

The Ampère House

The Ampère House and
the Museum of Electricity,
Poleymieux au Mont d'Or,
France (Near Lyon).



André-Marie Ampère (1775-1836)



Ampere at 21



Ampere at 39



Ampere at 55

Location: Poleymieux au Mont d'Or
Compound of the Ampere Family



Location: Poleymieux au Mont d'Or Compound of the Ampere Family

- Educated based on **Rousseau theories** directly by his father, Jean-Jacques.
- **Never went to school.**
- A genius as soon as 13 years old.
- A “Prodigy child” learn Latin and other languages.
- Teach himself the works of Bernouilli and Euler in Latin.
- Professor of **Mathematics, Italian, Chemistry, Mathematics and Physics at 22.**
- Member of the Academy in 1814 (39 years old).

Entrance room: History of the Museum



[Poleymieux au Mont d'Or]

- André-Marie lived there from 7 to 20 years old. His wife and his child stay there a few more years.
- Museum inaugurated on July 1, 1931.
- Picture of **Hernand & Sosthenes Behn**, re-purchased the house to make a museum (Founders of ITT in the USA in 1920). They were from a French Mother and Danish Father. Studied in France and emigrated to New York after graduation.
- Gave as a gift to the SFE (Société Française des Electriciens) in 1928.
- Hernand died in France in 1933 in a retirement villa.

Room of the Three Amperes.



[The House of Ampère -Partners]



[Curator: Mr. Georges Asch]

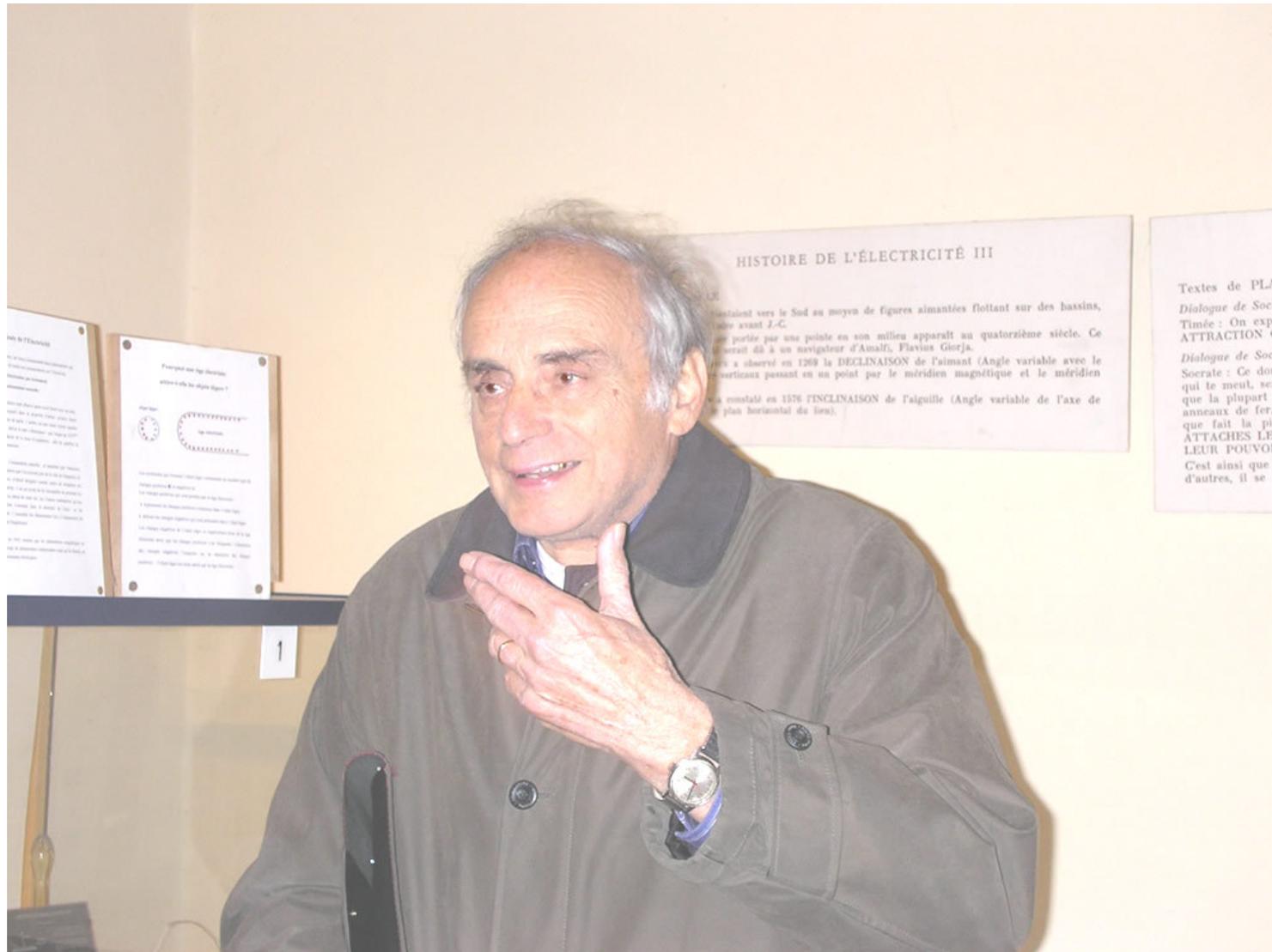
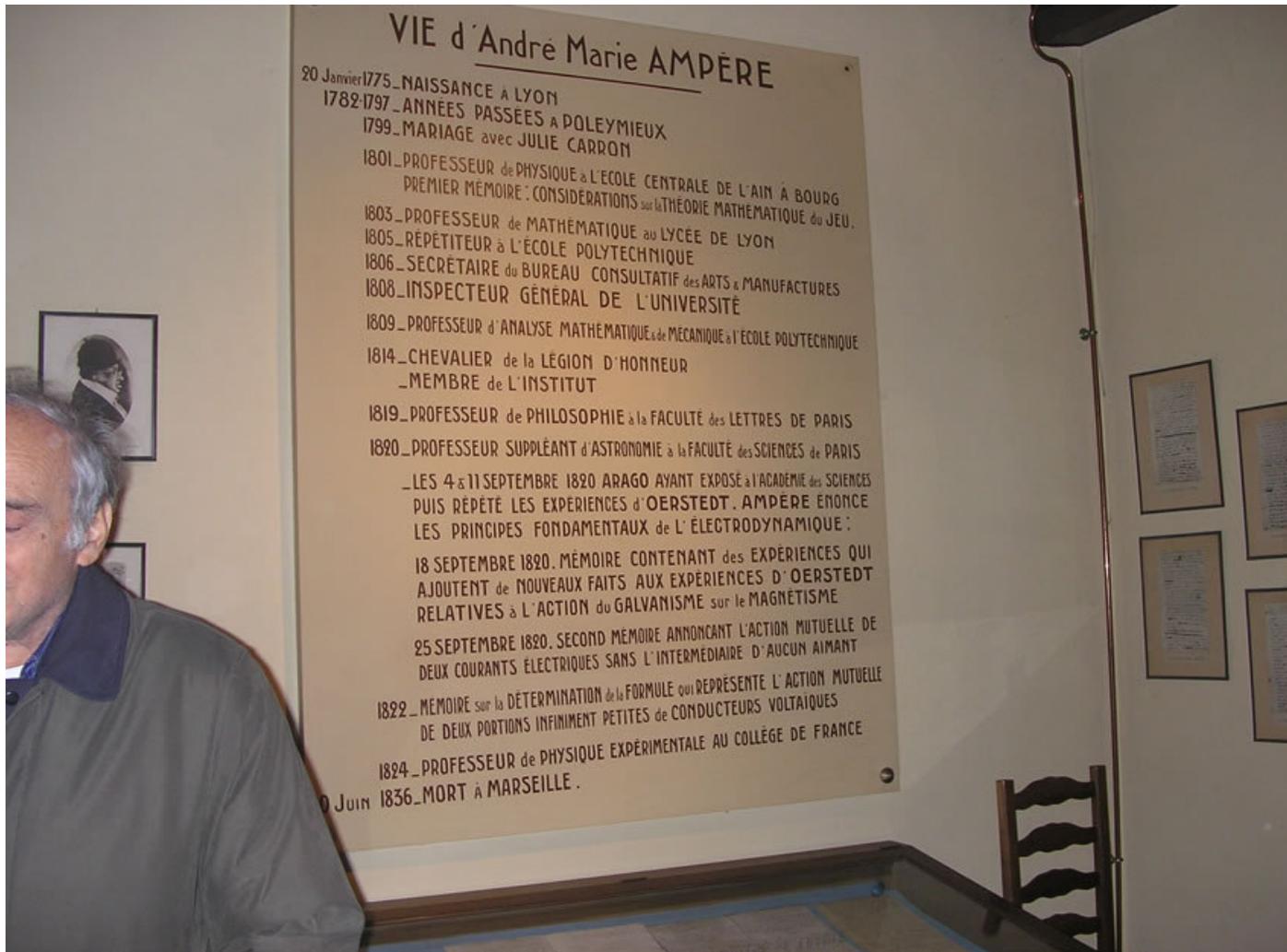
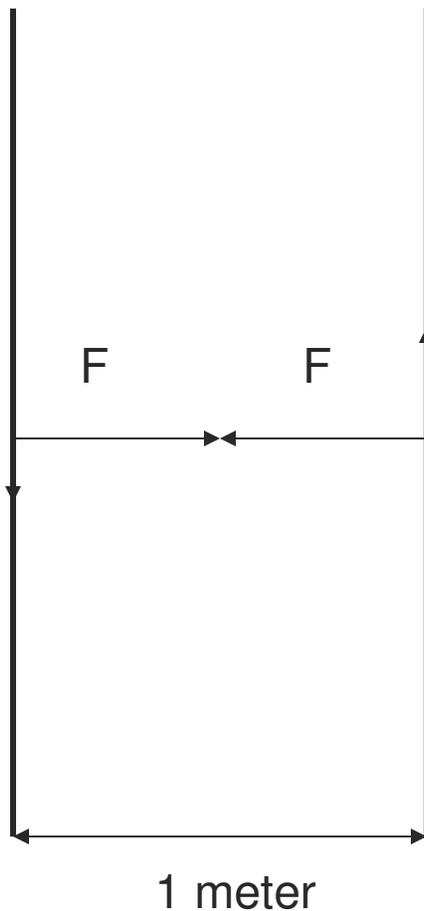


Plate on the life of Ampere.

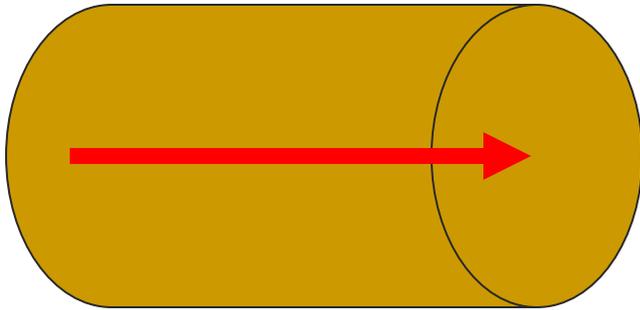


Definitions (ANSI/IEEE Std 100)



Ampere (1) (metric practice). That constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross section, and placed at one meter apart in vacuum, would produce between these conductors a force equal to 2×10^{-7} newton per meter of length (Adopted by the 9th General Conference on Weight and Measures in 1948).

[ANSI/IEEE Std 100]



1 coulomb / 1 second

- **Ampere (2)** (circuits and systems). A unit of electric current flow equivalent to the motion of 1 coulomb of charge passing any cross section in 1 second.
- 1 coulomb is the amount of electrical charge in 6.241×10^{18} electrons or other elementary charged particles.

