

Úvod do fyziky

1. Co je fyzika ?
2. Fyzikální poznávání
3. Měření
4. Prostor, čas, pohyb
5. Síly, pole
6. Základní fyzikální konstanty
7. Zákony zachování
8. Kmity, vlny
9. Mikrosvět

Literatura

- New D.Halliday, R.Resnick, J.Walker:
Fyzika. Brno VUTIUM 2001
- R.P.Feynman, R.B.Leighton, M.Sands :
Feynmanovy přednášky z fyziky 1.-3.díl.
Havlíčkův Brod: FRAGMENT 2000-2002.

1. Co je fyzika ?

Jak studovat fyziku

Fyzika je...

Vztah k přírodním vědám

Vztah k matematice

Vztah k obecným problémům

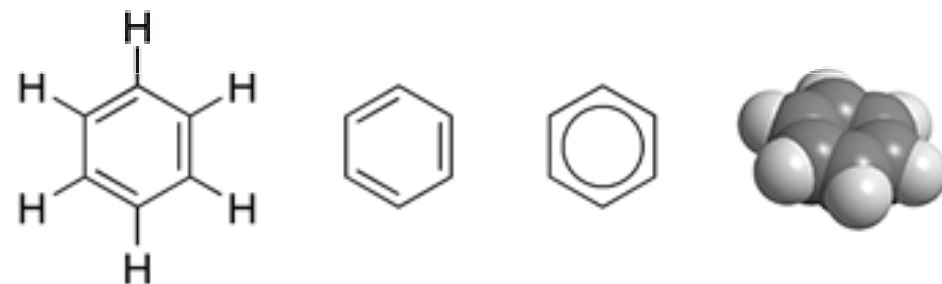
Fyzika a technické aplikace

Fyzika a filosofie

Fyzika - experimentální věda

- měření

- rozsah zájmu

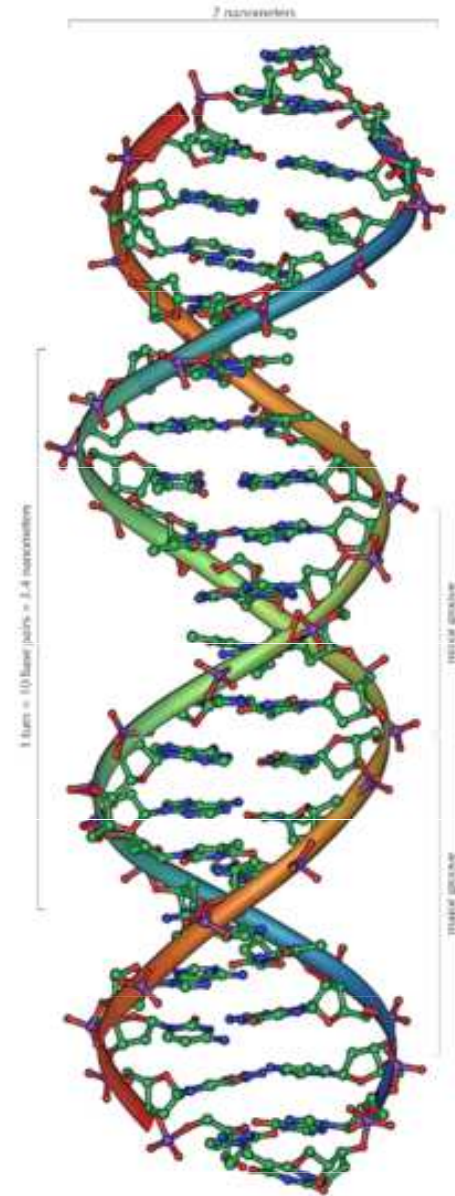


Benzen C₆H₆

Jan Josef Loschmidt ([1821](#) - [1895](#))

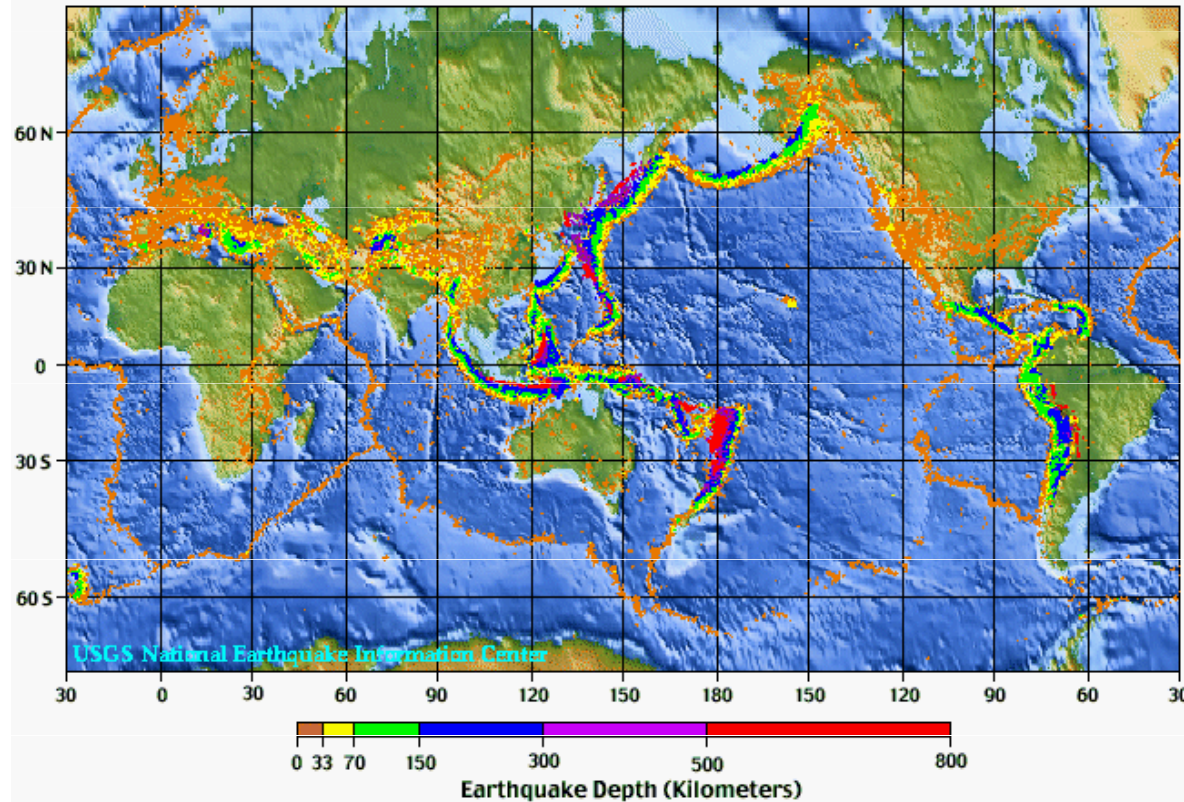


Gregor Mendel (1822-1884)



The structure of part of a DNA double helix

<http://en.wikipedia.org/wiki/DNA>



Distribution of earthquake epicenters from 1975 to 1995.

www.physicalgeography.net/fundamentals/images...



M81

This image combines data from the Hubble Space Telescope,
the Spitzer Space Telescope,
and the Galaxy Evolution Explorer (GALEX)

ipac.jpl.nasa.gov/.../sig07-009_small.jpg



Chammurapiho zákoník
1780 př.n.l.



$$\mathbf{p} = m\mathbf{v}$$

$$\mathbf{F} = \dot{\mathbf{p}}$$

$$\mathbf{F}_{12} = -\mathbf{F}_{21}$$

$$\nabla \cdot \mathbf{D} = \rho_e$$

$$\nabla \cdot \mathbf{B} = \rho_m$$

$$\nabla \times \mathbf{H} = \mathbf{j}_e + \dot{\mathbf{D}}$$

$$\nabla \times \mathbf{E} = -\mathbf{j}_m - \dot{\mathbf{B}}$$

$$\hat{H}\psi = E\psi$$

Newton

Maxwell

Schrödinger



www.aeolus-online.com

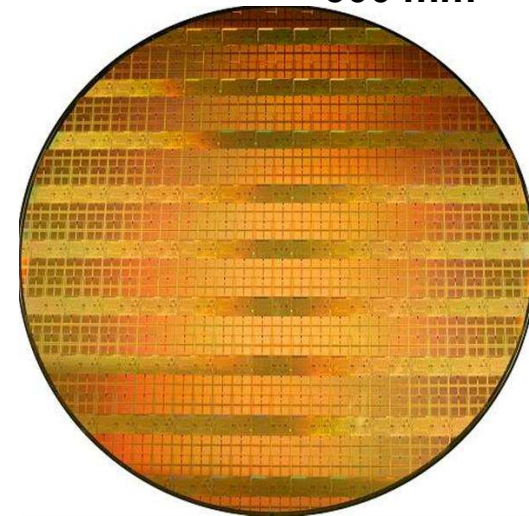


sant.theiet.org.au

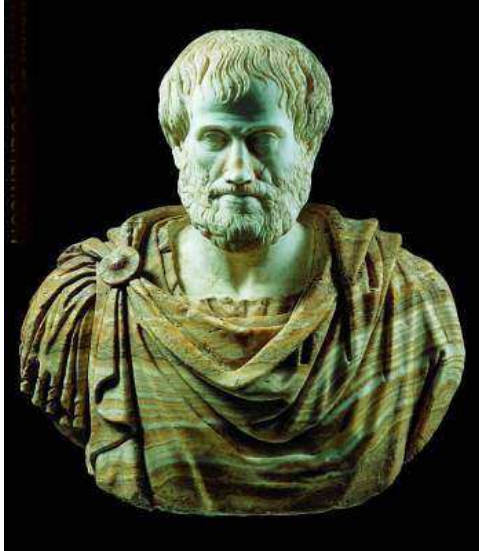


www.city-data.com

300 mm - 45 nm



<http://www.intel.com/pressroom/archive/releases/20...>



Aristóteles
384 a.C. - c. 322.A.C

paginas.terra.com.br/.../aristoteles.jpg

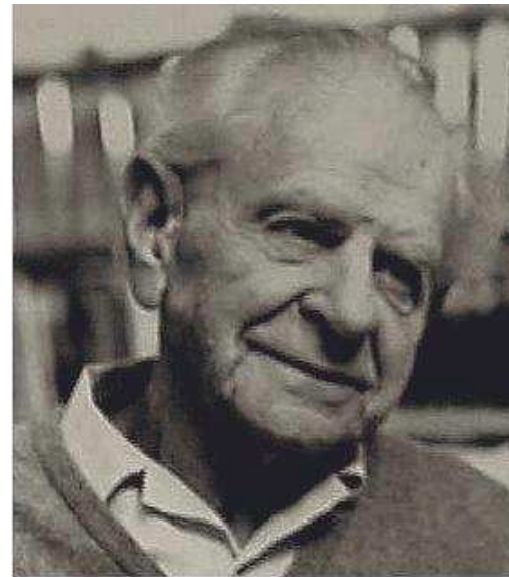


Isaac Newton www.crystalinks.com/newton.jpg
1643-1727



Werner Karl Heisenberg (1901-1976)

