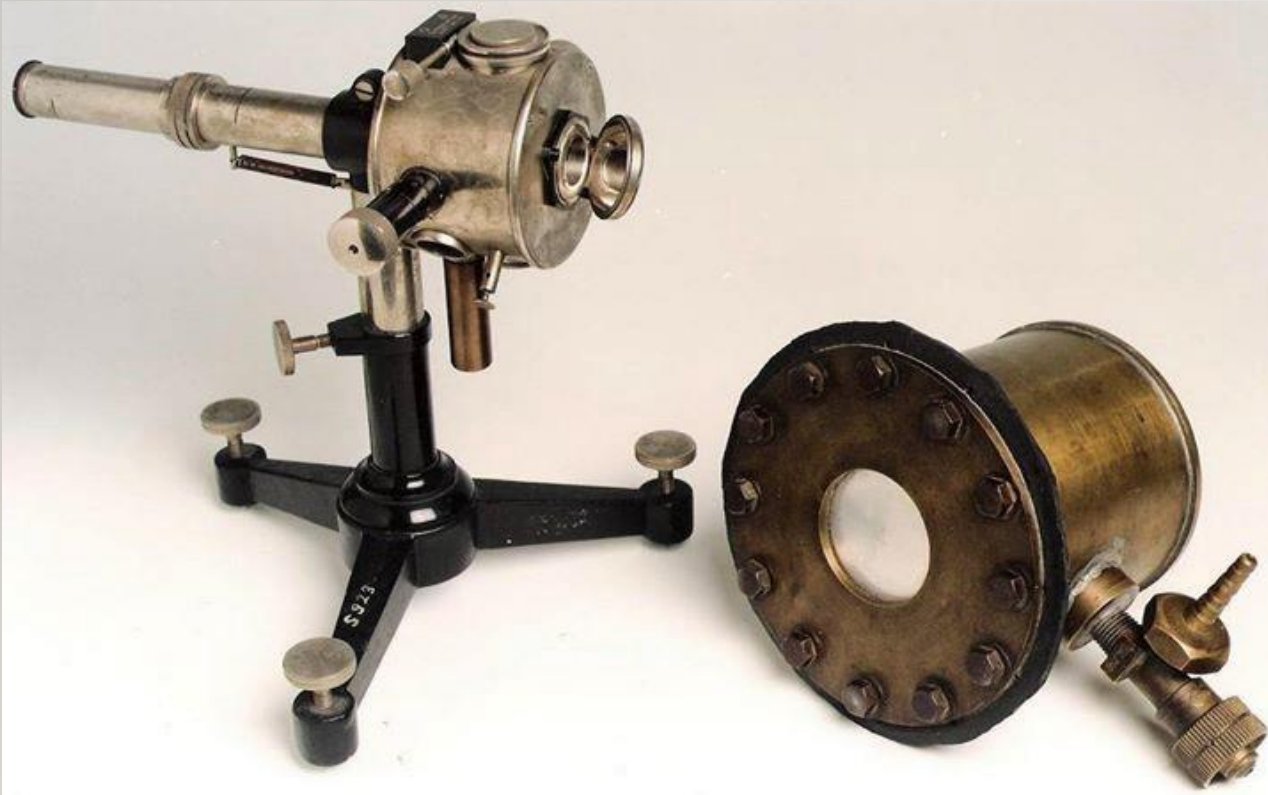
Figure 6. Red light emitted by the extra-virgin olive oil when illuminated with UV light produced by a portable LED torch.



Fluorescent plexiglass

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

MODERN PHYSICS: THE DISCOVERY OF ELEMENT 43



Segrè 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. Segrè, *Autobiografia di un fisico*, Bologna 1995
- R. Zingales, *From Masurium to Trinacrium: The Troubled Story of Element 43*, *J. Chem. Educ.* **82** (2005) 221

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).

OUR ACTIVITIES: AGREEMENTS AND PROJECTS









Agreements


-  Liceo Classico “Umberto I” di Palermo, 7.06.2014
-  IIS “Damiani Almeyda – Crispi” di Palermo, 12.01.2015
-  Liceo Musicale “Regina Margherita” di Palermo, 7.10.2016
-  Liceo Scientifico “S. Cannizaro” di Palermo, 7.10.2016

Projects

-  Bando MIUR DD N. 1524 del 8 luglio 2015 – Titolo 2, “**Musica e Scienza degli Strumenti**”, scuola proponente: Liceo "Regina Margherita" di Palermo
-  (Proposal) PON 2014-2020 “**Didattica museale e laboratoriale: imparo attraverso il conoscere il fare e il condividere per incrementare le competenze di base di scienze integrate**” - Asse I, Azione 10.2.1, scuola proponente: IIS “Damiani Almeyda - Crispi” di Palermo


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-  **A. Agliolo Gallitto**, V. Pace, R. Zingales, *The Venturi effect and its applications: the hydraulic air pump and the Bunsen burners*, (2017) submitted
-  **A. Agliolo Gallitto**, V. Pace, R. Zingales, *A multidisciplinary learning at the university scientific museums: the Bunsen burners*, (2017) submitted
-  *Atti del Convegno "Gli strumenti scientifici delle collezioni storiche nell'area palermitana"*, Ed. by **A. Agliolo Gallitto**, Quaderni di Ricerca in Didattica (Science), Suppl. n. 7 del 18.02.2015
-  F. Aglione, **A. Agliolo Gallitto** and E. Fiordilino, 'Naughty cylinder' mechanical paradox, Phys. Educ. 48 (2013) 137
-  **A. Agliolo Gallitto** and E. Fiordilino, *The double cone: a mechanical paradox or a geometrical constraint?*, Phys. Educ. 46 (2011) 682
-  **A. Agliolo Gallitto**, S. Agnello, M. Cannas, 'School adopts an experiment': the photoluminescence in extravirgin olive oil and in tonic water, Phys. Educ. 46 (2011) 599

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

 fisicaondemusica.unimore.it

 www.phys.uniroma1.it/DipWeb/museo/

 Whipple Museum, University of Cambridge, www.sites.hps.cam.ac.uk/whipple/explore/



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-

THANKS!