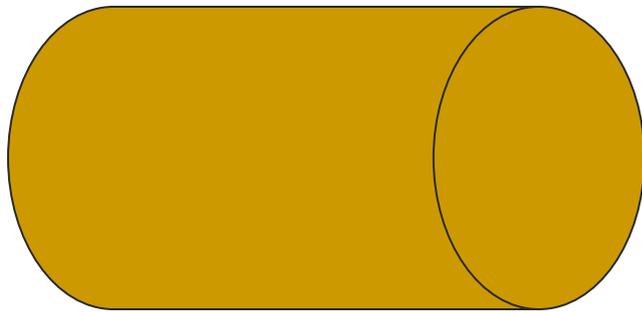
[André- Marie Ampere]

- Called the “Newton of Electricity”.
- House changed to the “Museum of Electricity”.
- Wikipedia: “**André-Marie Ampère (January 20, 1775 – June 10, 1836), was a French physicist who is generally credited as one of the main discoverers of electromagnetism. The ampere unit of measurement of electric current is named after him. The Ampere's Museum is in Poleymieux-au-Mont-d'Or (near Lyon, France).**”

[When he became famous.]

In 1881, the International Congress of Electricians gave **the name of Ampere to the unit of intensity of electrical current**, and this unit was first defined from the law of electrolysis. It was modified and defined directly from the electromagnetic forces between two parallel current such as described by Ampere.

[Other Definitions (Wikipedia)]

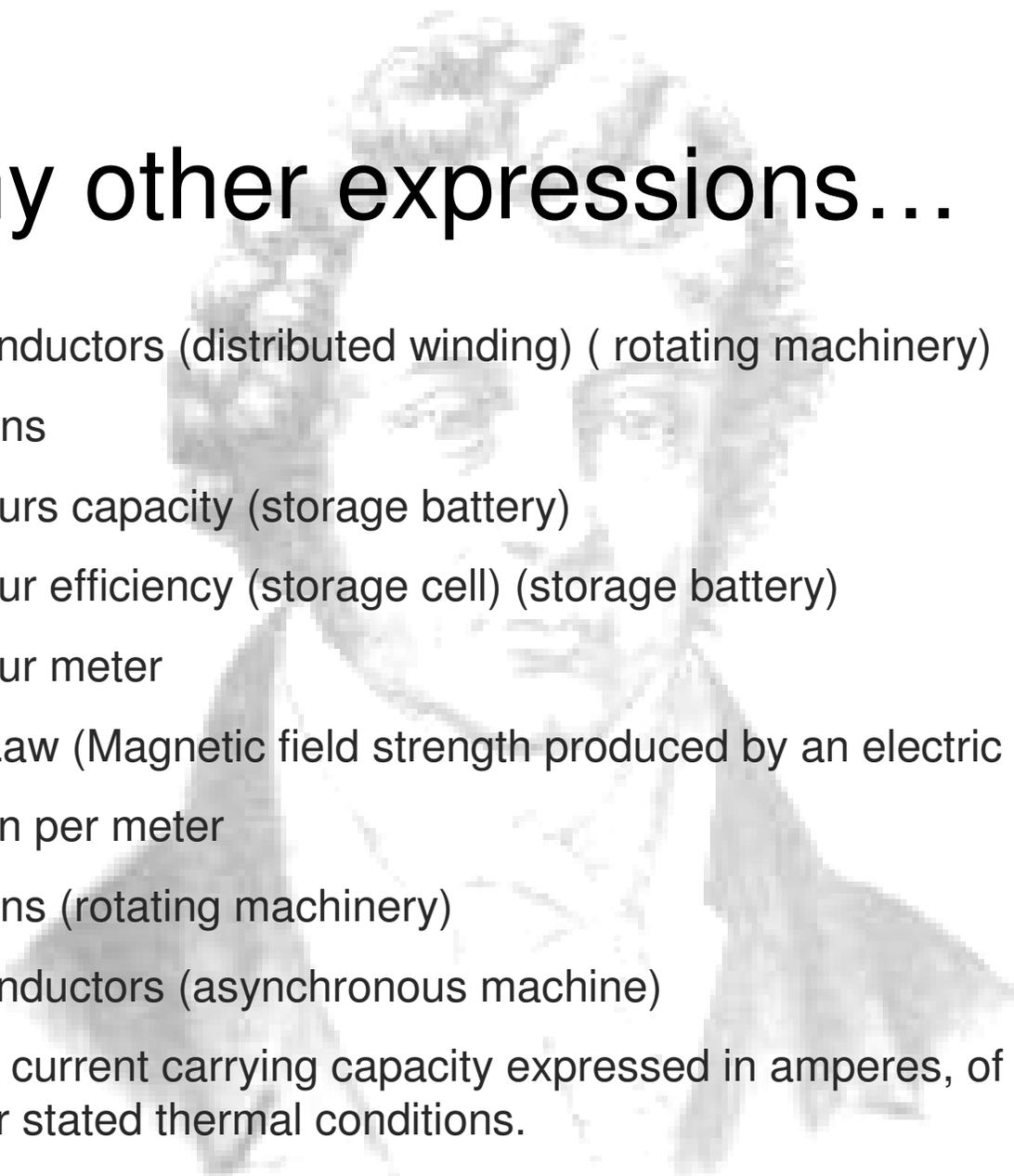


1 coulomb / 1 second

- Ampere “The **ampere** (symbol: A) is the SI base unit of electric current equal to one coulomb per second. It is named after André-Marie Ampère, one of the main discoverers of electromagnetism”.

[The man: André- Marie Ampère]

•Ampère's fame mainly rests on the service that he rendered to science **in establishing the relations between electricity and magnetism**, and in developing the science of electromagnetism, or, as he called it, **electrodynamics**. On September 11, 1820 he heard of H. C. Ørsted's discovery that a magnetic needle is acted on by a voltaic current. Only two weeks later, on September 25, he presented a paper to the Academy of Sciences attracts or repulses an other voltaic current. In the next months he established the laws of the phenomena.



[Many other expressions...]

Ampere-conductors (distributed winding) (rotating machinery)

Ampere-turns

Ampere-hours capacity (storage battery)

Ampere-hour efficiency (storage cell) (storage battery)

Ampere-hour meter

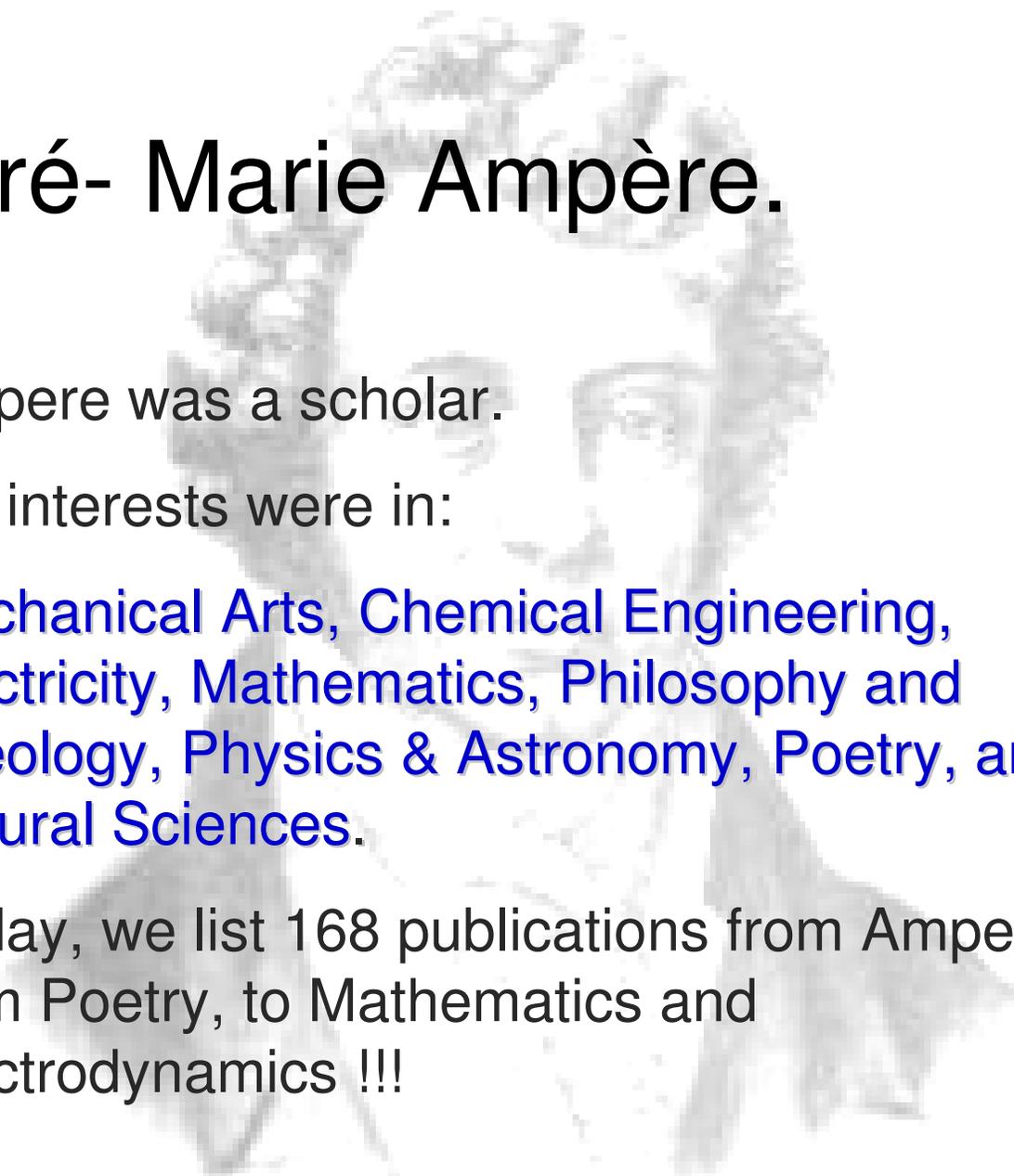
Ampere's Law (Magnetic field strength produced by an electric current)

Ampere turn per meter

Ampere-turns (rotating machinery)

Ampere-conductors (asynchronous machine)

Ampacity = current carrying capacity expressed in amperes, of a wire or cable under stated thermal conditions.

A faint, grayscale portrait of André-Marie Ampère is visible in the background of the slide. He is shown from the chest up, wearing a dark coat and a white cravat. His hair is dark and curly. The portrait is centered behind the text.

[André- Marie Ampère.]

Ampere was a scholar.

His interests were in:

Mechanical Arts, Chemical Engineering, Electricity, Mathematics, Philosophy and Theology, Physics & Astronomy, Poetry, and Natural Sciences.

Today, we list 168 publications from Ampere, from Poetry, to Mathematics and Electrodynamics !!!