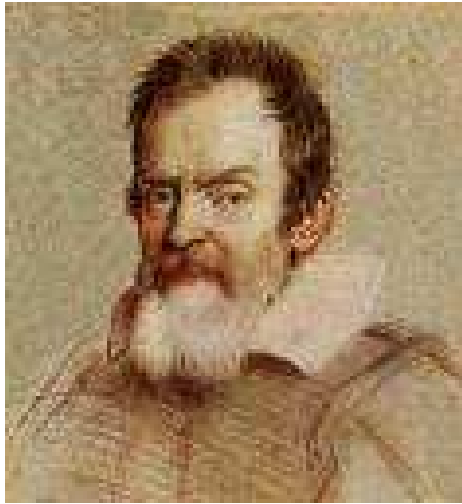
<http://en.wikipedia.org/>



Sir Karl Popper (1902-1994)

Karl Raimund Popper
1902-1994

www.seop.leeds.ac.uk/.../popper/popper.jpg

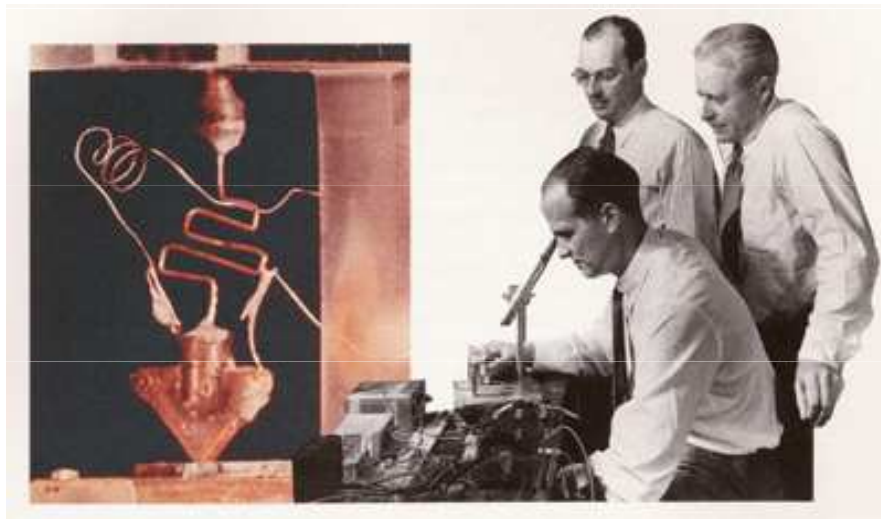


Galileo Galilei 1564-1642

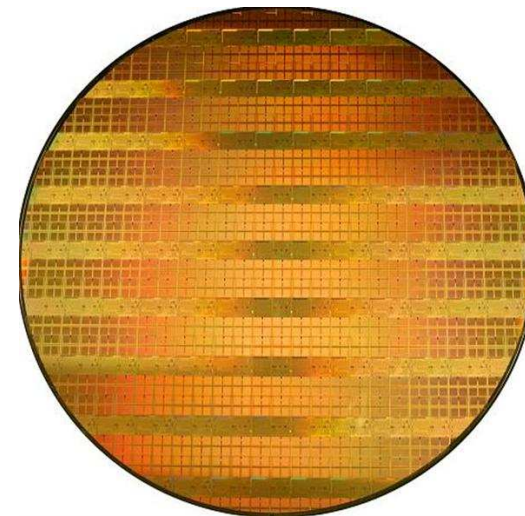
ww.cbk.waw.pl/zgp/images/dg/GalileoGalilei.jpg



science.nasa.gov/.../lunarranging/tower1_med.jpg



<http://www.cedmagic.com/history/transistor-1947.jpg>



$$L=2.1746\pm 0.0003 \text{ m}$$

$$c=299\,792\,458 \text{ m/s;}$$

$$\Delta x \cdot \Delta p > \sim h$$

m(kg)	10^{-36} (neutrino)	10^0 (litr)	10^{50} (vesmír)
l(m)	10^{-35} (Planck, struna)	10^0 (člověk)	10^{26} (vesmír)
t(s)	10^{-44} (Planck)	10^0 (srdce)	10^{17} (vesmír)

2. Fyzikální poznávání

Filosofie objevu

-Koperník, Brahe, Kepler, Newton

Model, teorie, zákon

- model (světlo)

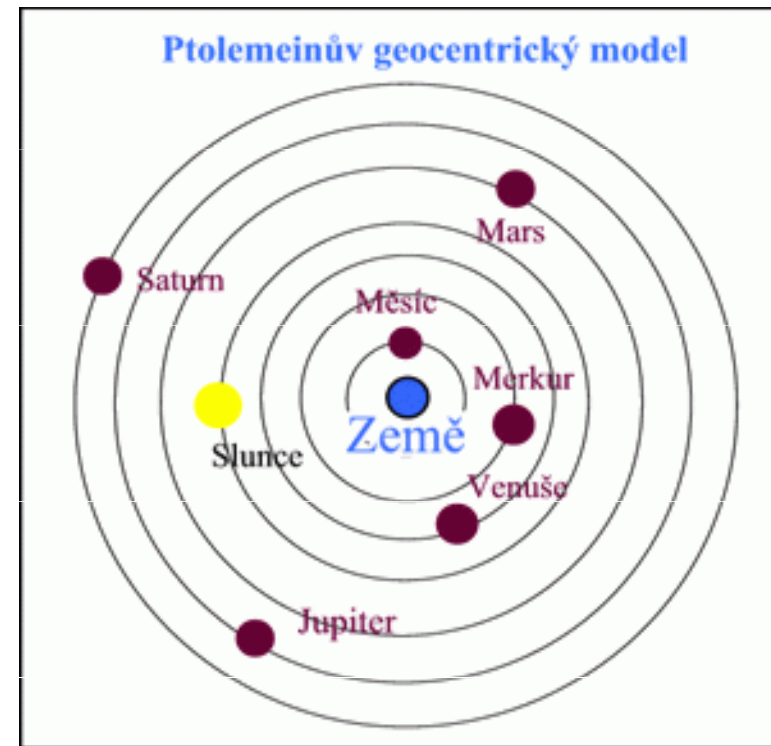
- teorie (mechanika, relativita)

- zákon (zákony zachování, empirie)

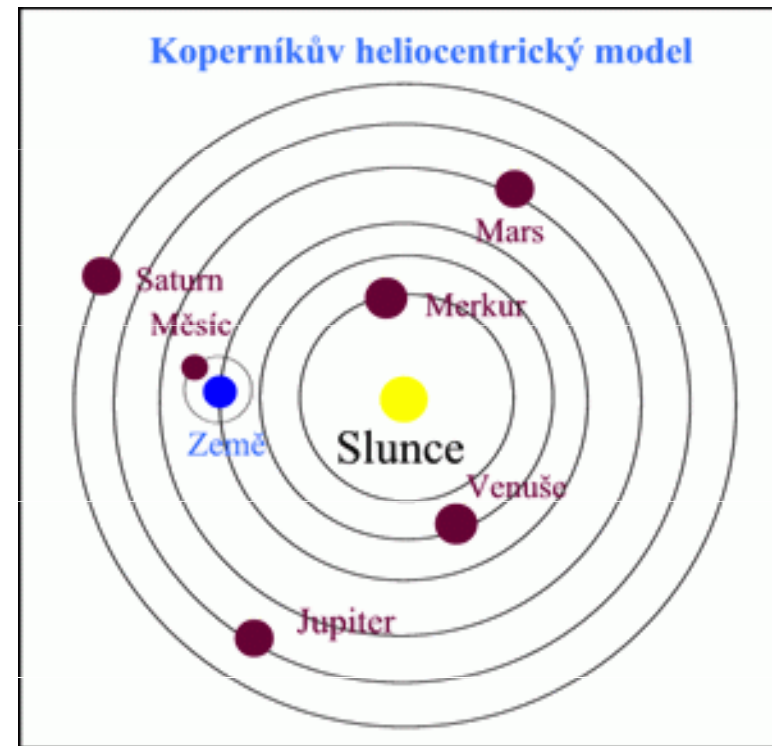
Pravidlo pravidel (symetrie)



Claudius Ptolemaeus 85 - 165

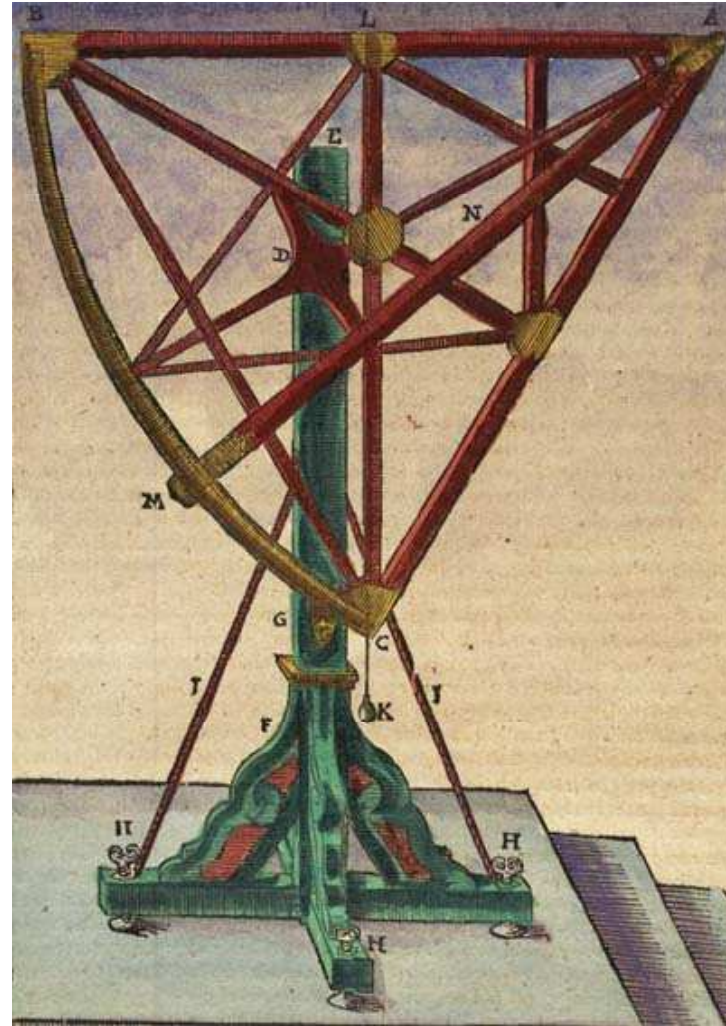


<http://galaxie.web2001.cz/astronomie/obrazky/geocentr.gif>
<http://geog.arizona.edu/about/ptolemy.jpg>