ESSAI
SUR
LA PHILOSOPHIE
DES SCIENCES,

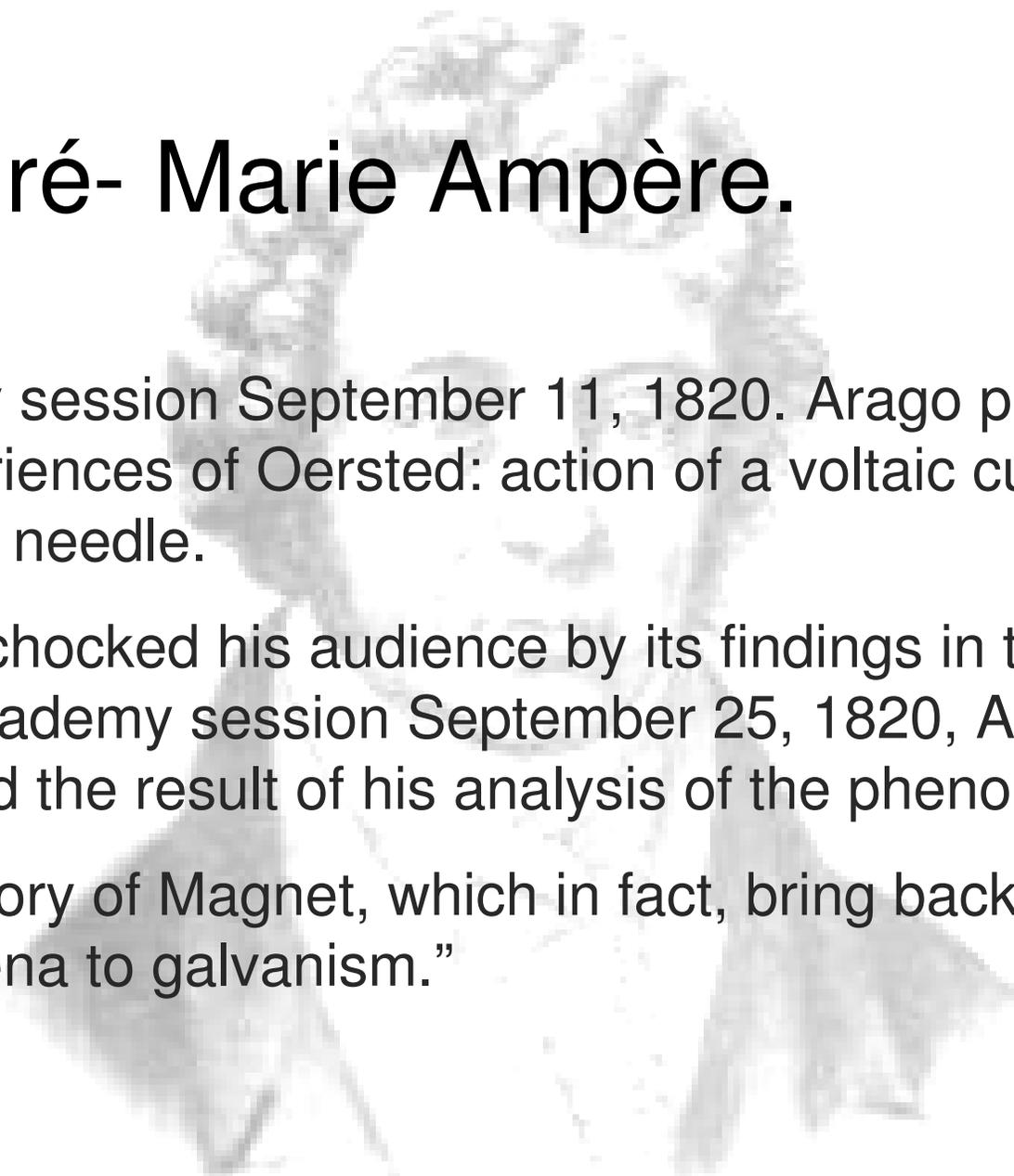
OU
EXPOSITION ANALYTIQUE D'UNE CLASSIFICATION
NATURELLE DE TOUTES LES CONNAISSANCES
HUMAINES;

PAR
ANDRÉ-MARIE AMPÈRE,

De l'Académie royale des sciences, des Sociétés royales de Londres et d'Edimbourg, de la Société philomatique, de la Société helvétique des scrutateurs de la nature, de la Société philosophique de Cambridge, de celle de physique et d'histoire naturelle de Genève, de la Société italienne, de l'Académie royale des sciences et belles-lettres de Bruxelles, de l'Académie royale de Lisbonne, des Académies de Lyon, de Modène, de Lille, Correspondant de l'Académie des sciences de Berlin et de l'Institut de Bologne, Membre de plusieurs autres Sociétés savantes, Chevalier de la Légion d'honneur, Inspecteur général des études, et Professeur au Collège de France.

A PARIS,
CHEZ BACHELIER, IMPRIMEUR-LIBRAIRE POUR LES SCIENCES,
Quai des Augustins, n° 55.

—
1834.

A faint, grayscale portrait of André-Marie Ampère is visible in the background of the slide. He is shown from the chest up, wearing a dark coat and a white cravat. His hair is powdered and styled in a typical 18th-century fashion. The portrait is centered behind the text.

[André- Marie Ampère.]

Academy session September 11, 1820. Arago presented the experiences of Oersted: action of a voltaic current on a magnetic needle.

Ampere chocked his audience by its findings in two weeks. At the Academy session September 25, 1820, Ampere presented the result of his analysis of the phenomena:

“New theory of Magnet, which in fact, bring back the phenomena to galvanism.”

EXPERIMENTA

CIRCA EFFECTUM

CONFLICTUS ELECTRICI IN ACUM MAGNETICAM.

Prima experimenta circa rem, quam illustrare aggredior, in scholis de Electricitate, Galvanismo et Magnetismo proximè-superiori hinc a me habitis instituta sunt. His experimentis monstrari videbatur, acum magneticam ope apparatus galvanici e situ moveri; idque circulo galvanico cluso, non aperto, ut frustra tentaverunt aliquot abhinc annis physici quidam celeberrimi. Cum autem hæc experimenta apparatu minus efficaci instituta essent, ideoque phenomena edita pro rei gravitate non satis luculenta viderentur, socium adscivi amicæ Esmarch, regi a consiliis justitiæ, ut experientia cum magno apparatu galvanico, a nobis conjunctim instructo, repeterentur et augerentur. Etiam vir egregius Wleugel, eques auratus ord. Dan. et apud nos prefectus rei gubernatoriæ, experimentis interfuit, nobis socius et testis. Præterea testes fuerunt horum experimentorum vir excellentissimus et a rege summis honoribus decoratus *Hauch*, cujus in rebus naturalibus scientiæ jam tum inclaruit, vir acutissimus Reinhardt, Historiæ naturalis Professor, vir in experimentis institendis sagacissimus Jacobsen, Medicinæ Professor, et Chemicus experimentissimus Zeise, Philosophie Doctor. Sæpius equidem solus experimenta circa materiam propositam institui, que autem ita mihi conûgit detegere phenomenæ, in conventu horum virorum doctissimorum repetivi.

In experimentis recensendis omnia præteribo, que ad rationem rei invenientiam quidem condaxerunt, hæc autem inventa rem amplius illustrare nequeunt; in eis igitur, que rei rationem perspicue demonstrant, acquiescamus.

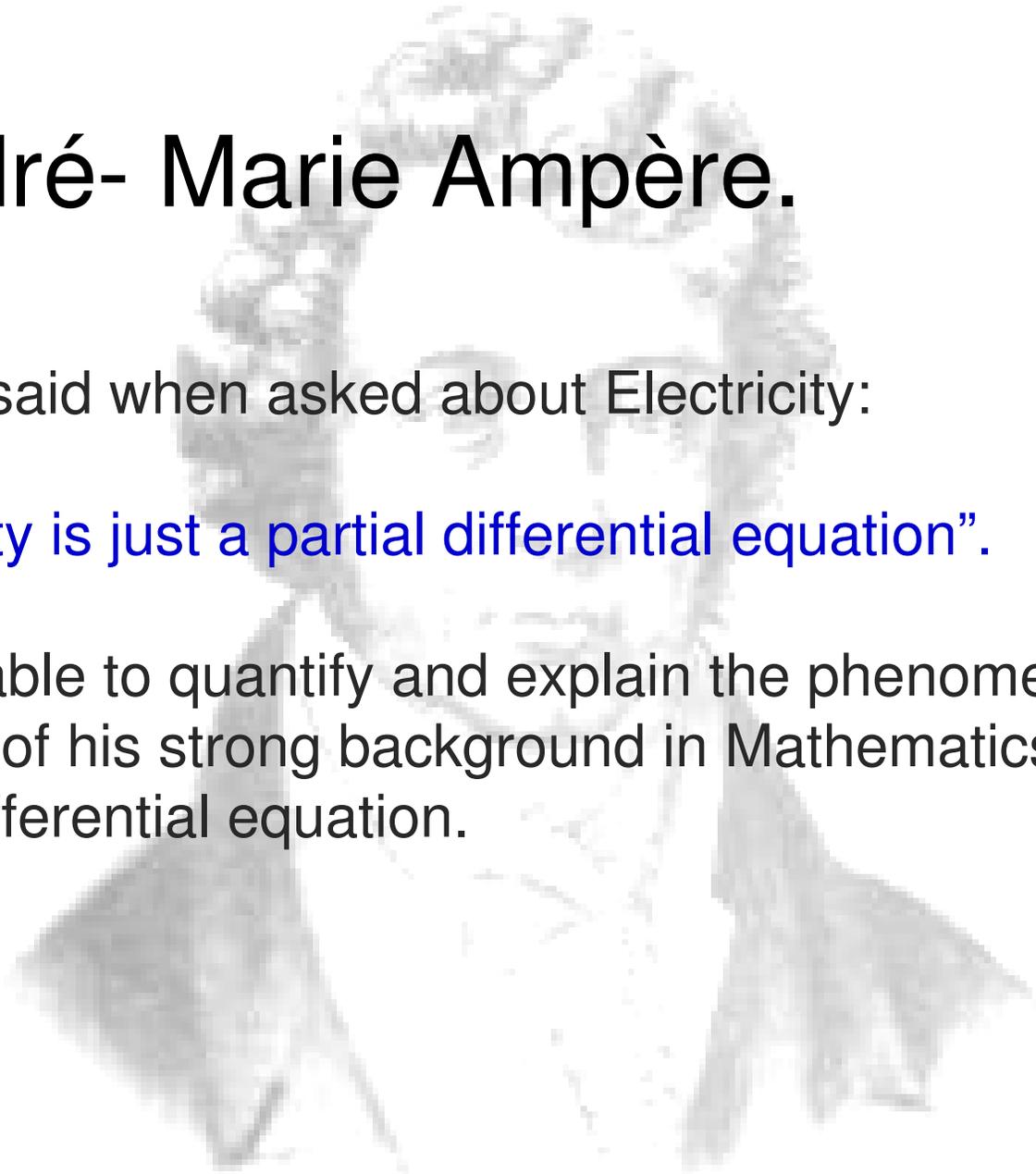
Apparatus galvanicus, quo usum summus, constat viginti receptaculis cypreis rectangularibus, quorum et longitudo et altitudo duodecim equaliter est pollicum, latitudo autem duos pollices et dimidium vix excedit. Quodvis receptaculum duabus laminis cypreis instructum est ita inclinatis, utloculam cypreum, qui laminam zincam in aqua receptaculi proximi sustinet, portare possint. Aqua receptaculorum $\frac{1}{2}$ sui ponderis acidi sulphurici et pariter $\frac{1}{4}$ acidi nitrici continet. Pars ejusque laminæ Zincæ in aqua submersa Quadratum est, cujus latus circiter longitudinem 40 pollicum habet. Etiam apparatus minores adhiberi possunt, si modo filam metallicam candefacere valeant.

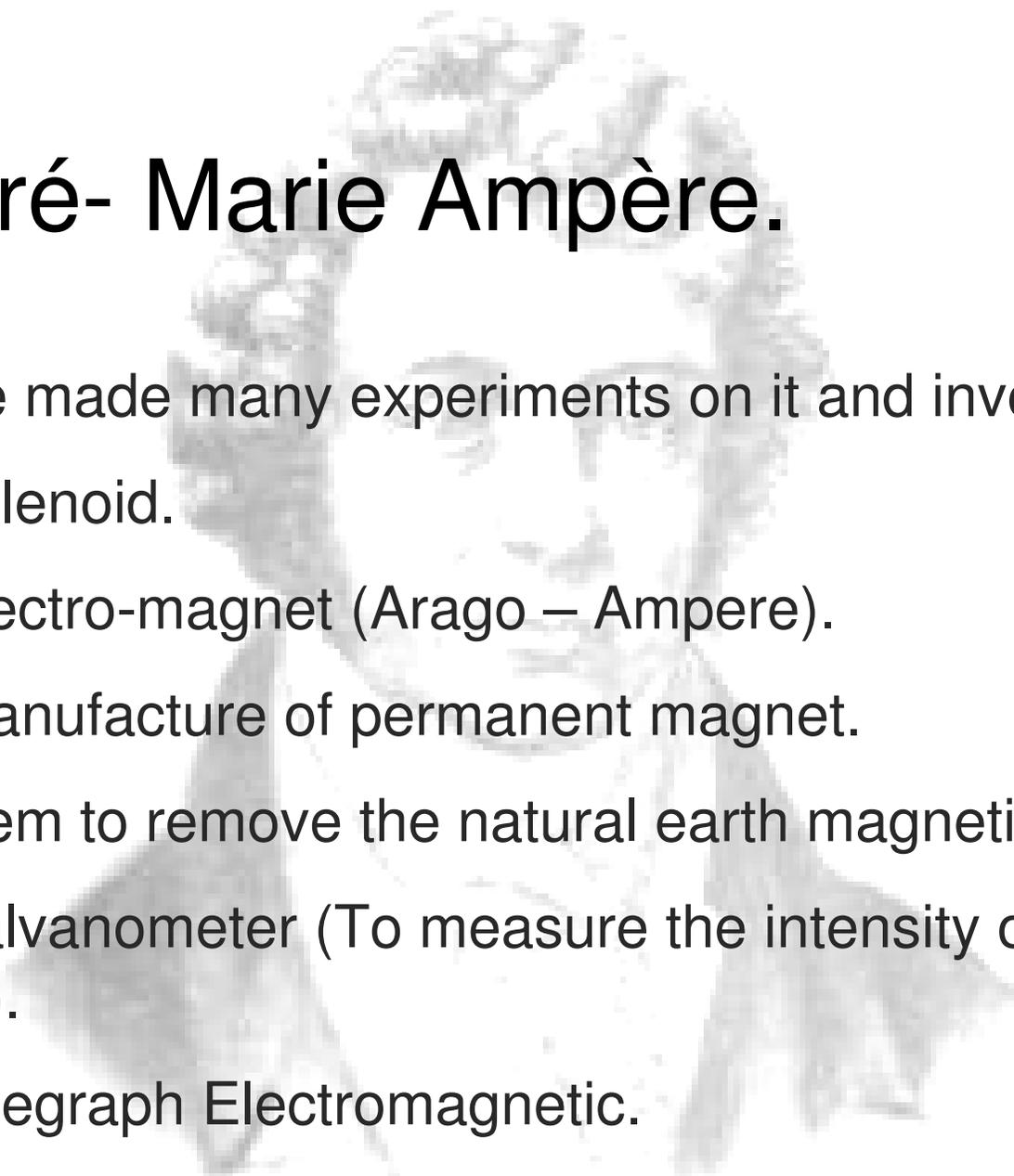
[André- Marie Ampère.]

Ampere said when asked about Electricity:

“Electricity is just a partial differential equation”.

He was able to quantify and explain the phenomena, because of his strong background in Mathematics and partial differential equation.



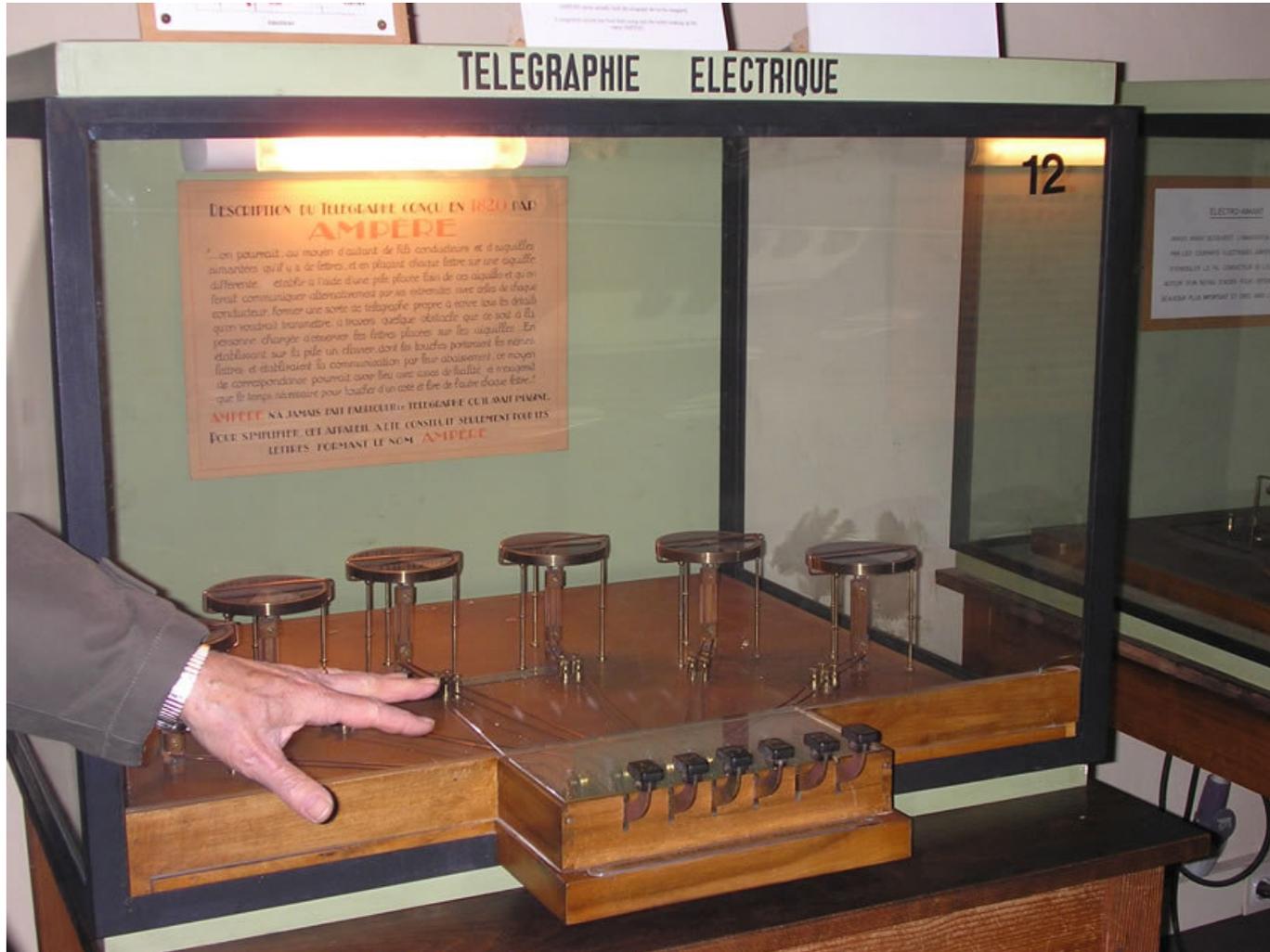
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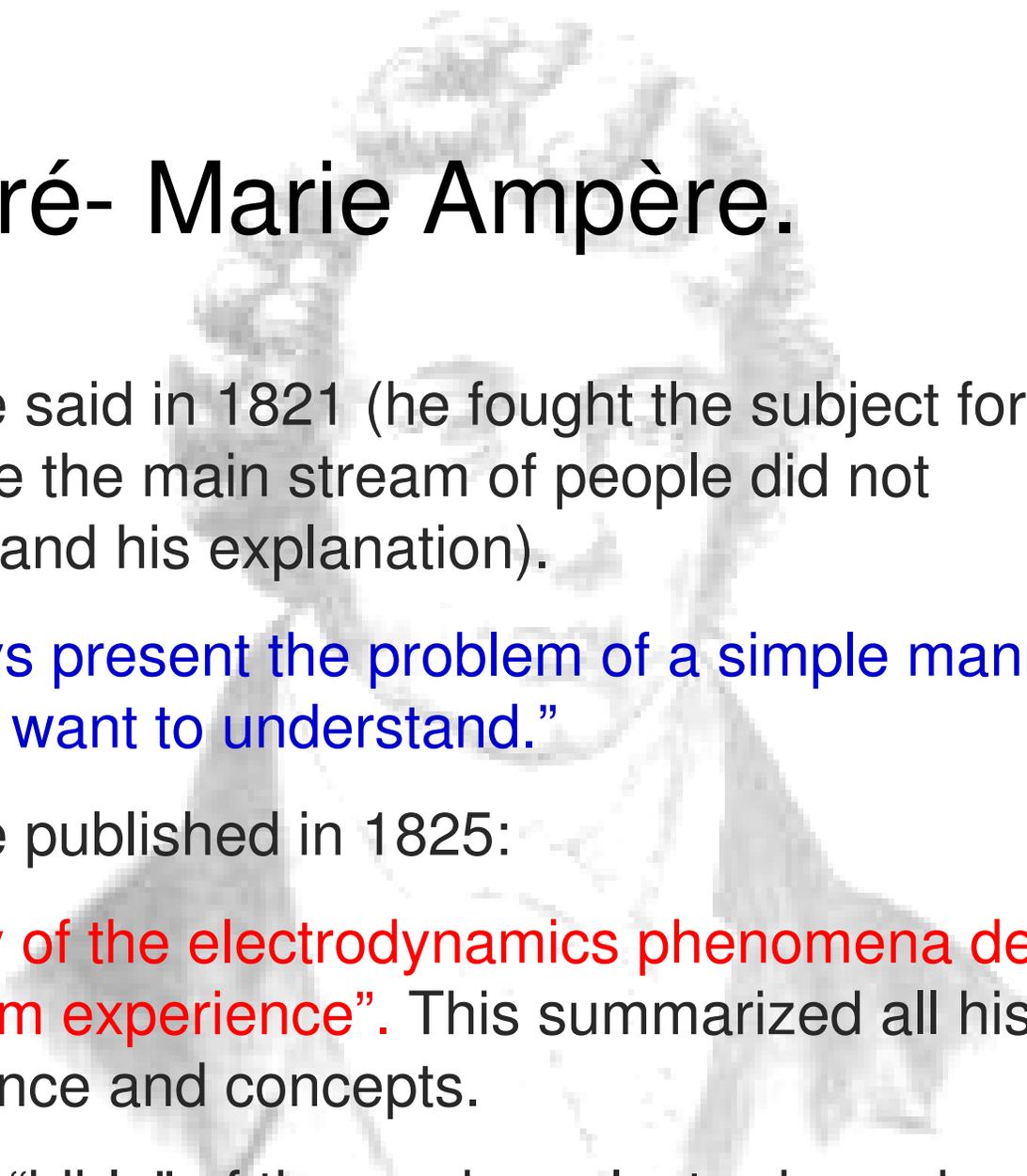
[André- Marie Ampère.]

Ampere made many experiments on it and invented:

- The solenoid.
- The electro-magnet (Arago – Ampere).
- The manufacture of permanent magnet.
- A system to remove the natural earth magnetism.
- The galvanometer (To measure the intensity of current).
- The telegraph Electromagnetic.
- In about three months.....

[The Electric Telegraph of Ampere.]



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[André- Marie Ampère.]

Ampere said in 1821 (he fought the subject for 5 years because the main stream of people did not understand his explanation).

“I always present the problem of a simple manner, and nobody want to understand.”

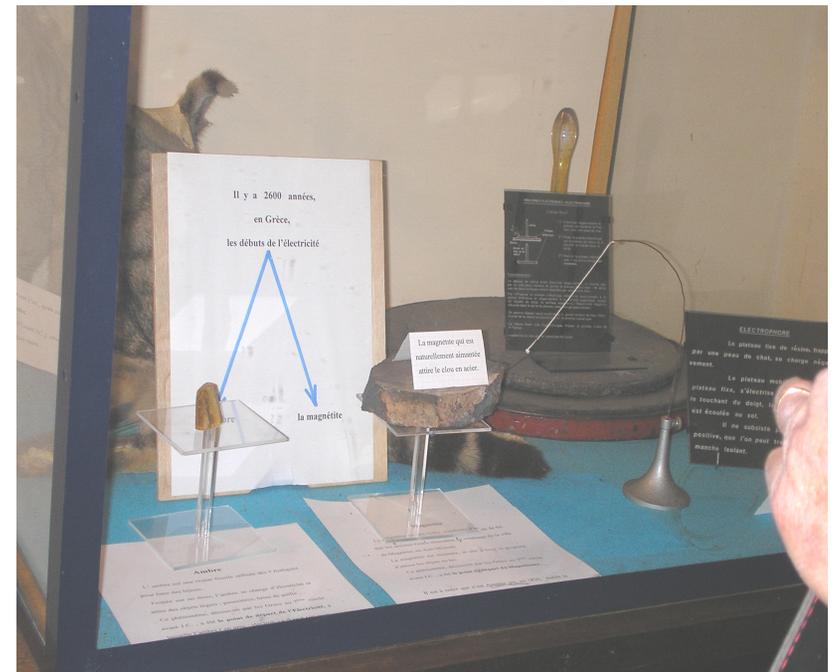
Ampere published in 1825:

“Theory of the electrodynamic phenomena deduced only from experience”. This summarized all his experience and concepts.

It is the “bible” of the modern electrodynamics.

Museum of Electricity

Two of the rooms of the museum are specialized in the tests that Amperes made. (Fundamental experiences of Electro-mechanism of the action of electricity on a magnet. Experiences showing the electro-dynamics actions of a current on an other current). Twelve others rooms are representative of the history of electricity from the Greeks to today.



[Museum of Electricity]

The galvanometer
(To measure the
intensity of current).