1473 - 1543

<http://galaxie.web2001.cz/astronomie/obrazky/heliocentr.gif>
wikipedie



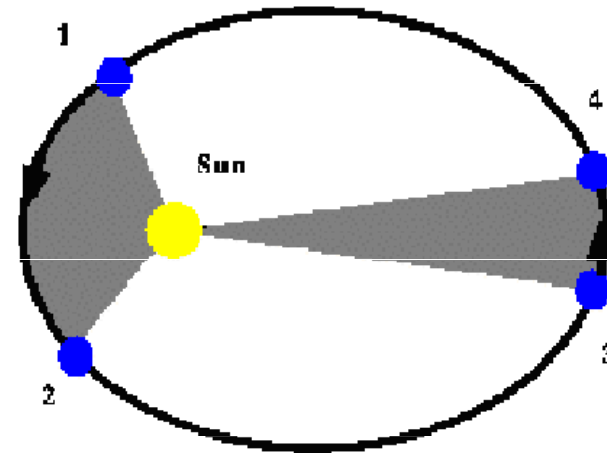
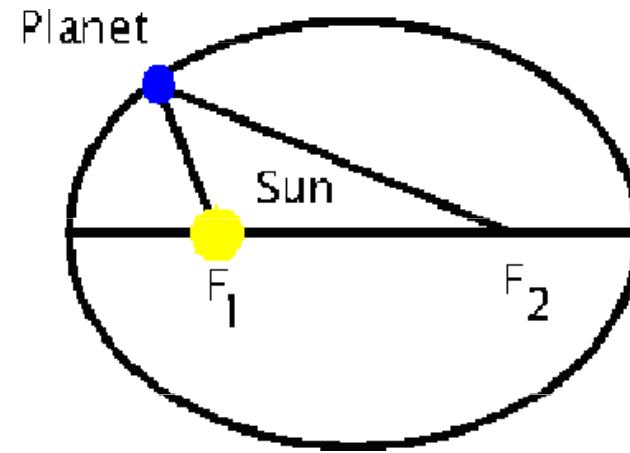
Tycho Brahe 1546 - 1601

tycho-brahe.navajo.cz/tycho-brahe-2.jpg

upload.wikimedia.org/wikipedia/commons/e/e0/T.



Johannes Kepler 1571-1630

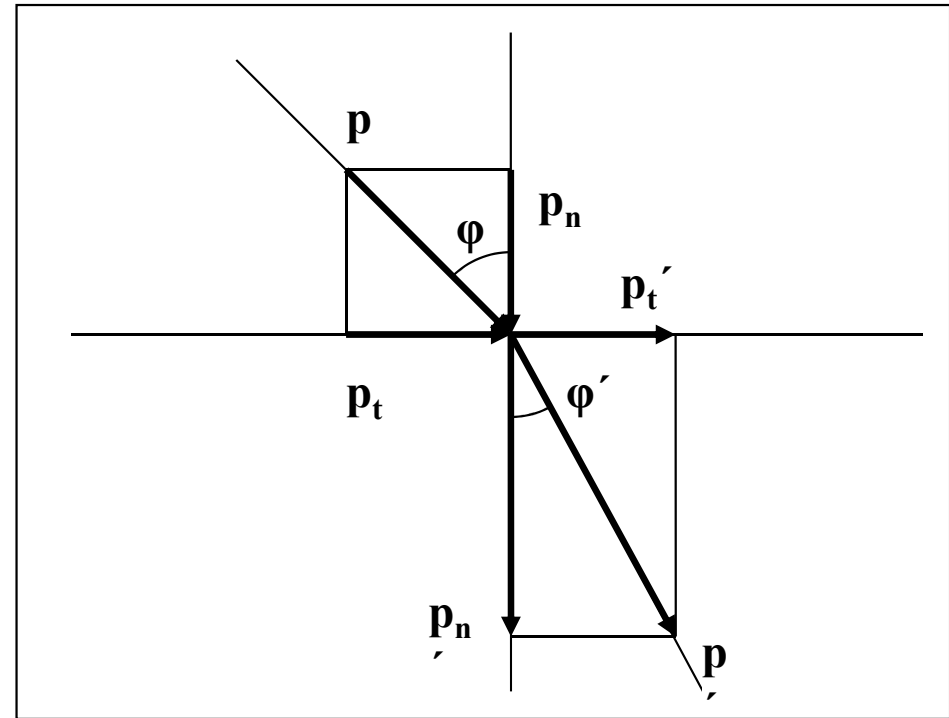
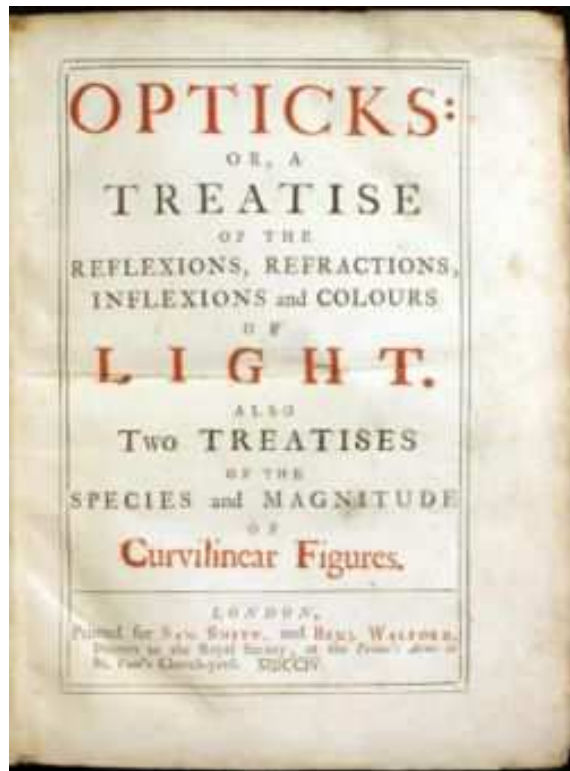


$$\frac{r^3}{T^2} = \text{konst}$$

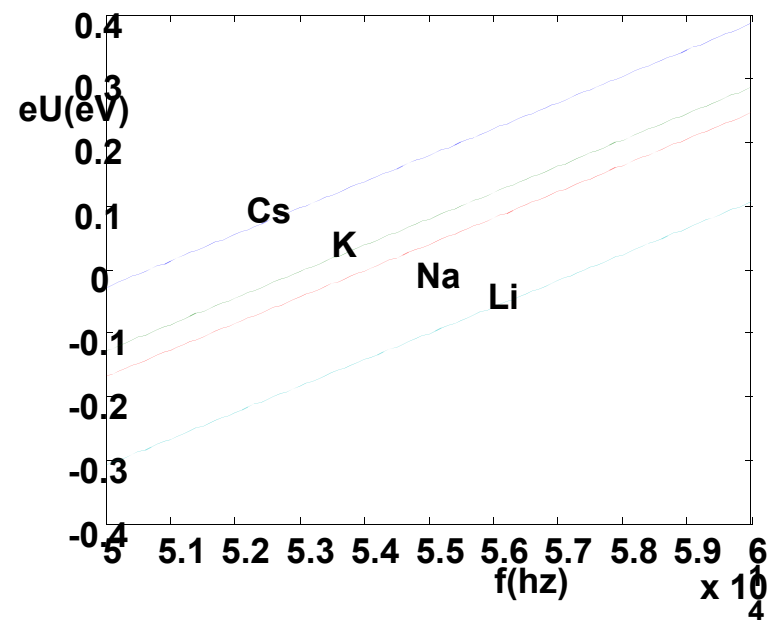
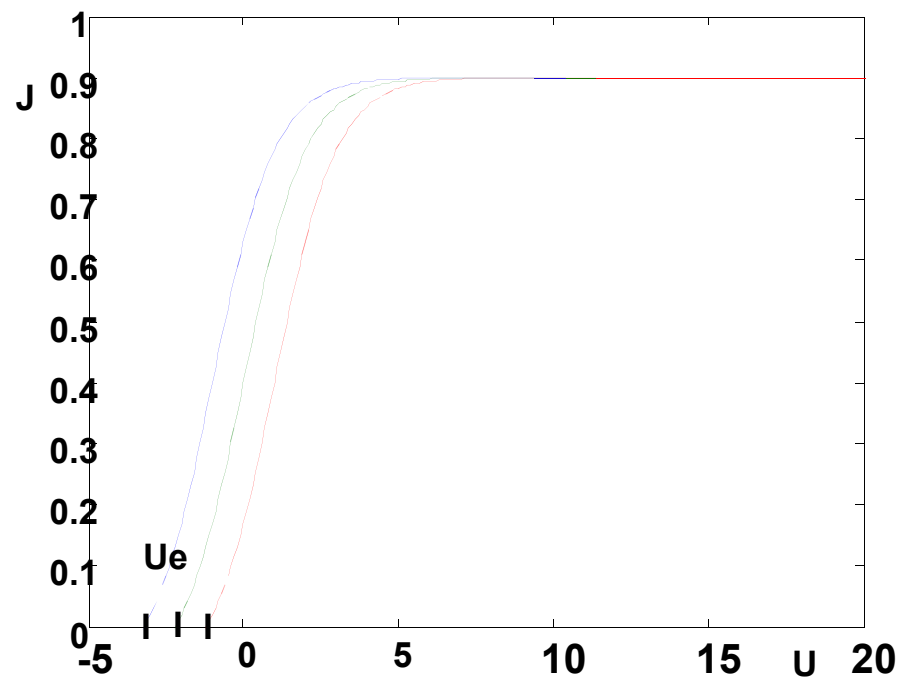
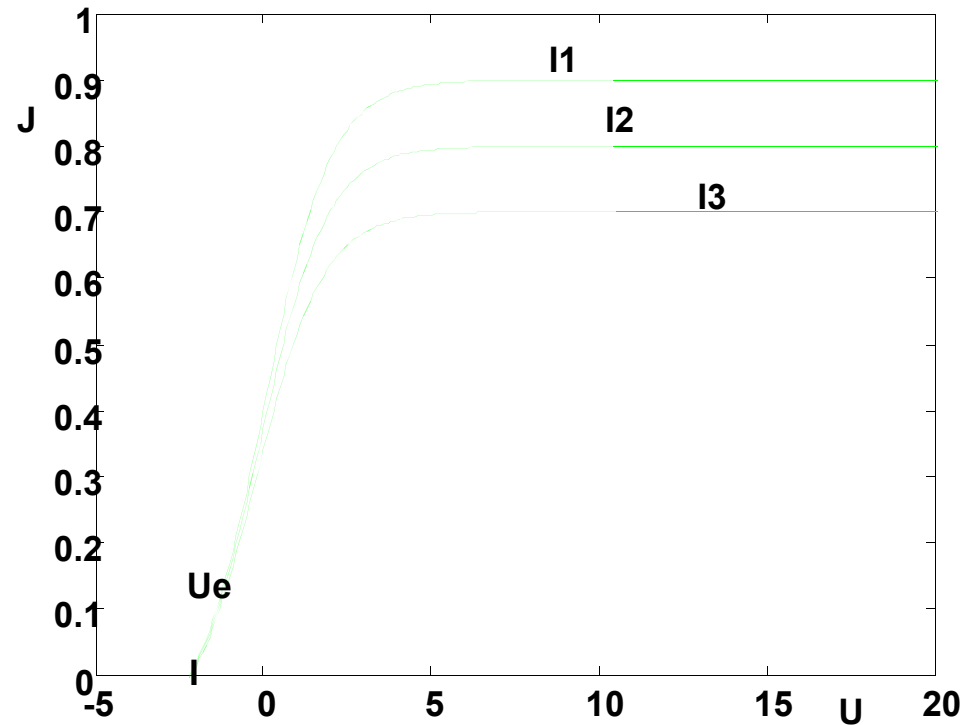
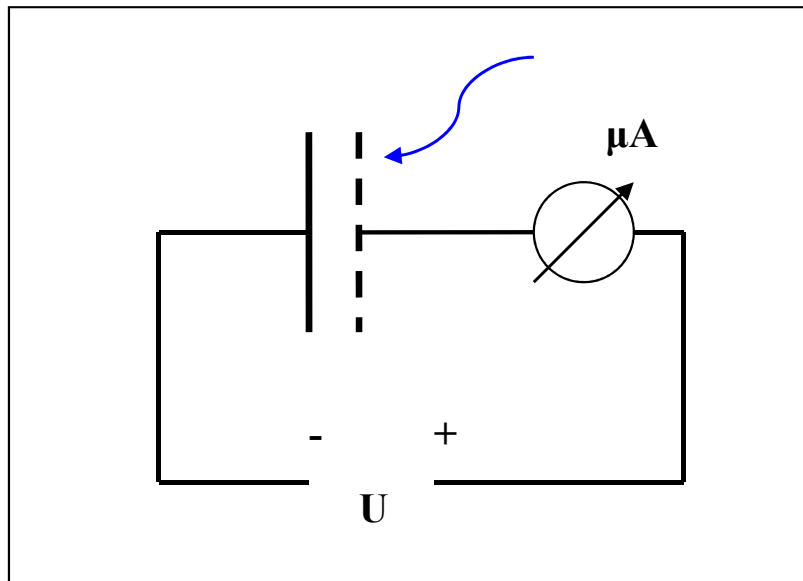


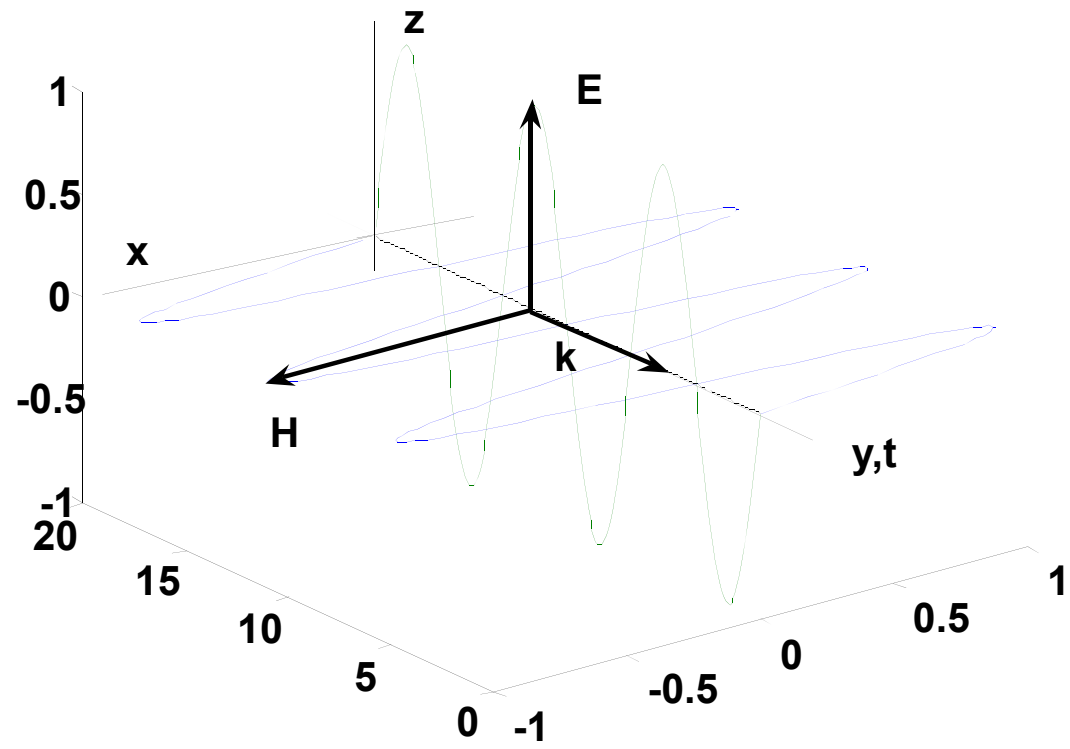
$$F = G \frac{m_1 m_2}{r^2}$$

Isaac Newton
1643-1727



<http://en.wikipedia.org/wiki/Image:Opticks.jpg>

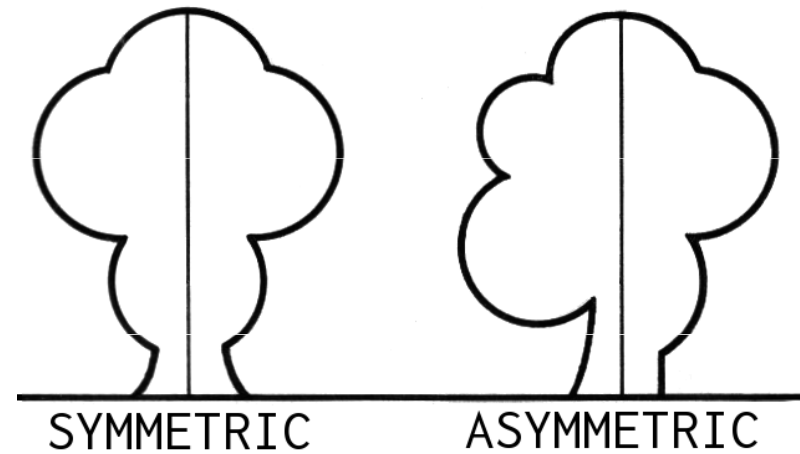
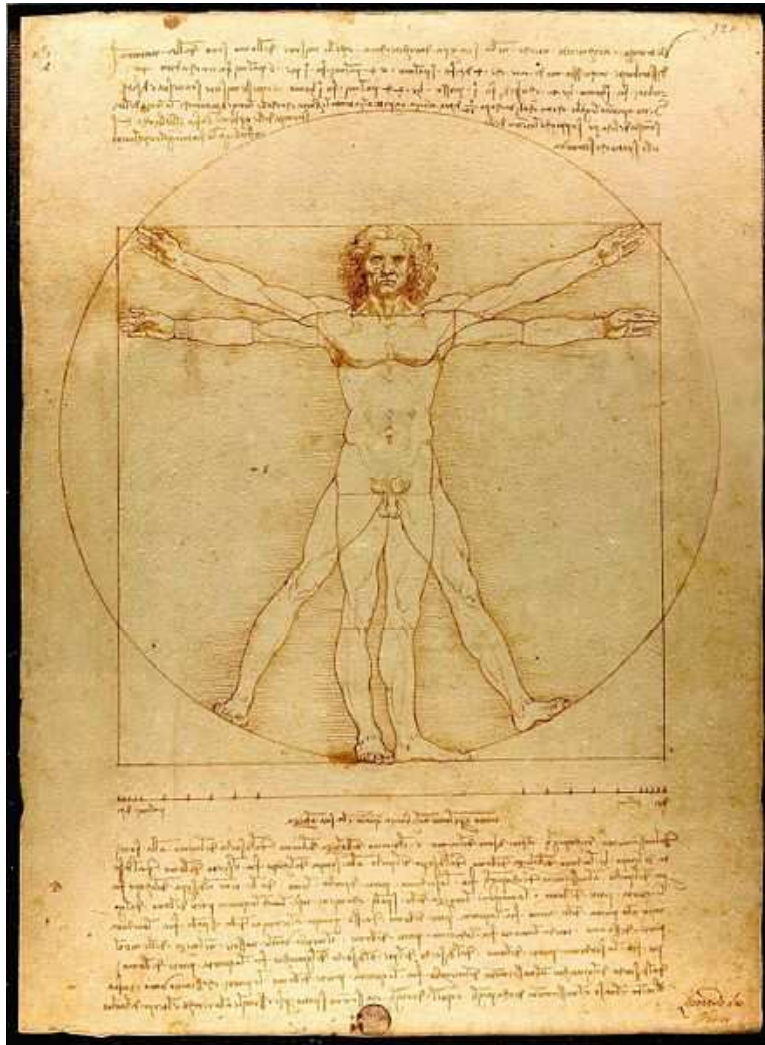