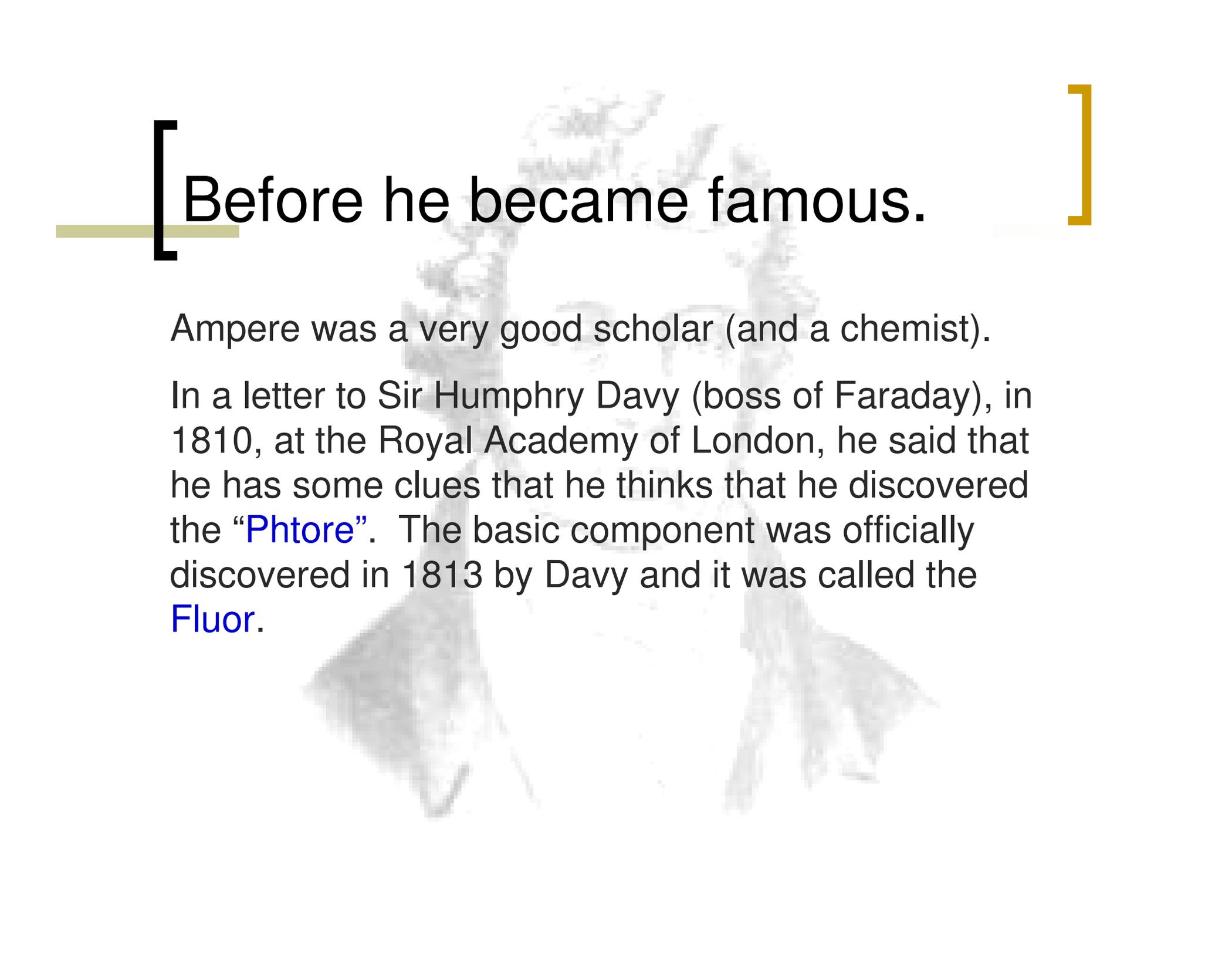
Galvanometer

According to

Ampere design.

1826



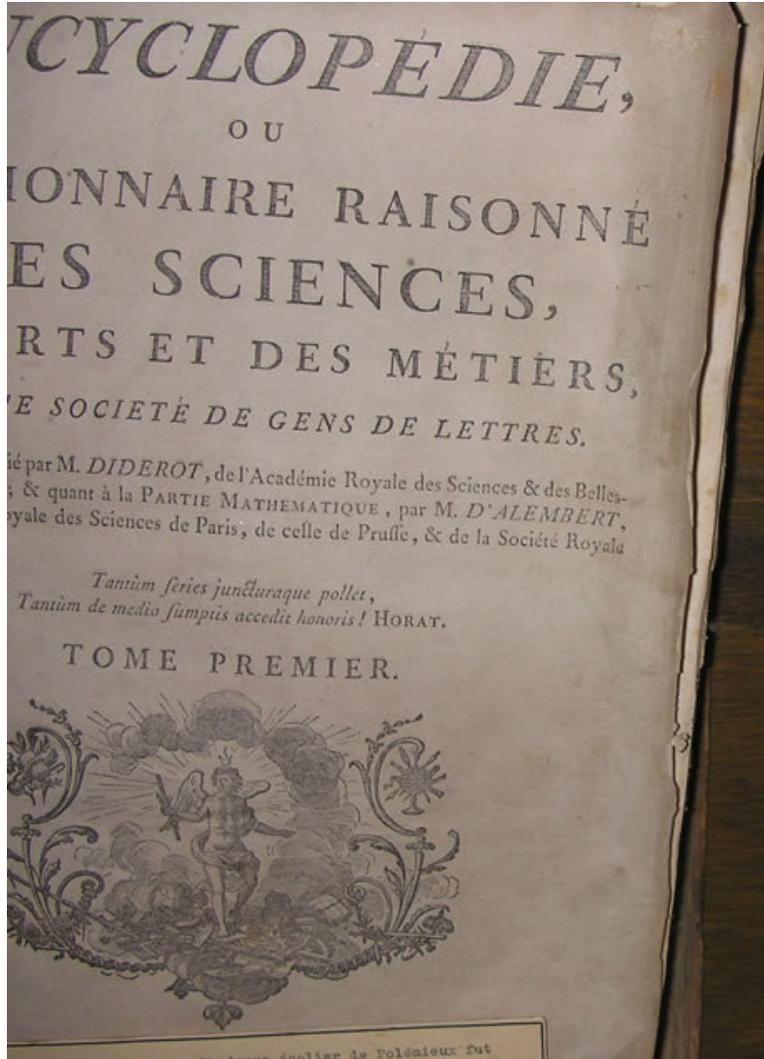


[Before he became famous.]

Ampere was a very good scholar (and a chemist).

In a letter to Sir Humphry Davy (boss of Faraday), in 1810, at the Royal Academy of London, he said that he has some clues that he thinks that he discovered the “**Phtore**”. The basic component was officially discovered in 1813 by Davy and it was called the **Fluor**.

[Young Ampere's Writing]



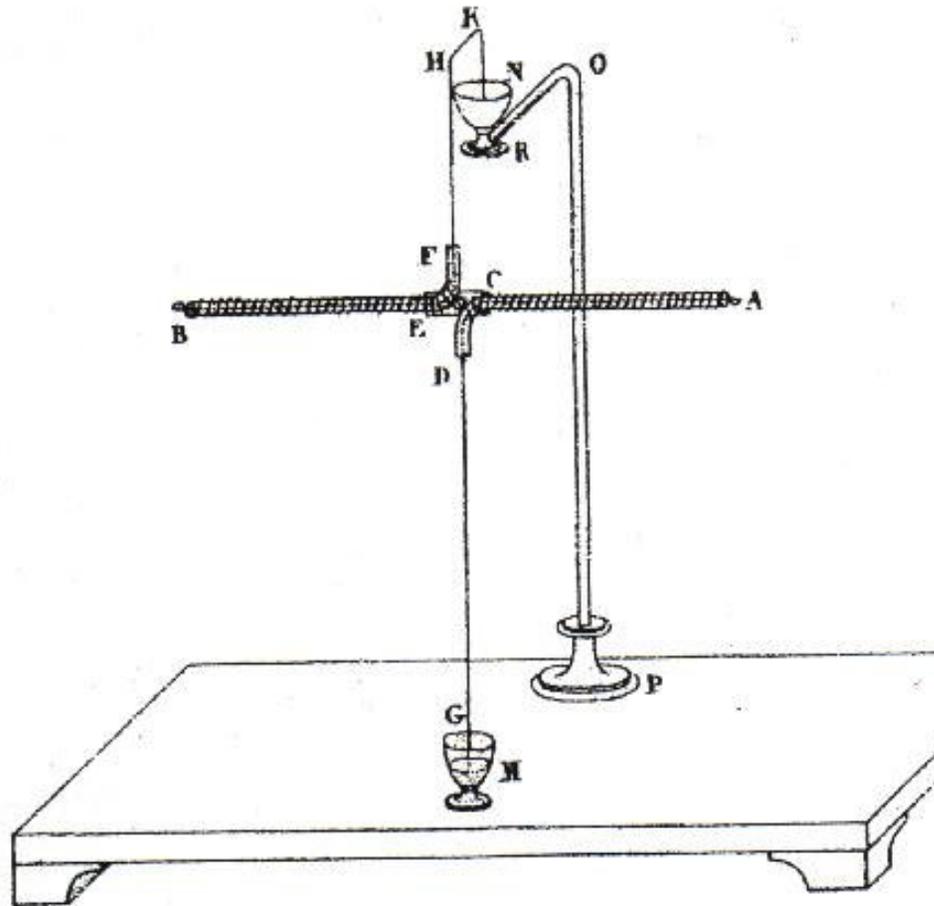
First Textbook of Ampere (C. 1720)



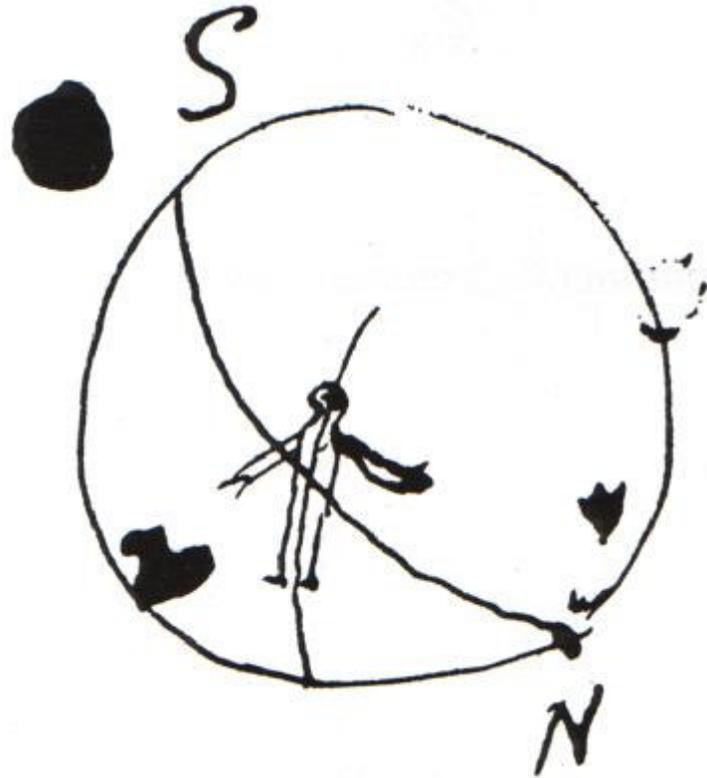
Museum of Electricity

“The Decisive Experience: 25 September 1820.”

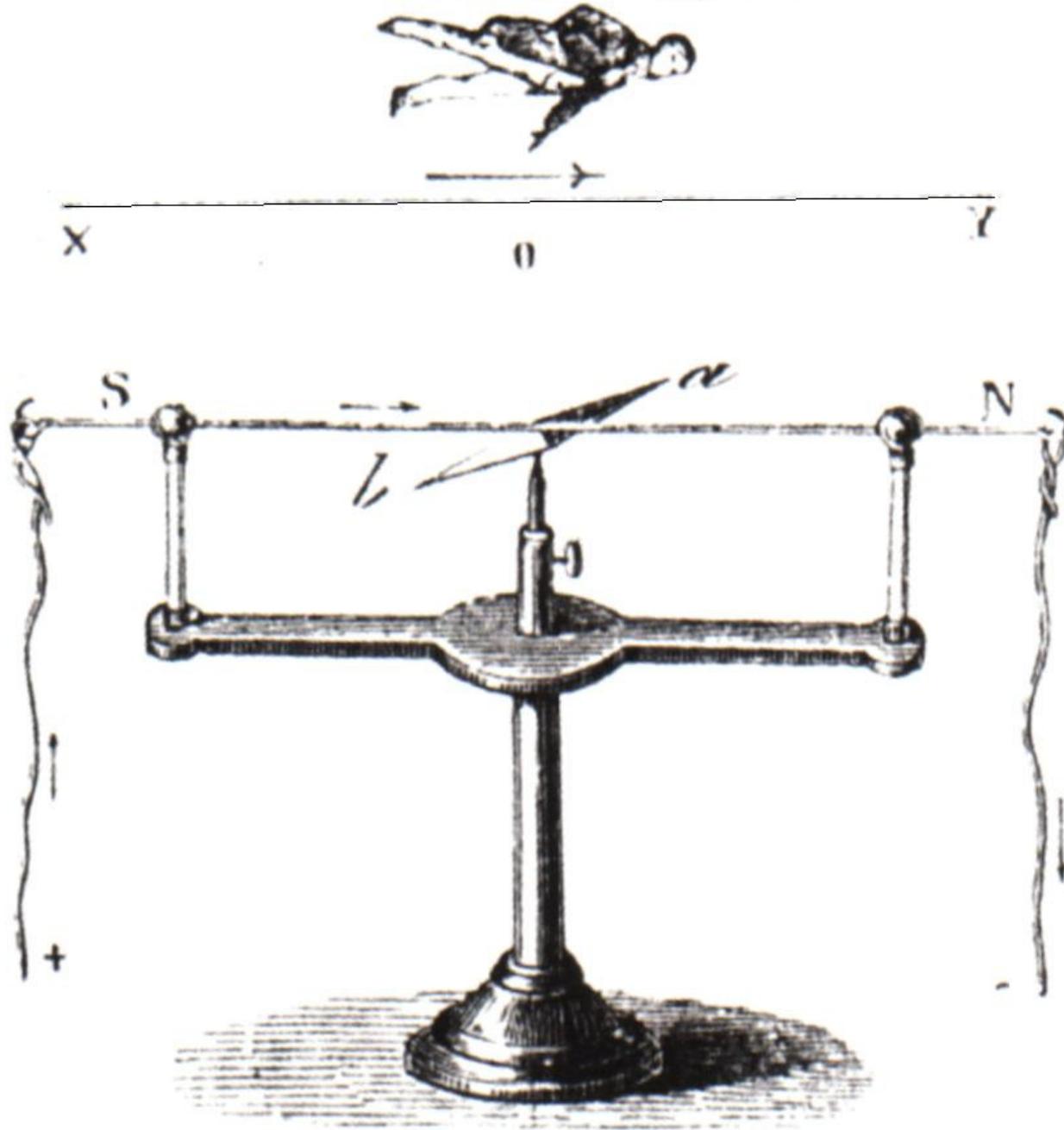
“Attraction
&
Repulsion
Between
Two
Windings”



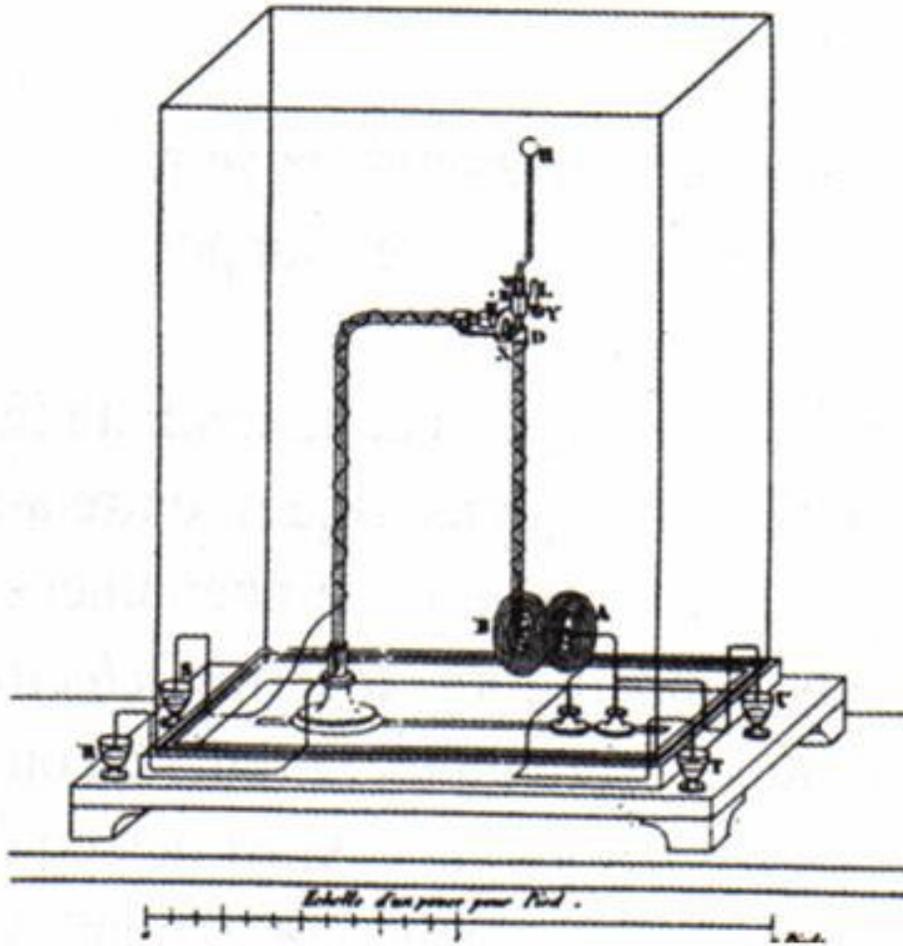
[Ampere first drawing]



The "Bonhomme" Ampere.



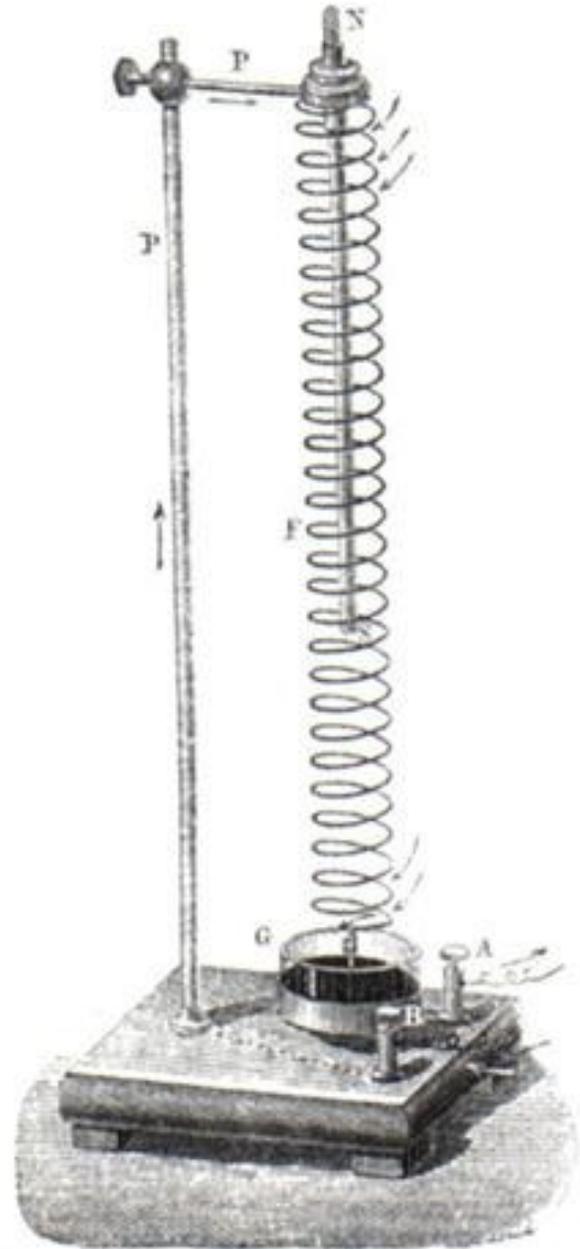
[Museum of Electricity]



- A = Fixed Solenoid**
- B = Moving Solenoid**

Solenoid = solen = "Hose" in grec.

[Ampere tests



Attraction of the steel core of the contiguous spires by the current.



Leyden's
jars = first
batteries.

[Museum of Electricity]



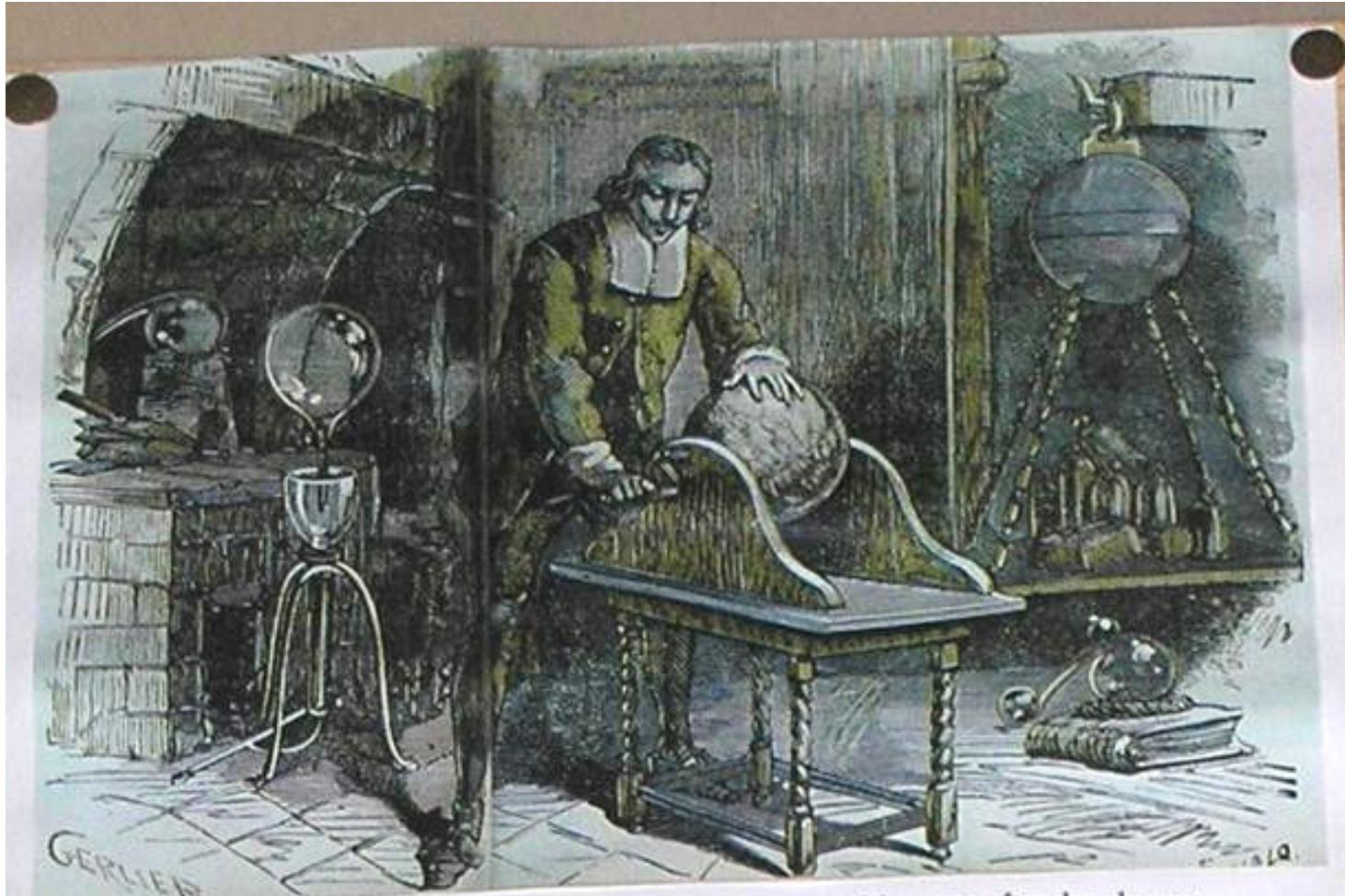
Leyden's jars = first batteries.