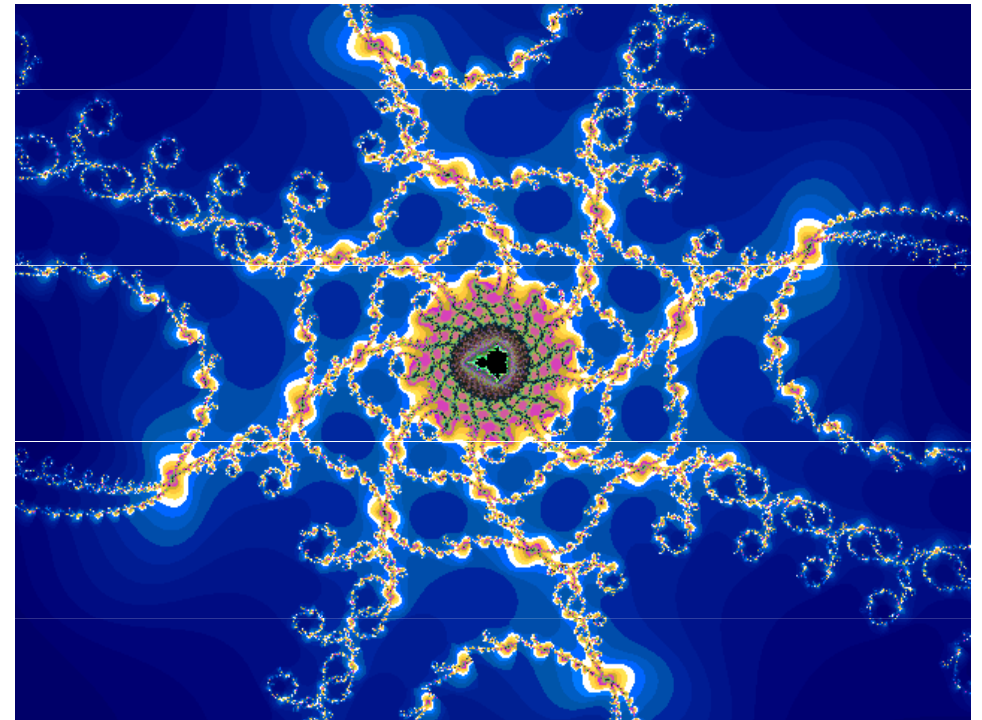
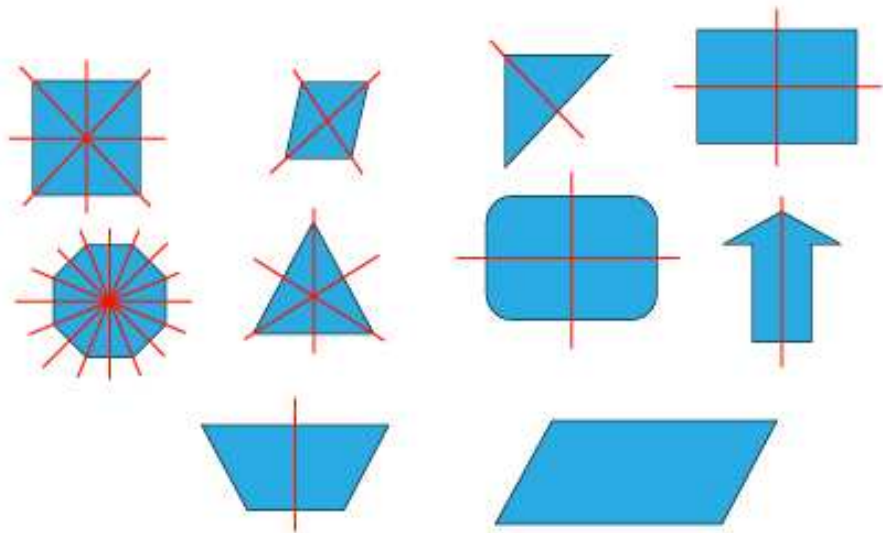


Amalie Emmy Noether 1882-1935

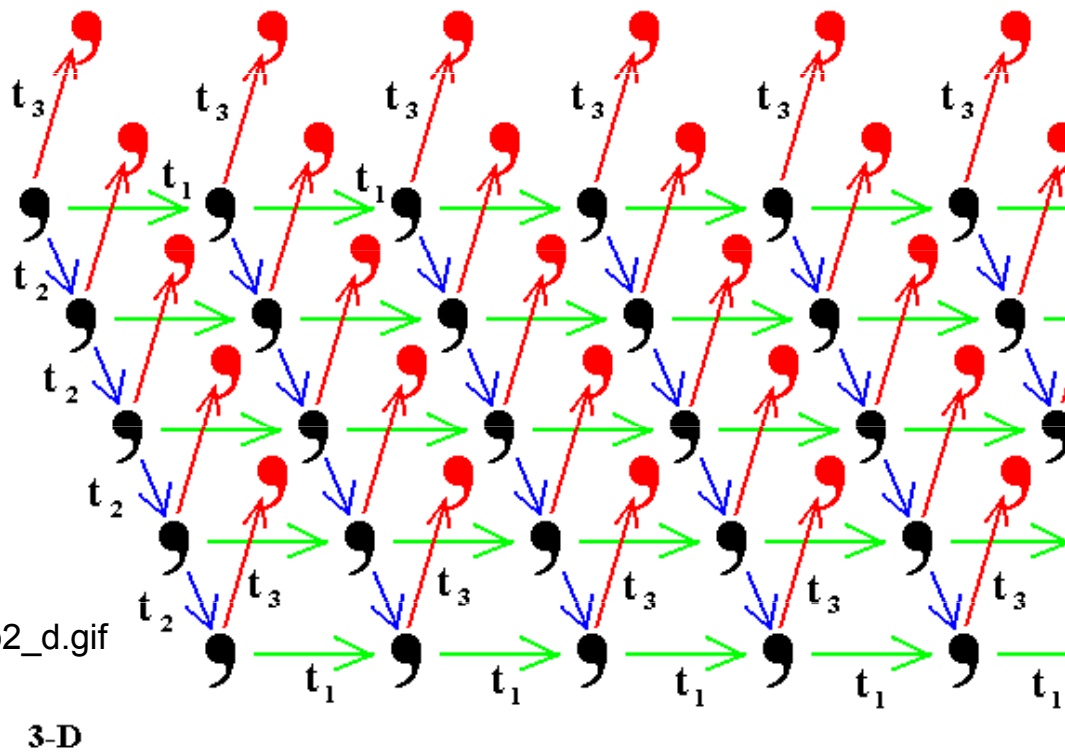
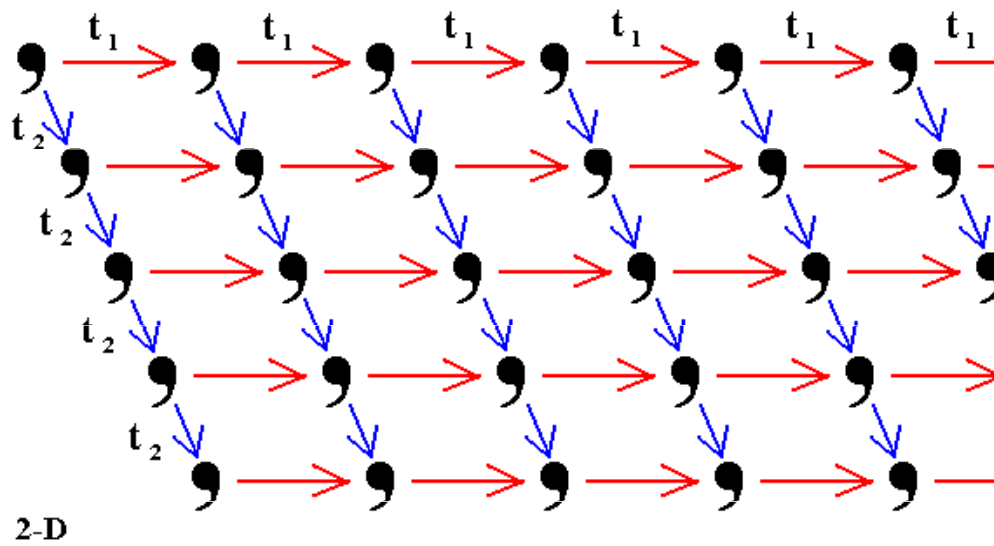
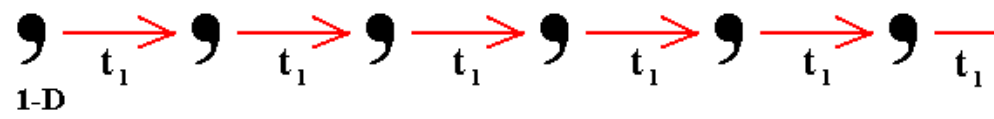
http://en.wikipedia.org/wiki/Emmy_Noether

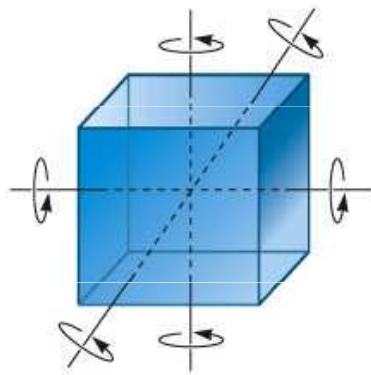


**Leonardo da Vinci's *Vitruvian Man* (ca. 1487)
is often used as a representation of symmetry
in the human body and, by extension, the natural universe.**

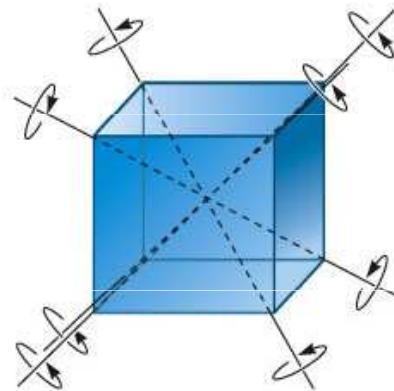


Fractal

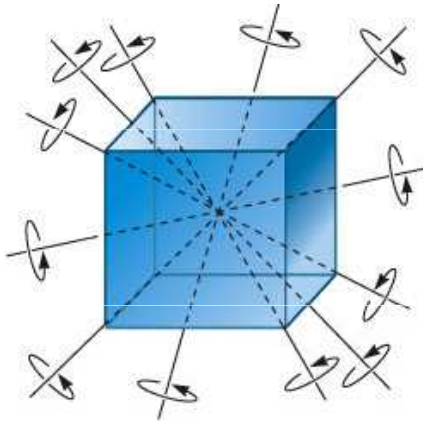




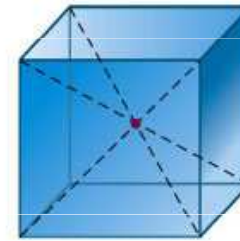
Three 4-fold axes



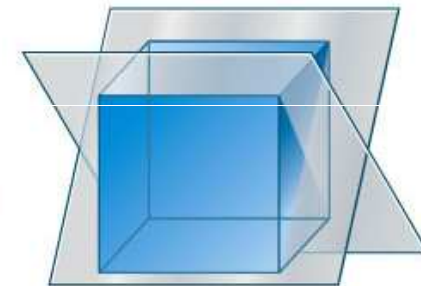
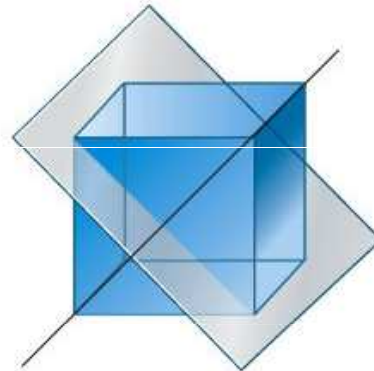
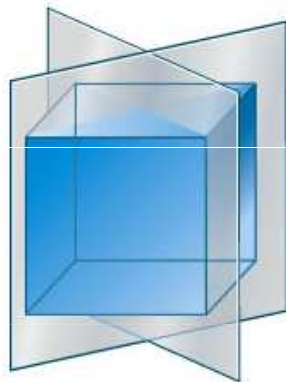
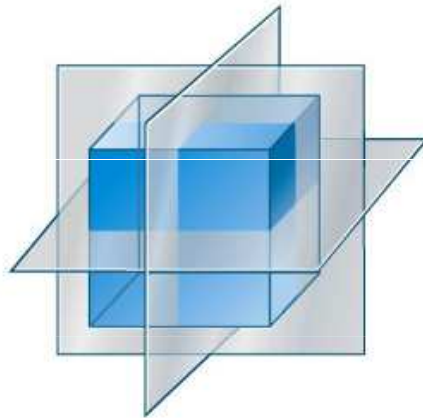
Four 3-fold axes



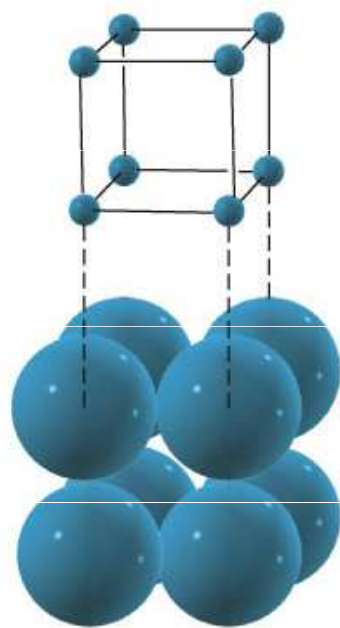
Six 2-fold axes



Center of inversion

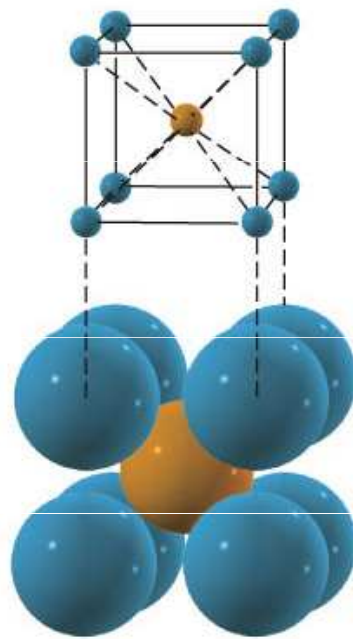


Nine mirror planes

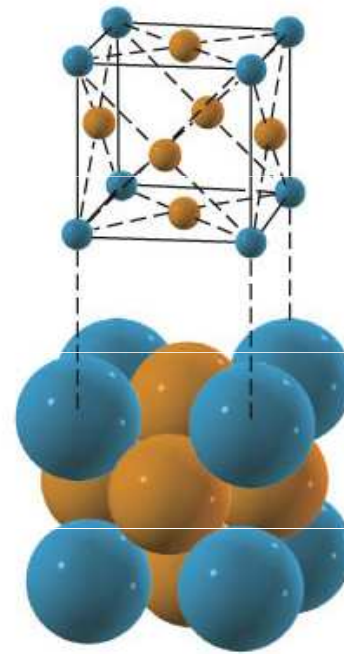


Primitive

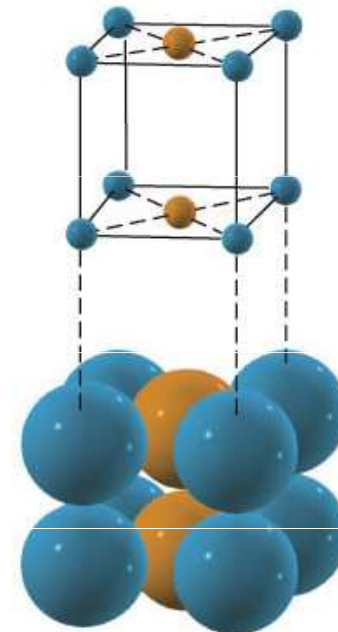
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Body-centered



Face-centered



Side-centered

3. Měření

Fyzikální veličiny

Fyzikální jednotky

Soustava SI

Jiné soustavy

Měření

- chyby
- zpracování výsledků měření
- graf

činitel předpona značka

10²⁴ yotta Y

10²¹ zetta Z

10¹⁸ exa E

10¹⁵ peta P

10¹² tera T

10⁹ giga G

10⁶ mega M

10³ kilo k

10² hekto h

10¹ deka da

10⁻¹ deci d

10⁻² centi c

10⁻³ mili m

10⁻⁶ mikro μ

10⁻⁹ nano n

10⁻¹² piko p

10⁻¹⁵ femto f

10⁻¹⁸ atto a

**10⁻²¹ zepto (*dříve*
banto) *z (dříve*
*b)***

10⁻²⁴ yokto y

Veličina	jednotka	značka	přesnost
Délka	metr	m	10^{-10}
Hmotnost	kilogram	kg	10^{-7}
Čas	sekunda	s	10^{-14}
Elektrický proud	ampér	A	10^{-5}
Teplota	kelvin	K	10^{-4}
Svítivost	kandela	cd	$5 \cdot 10^{-3}$
Látkové množství	mol	mol	10^{-6}