[The story of Electricity (Museum)]



Where Ampere was performing his experimentations.

Museum of Electricity



Experiments of Brandebourg, 1663 (Purpose: to demonstrate that the gravity is of electrical origin.)

Museum of Electricity

Scale of
Coulomb
1785



Museum of Electricity

Static
Electricity



[Museum of Electricity]

First
battery by
Volta.

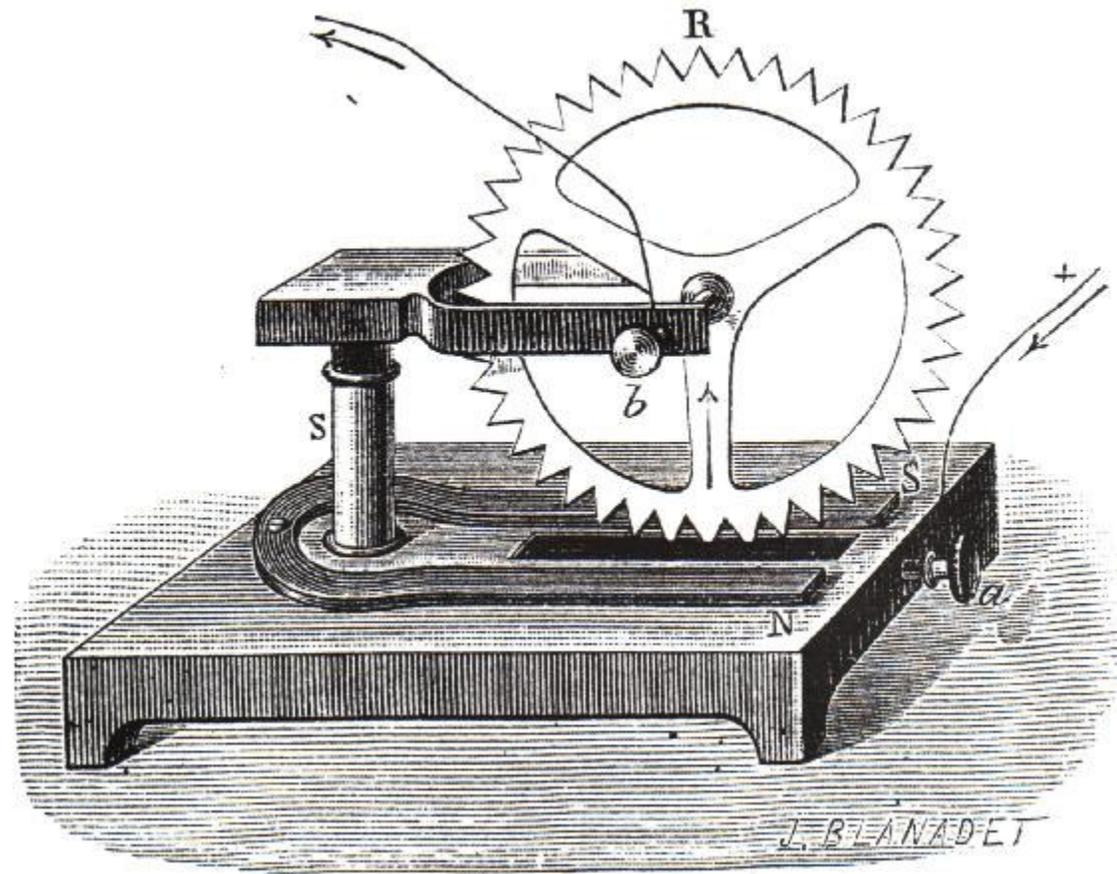
Early
1800's.



Volta (1745-1827)

Museum of Electricity

First modern
electrical
motor: Wheel
of Barlow -
1822

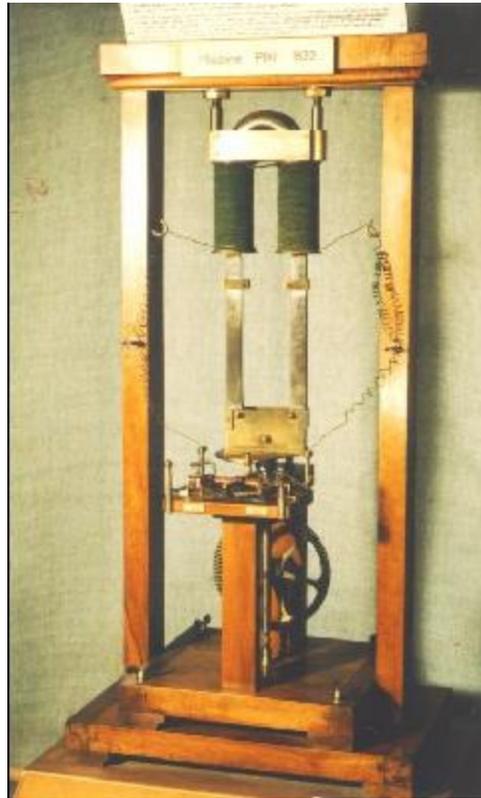


Museum of Electricity

Machine
Hydro-
Electric of
Amstrong. In
1840 in
which small
drops of
water
electrically
charged
were send
as steam.

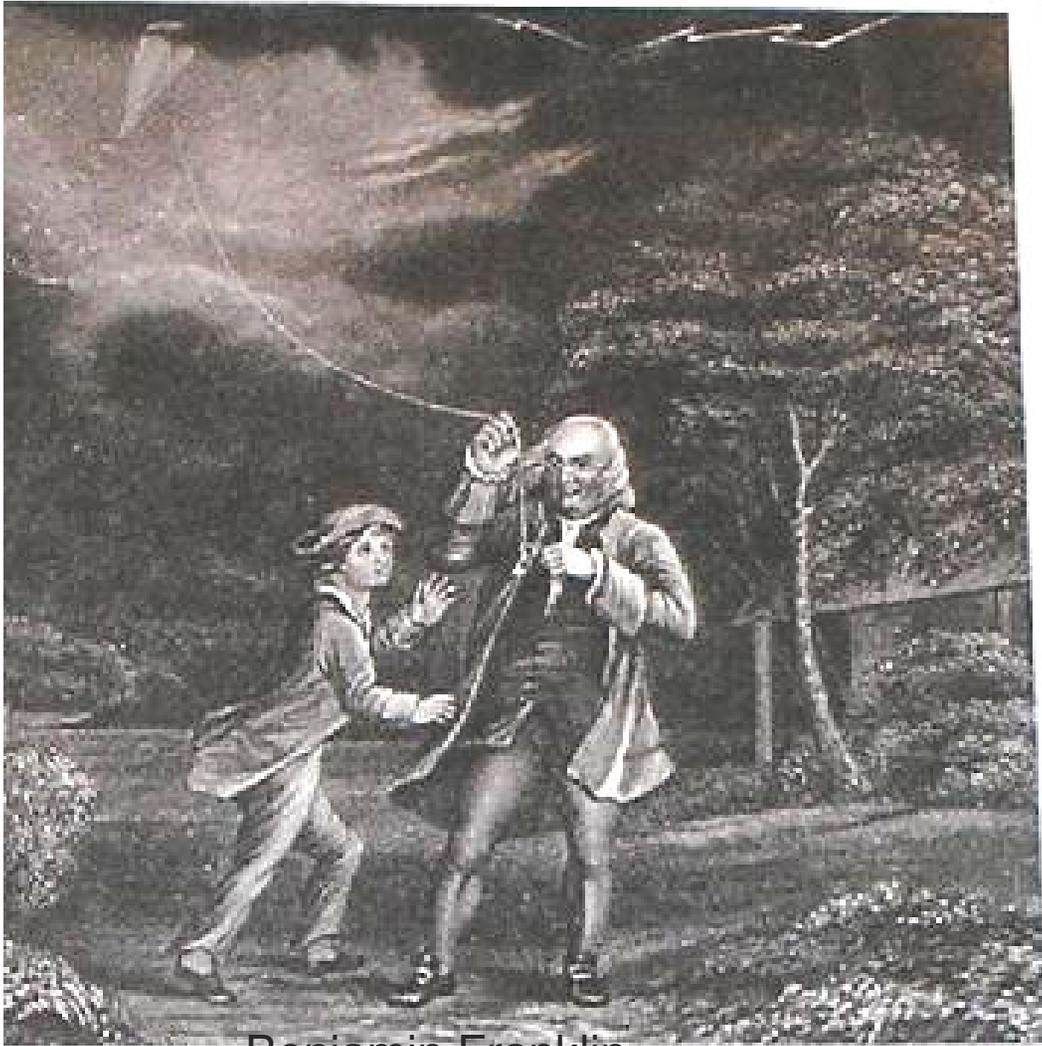


Museum of Electricity



Generator of Pixii – 1832 – With a mechanical system transforming AC to DC with the Ampere Balance.

[Museum of Electricity]



Benjamin Franklin



Physician Richmann

... Bienville laboratory, c. 1791



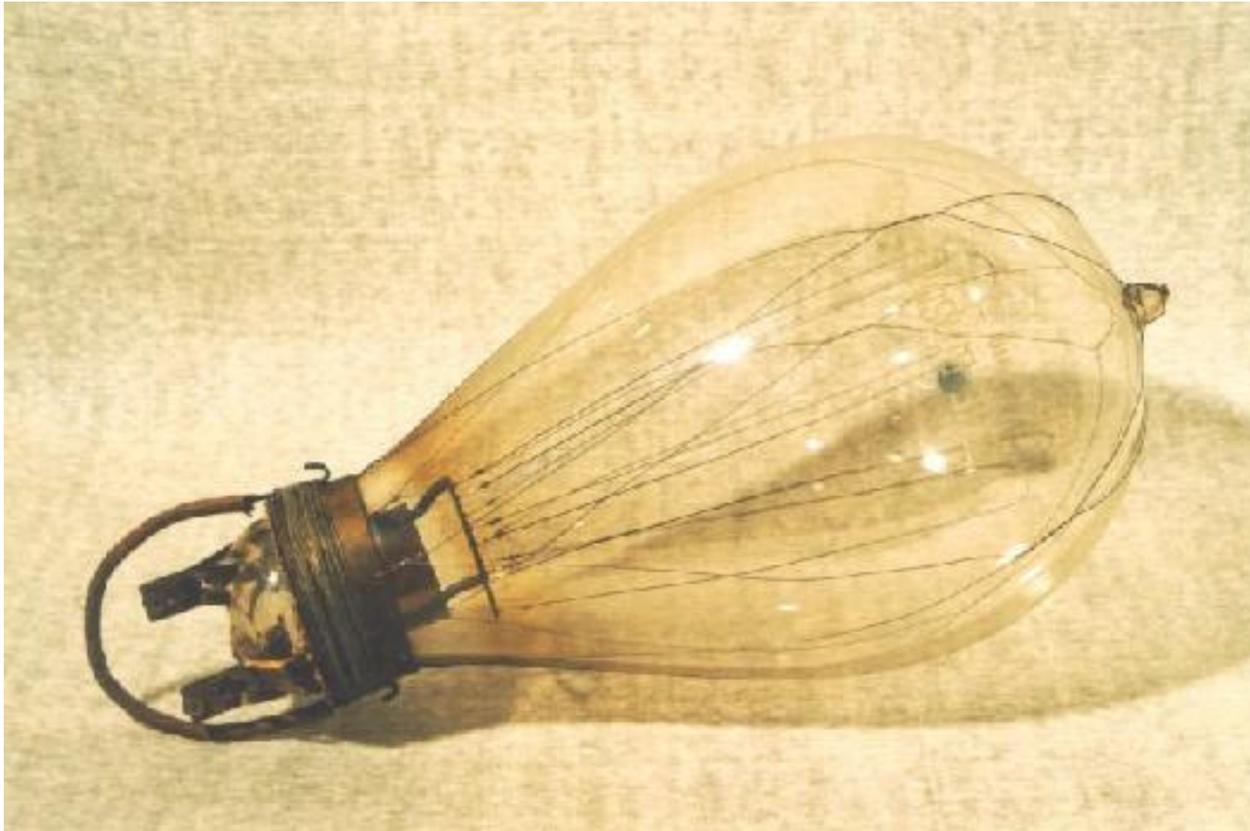
Visible in this engraving is the electrical apparatus
with the fluids extracted from the body of a frog.