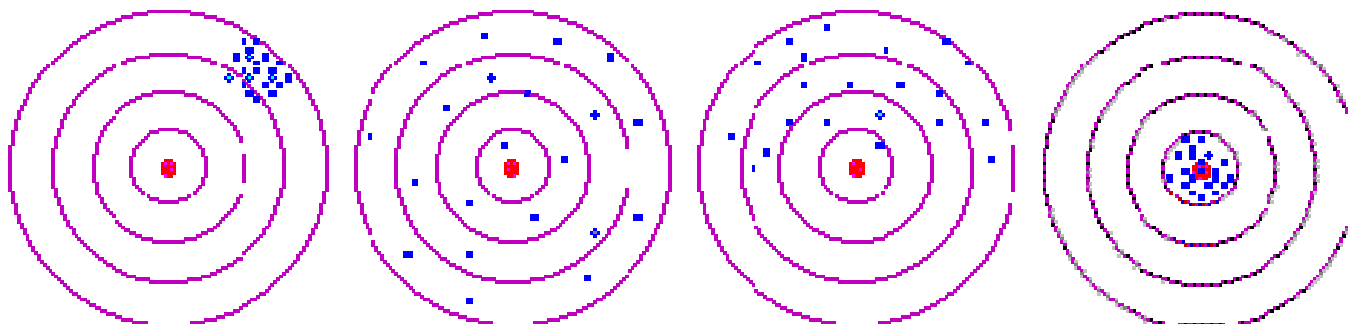


m



kg

<http://en.wikipedia.org/wiki/>

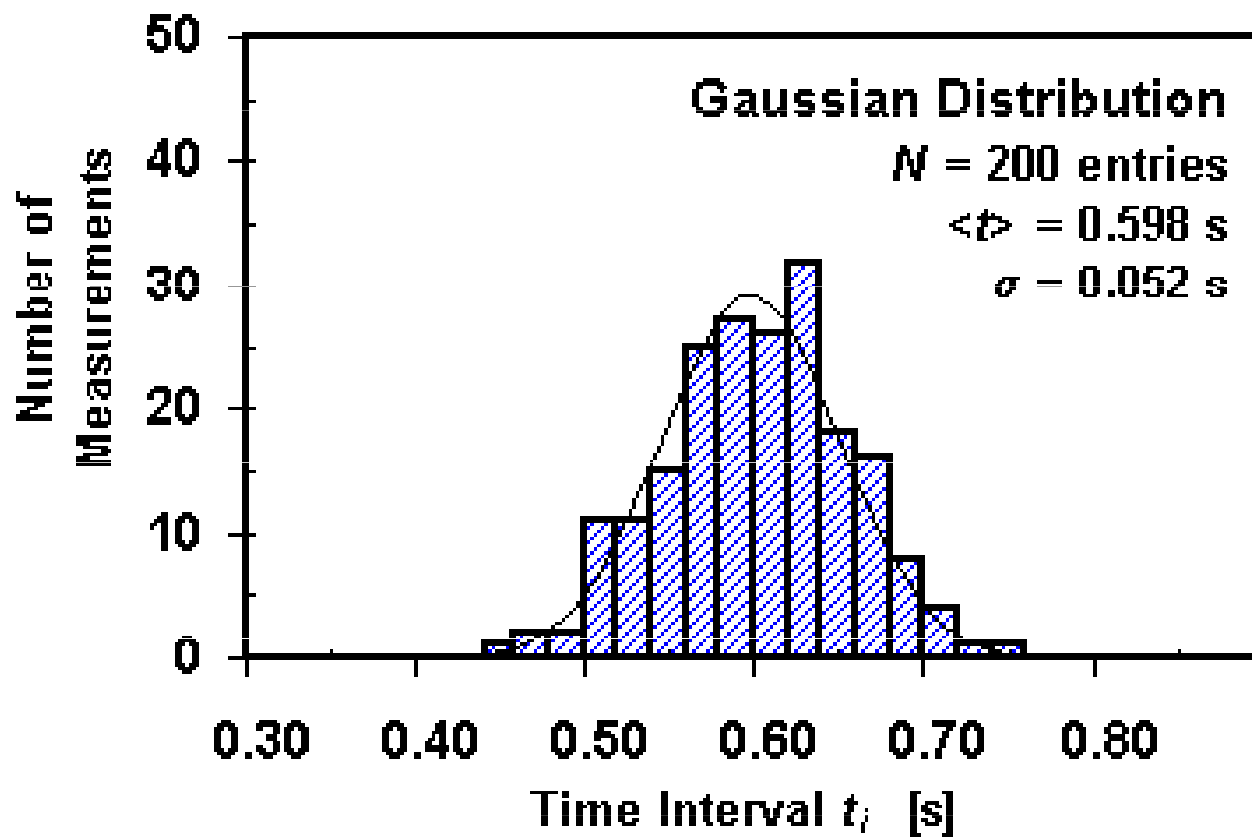


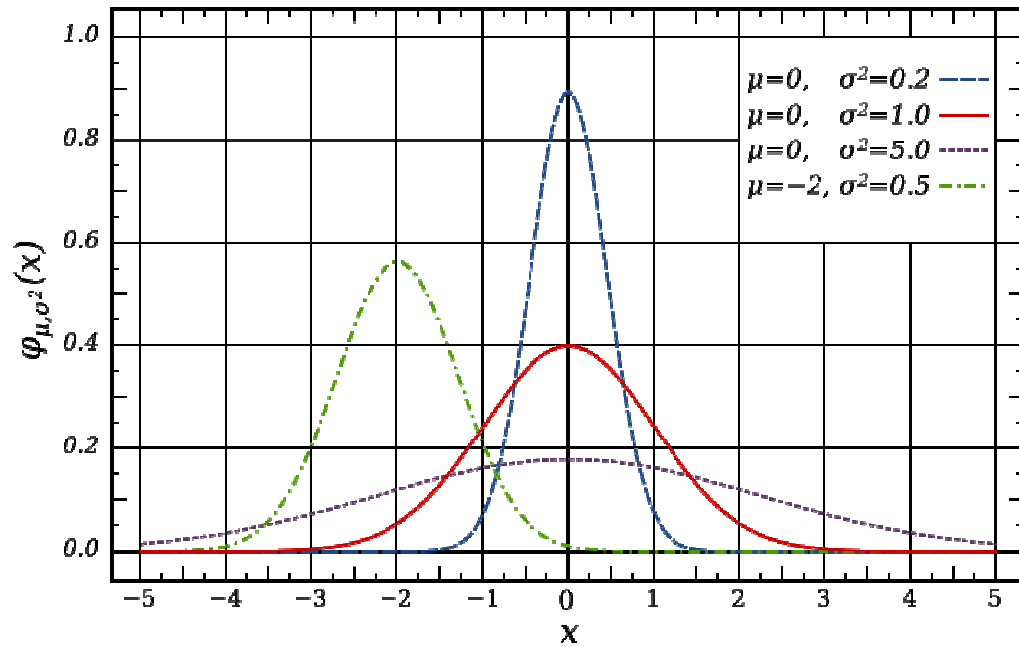
Statistical: Small
Systematic: Large

Large
Small

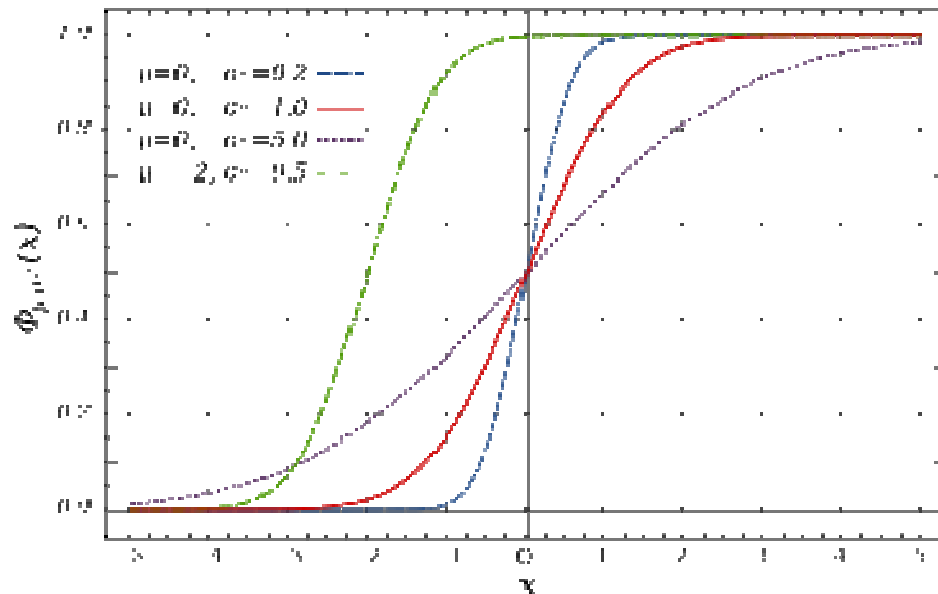
Large
Large

Small
Small

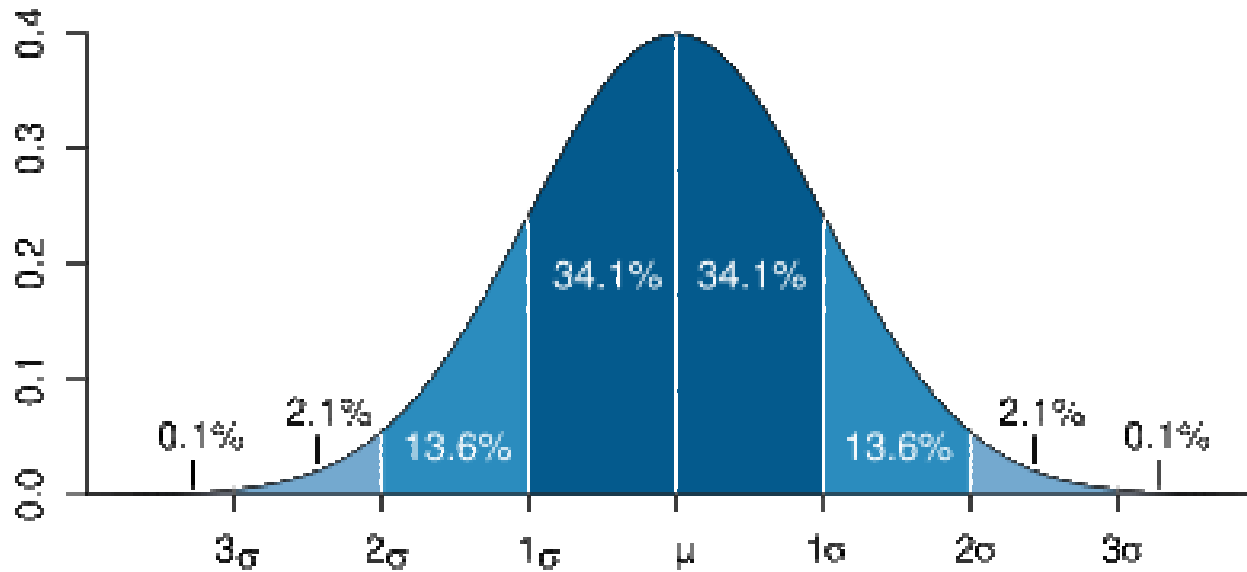




$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-\frac{(x-\mu)^2}{2\sigma^2}\right]$$



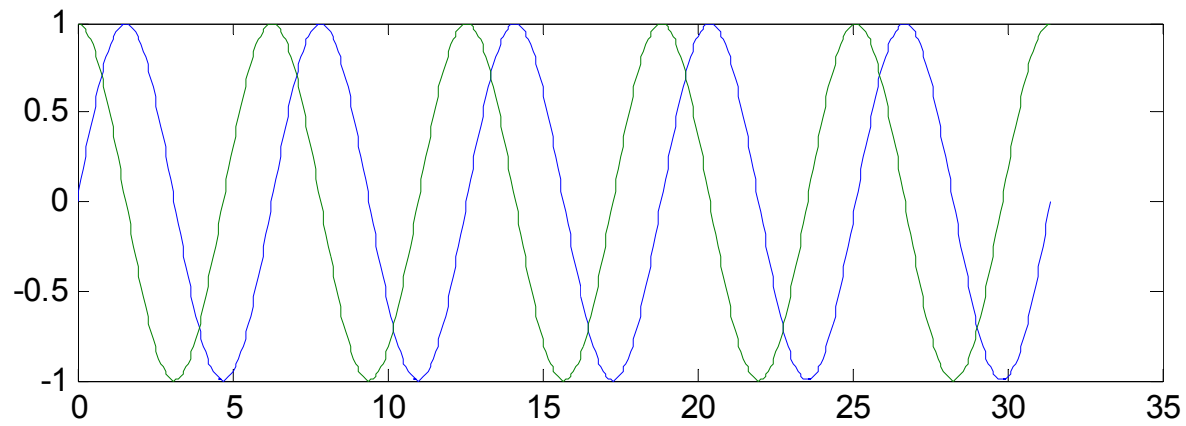
$$F(x) = \int_{-\infty}^x f(x') dx'$$



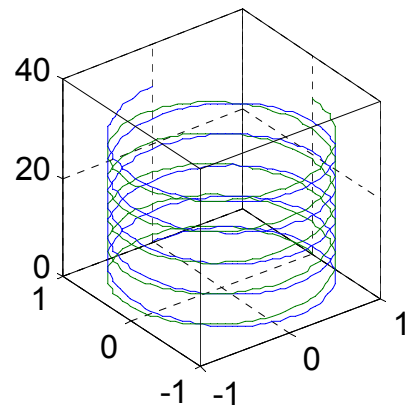
$$P(\mu - \sigma, \mu + \sigma) = 0.682$$