[Museum of Electricity]

DC
Generator
of
Gramme
1873



[Museum of Electricity]



Light bulb of 1889, lighted the main square in Lyon.

Thomas Edison light bulb.

[Museum of Electricity]



Amplifier Low Frequency 1916

[The fathers of Electromagnetism]



Volta (1745-1827)

Italian



Ampère (1775-1836).

French



Faraday (1777-1851)

British



Oersted (1791-1867),

Danish

[The fathers of Electromagnetism]



Joseph Henry

(1797-1878)

(Build & experiment the first large electromagnet,
discovered self inductance)

American (from Scottish parents)

[The fathers of Electricity]

From Wikipedia:

Base units

Coulomb, electric charge – Charles-Augustin de Coulomb

Ampere, electric current – André-Marie Ampère

Volt, electric potential, electromotive force – Alessandro Volta

Ohm, electrical resistance – Georg Ohm

Farad, capacitance – Michael Faraday

Hertz, frequency – Heinrich Rudolf Hertz

Henry, inductance – Joseph Henry

Siemens, electrical conductance – Werner von Siemens

Tesla, magnetic flux density – Nikola Tesla

Watt, power, radiant flux – James Watt

Weber, magnetic flux – Wilhelm Eduard Weber

[The fathers of Inventions]

Other units:

Kelvin, thermodynamic temperature – Lord Kelvin

Degree Celsius, temperature – Anders Celsius

Becquerel, radioactivity – Henri Becquerel

Gray, absorbed dose of radiation - Louis Harold Gray

Joule, energy, work, heat – James Prescott Joule

Newton, force – Isaac Newton

Pascal, pressure – Blaise Pascal

Sievert, radiation dose equivalent – Rolf Sievert

[The fathers of Inventions]

Derived units:

Centimeter-gram-second system of units

Biot, electric current; Jean-Baptiste Biot

Debye, electric dipole moment; Peter Debye

Gauss, magnetic induction – Carl Friedrich Gauss

Maxwell, magnetic flux – James Clerk Maxwell

Oersted, magnetic field strength – Hans Christian Ørsted

Galileo, acceleration; Galileo Galilei

Eotvos, gravitational gradient; Loránd Eötvös

No longer in use:

Franklin, electric charge – Benjamin Franklin

[The fathers of Inventions]

Others Derived units:

Angstrom, distance – Anders Jonas Ångström

Curie, radioactivity – Marie and Pierre Curie

Decibel (i.e. tenths of Bels) dimensionless proportions and ratios,
e.g. relative power levels – Alexander Graham Bell

Degree Fahrenheit, temperature – Daniel Gabriel Fahrenheit

Jansky, flux density – Karl Jansky

Neper, relative power level – John Napier

Poise, viscosity – Jean Louis Marie Poiseuille

Röntgen, dosage of X-rays or gamma radiation – Wilhelm Röntgen

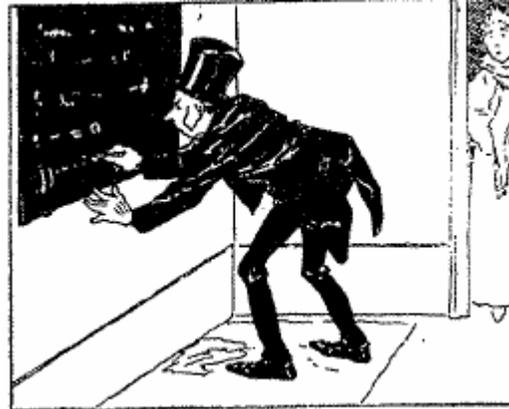
Richter scale, earthquake – Charles Francis Richter

Stokes, viscosity – George Gabriel Stokes

Sverberg, sedimentation rate – Theodor Svedberg

[Ampère was the example (1).]

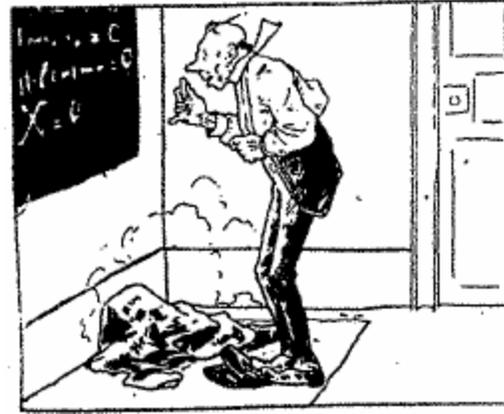
Vie et mésaventures du savant Cosinus
Le Petit Français Illustré 27 janvier 1894



Stories of absent minded professor.

[Ampère was the example (2).]

Vie et mésaventures du savant Cosinus
Le Petit Français Illustré 27 janvier 1894



Stories of absent minded professor.

[André-Marie Ampère—1836-End]

Legacy and final days

He developed a whole field because he explored with very good care, and developed a mathematical theory which not only explained the **electromagnetic phenomena already observed but also predicted many new ones.**

He died in Marseille and is buried in the Cemetery in Montmartre, Paris with his son. The great **amiability and childlike simplicity of Ampère's character** are well brought out in his “*Journal et correspondance*” (Paris, in 1872).

A faint, grayscale portrait of André-Marie Ampère is centered in the background. He is shown from the chest up, wearing a dark coat and a white cravat. His hair is styled in a large, curly wig.

[André-Marie Ampère]

Thank you for your
attention.

**The Ampère House and the Museum of Electricity,
Poleymieux au Mont d'Or, France (Near Lyon).**

Access sketch to the Ampère's House
 Open every day except Monday
 from 10:00am to 12:00pm and from 2:00pm to 6:00pm

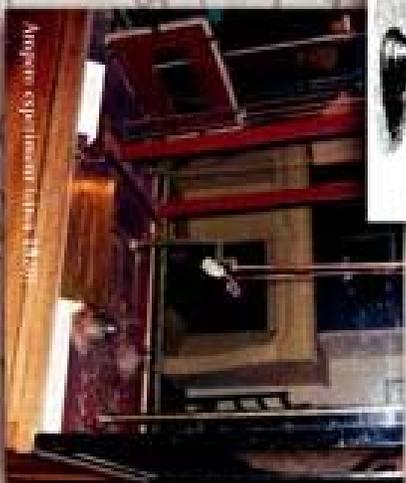
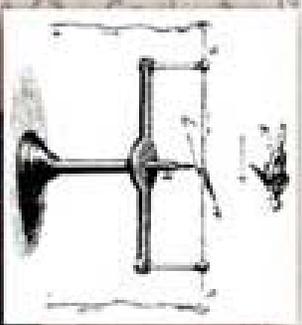
Ampère's House and Museum of Electricity
 69250 Teyssières sur Moiré d'Or
 Tel (International): 011-33-4-78-31-90-77
 Internet: <http://musee-ampere.uem.fr/>



Distance Lyon-Teyssières:
 Estimated 20 km.

Follow the directions indicated on the road:
 "Teyssières", or "Maison de l'Électricité" or "Maison d'Ampère".

Partners of the "Maison d'Ampère"



Ampère's experiment with the...

André-Marie Ampère

1775-1836



Ampère's House Museum of Electricity



Monroe's machine

Electricity before Ampère's time is represented by an exceptional collection of machines from the XVIII century: electrostatic machines, Leyden's jar and Coulomb's scale.



First machine for turning generator based on electrical induction

Hippolyte Pixii an "Engineer in Physics Instrumentation" in Paris, France, worked with Ampère. As he first learned about the new discovery of Faraday on induction, he invented and manufactured in 1832 the first generator.



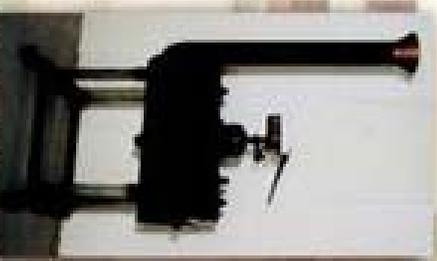
Stave (copper)

The first industrial applications of electricity are shown: the generators and their evolution, the first motors, and the measuring instruments. A large space is devoted to the history of the telegraph and of the telephone. Finally, we can see a complete room dedicated to electrical lighting.

Room called "The Three Ampères" where there are mainly manuscript documents on the life of Ampère. In this room there is a library that groups the scientific and philological publications at the time of Ampère.



Primary text Ampère's book by Legendre and Kuhnne



Hydro-communication

Armstrong (1840) hydro-electric machine : (from the Museum of the "Ars & Mètier" of Paris).

In Poleymieux, only 20 km from Lyon, in the center of the Mont's d'Or mountains, is the house where André Marie Ampère spent his youth and shaped his genius. In this house is located the Museum of Electricity that gathers:

- precious documents on the life of the scholar and his family;
- the fundamental experiments of Ampère;
- an important collection of static electrical machines;
- numerous equipments from the beginning of the 20th century;

A multimedia interactive illustrates the life of Ampère.





Home School Helps Ampère Electrify Europe Scholars

The fate of the brilliant French scientist André-Marie Ampère was probably fixed at an early age, along with subsequent advances in the development of electrical theory. In fact, the ampere—the unit of electric current—is named after him. Ampère was credited with the invention of the astatic needle, making possible the modern astatic galvanometer. He was the first to show that two parallel conductors carrying currents travelling in the same direction attract each other and, if travelling in the opposite direction, repel. He studied metaphysics, physics, and chemistry, and worked on the theory of light. He was a child prodigy who it was claimed, with probable exaggeration, had mastered all known mathematics by the age of 12. His mathematical dexterity no doubt aided him in his later work on electromagnetism and analysis, in addition to his contributions to line geometry.

Ampère's obvious brilliance notwithstanding, he might very well have languished away learning his arts and letters in a typical 18th century school had it not been for his father. In fact, the young Ampère never attended school.

Born in Lyon, France in 1775,

he was provided a home education under the careful tutelage of his prosperous father. He chose to raise his son in the peaceful solitude of the Polymieux countryside and inspired in the young boy an intense desire to learn.

At the age of 13, Ampère submitted his first paper to the Académie de Lyon. In it, he attempted to solve the problem of constructing a line of the same length as an area of a circle. It was his first of many experiments in line geometry. About ten years later, he began tutoring mathematics in Lyon, which prepared him for a later professorship there. All the while, he was making significant contributions to chemistry, suggesting that an anhydrous acid prepared two years earlier was a compound of hydrogen with an unknown element, analogous to chlorine—he suggested the name fluorine—and he later produced a classification of elements in 1816.

Ampère's study of the theory of light yielded published work on the refraction of light and his strong advocacy on the wave theory of light. But some of his most interesting work involved his attempt to produce a combined theory of electricity and magnetism after hearing about experimental results by a little-known Danish physicist named Hans Christian Orsted. Orsted had noticed by chance that a compass needle was deflected when brought close to a wire carrying an electric current. It was the first suggestion between magnetism and electricity.

Ampère immediately repeated this experiment under carefully controlled conditions. He worked out a rule relating the direction in which the compass needle was

deflected to the direction in which the electric current flowed along the wire, and soon formulated a circuit force law and created magnetism by postulating small closed circuits inside the magnetized substance. With great speed and seemingly scant effort, he demonstrated various magnetic/electrical effects to professors at the Académie. He discovered electrodynamic forces between linear wires only a few months later. He built an instrument to measure the flow using a free-moving needle—an early version of the instrument later called the galvanometer. It was the first device for detecting and measuring a small electric current.

His most important publication on electricity and magnetism, "Memoir on the Mathematical Theory of Electrodynamical Phenomena, Uniquely Deduced from Experience," was published in 1826 and contained a mathematical derivation of the electrodynamic force law. Ampère's theory became fundamental for 19th century developments in electricity and magnetism. Despite all his discoveries and abilities, Ampère does not get credit for the discovery of induced electricity. Michael Faraday discovered electromagnetic induction in 1831. Ampère initially believed that he had discovered the effect in 1822, but later agreed that full credit for discovery should go to Faraday.

This in no way diminishes Ampère's contribution to the field. His unquenchable thirst for knowledge and the values instilled in the young Frenchman by his father combined to make him one of the giants of electrical theory, who was once dubbed the "Newton of electricity." ■