$$P(\mu - 2\sigma, \mu + 2\sigma) = 0.954$$

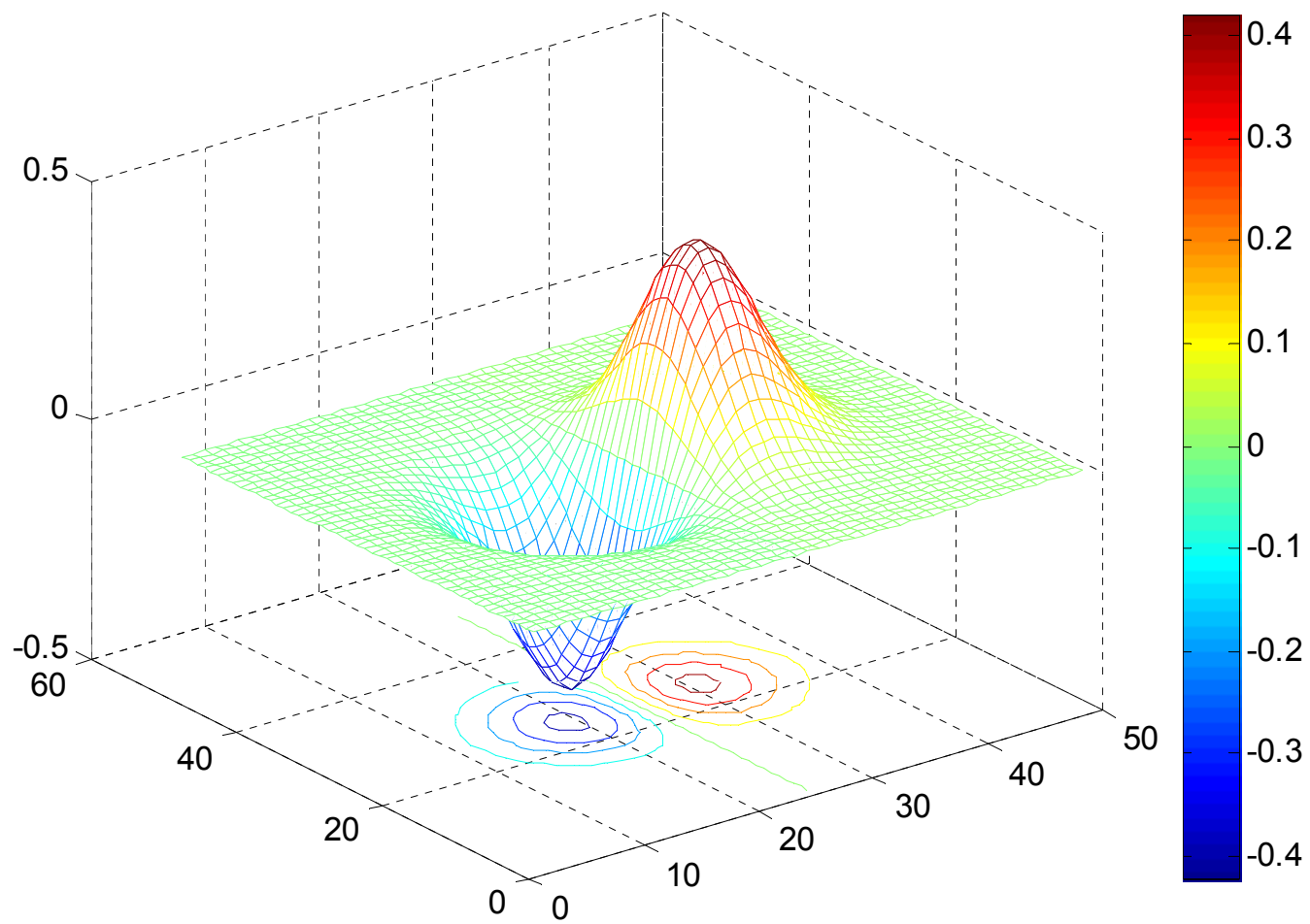
$$P(\mu - 3\sigma, \mu + 3\sigma) = 0.997$$



$y = \sin(t)$
 $y = \cos(t)$



$x = \sin(t)$
 $y = \cos(t)$
 $z = t$
 $x = \cos(t)$
 $y = \sin(t)$
 $z = t$

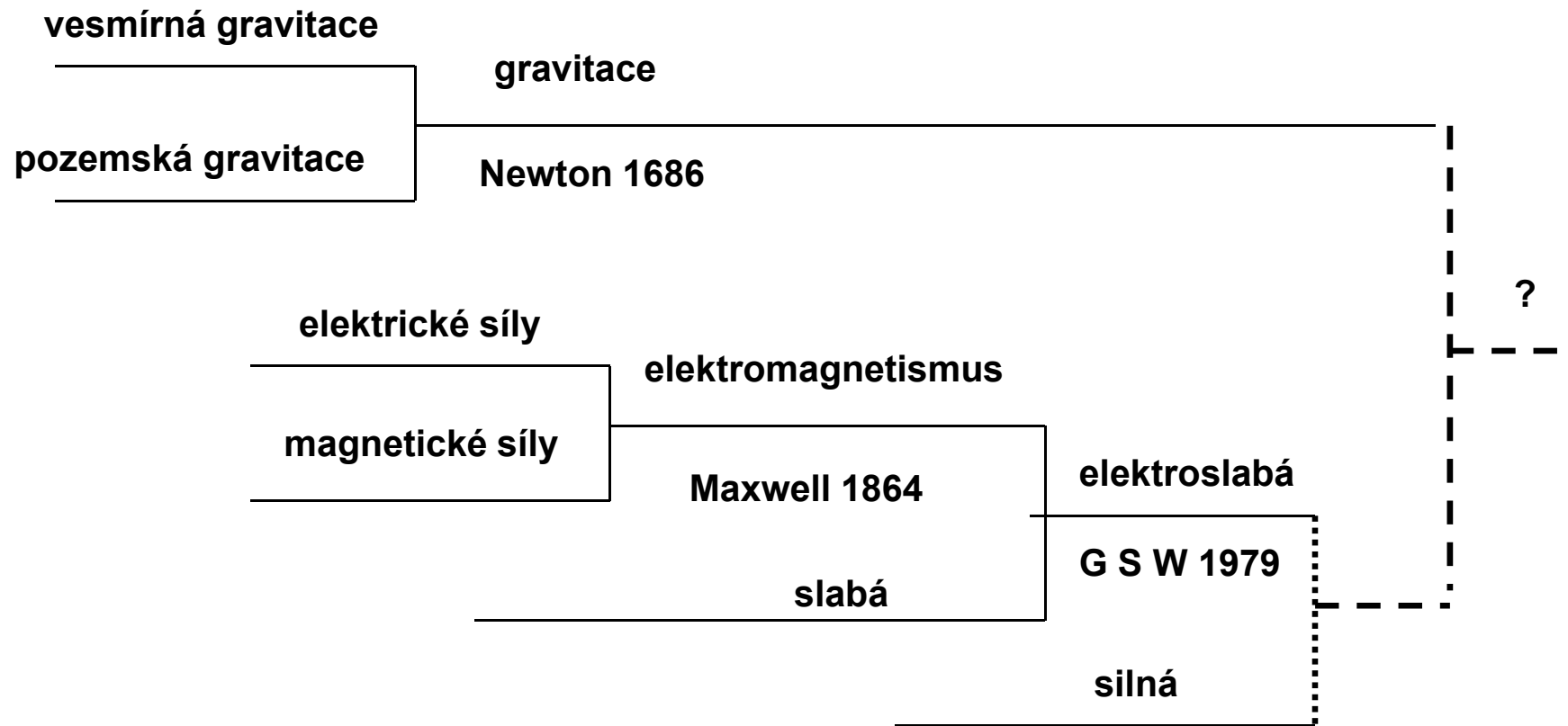


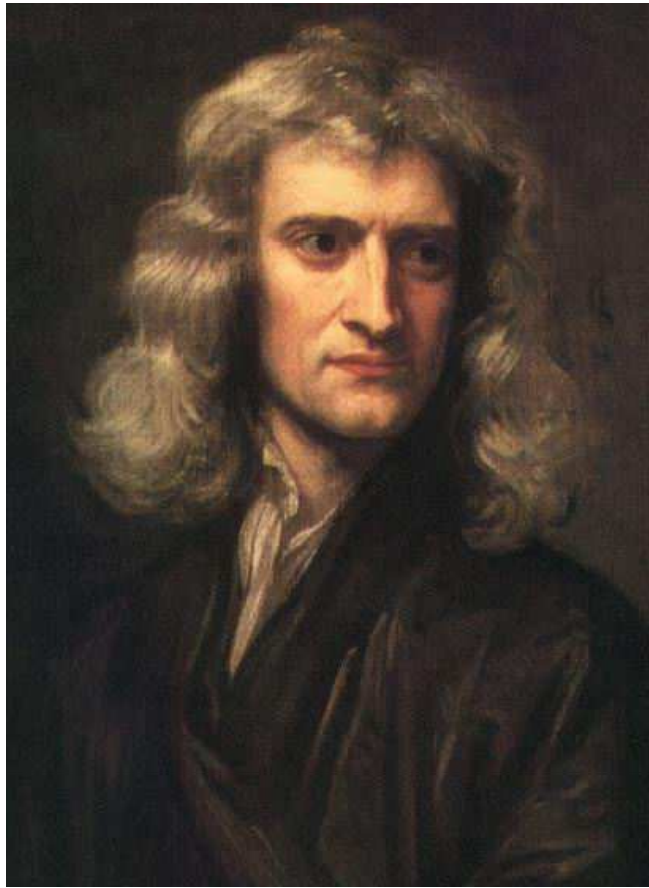
$$z = x \cdot \exp(-x^2 - y^2)$$

interakce		rel.vel.		dosah
gravitační	„gravitony“	10^{-38}	$1/r^2$	∞
slabá	W a Z bozony	10^{-15}		10^{-18}
elektroma gnetická	fotony	10^{-2}	$1/r^2$	∞
silná	gluony	1		10^{-15}

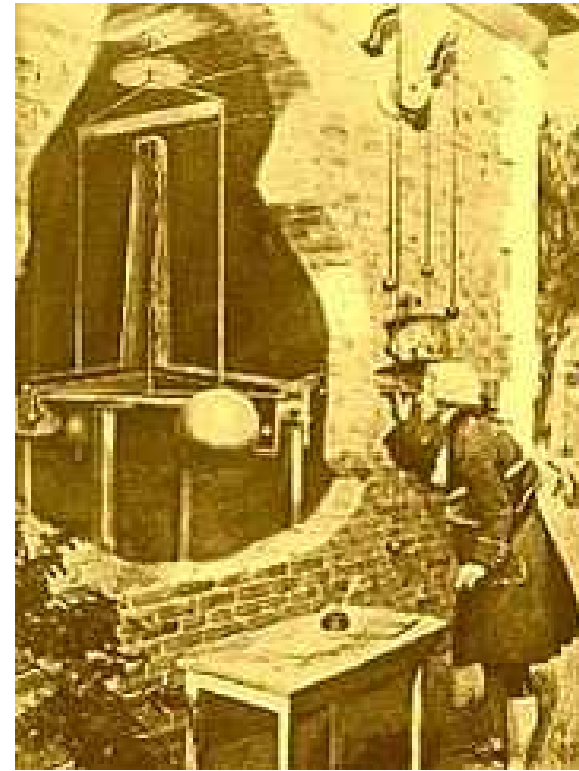
interakce	e-v	e-p	p-p	p-n,n-n
gravitační	0	10^{-41}	10^{-38}	10^{-38}
slabá	10^{-15}	10^{-15}	10^{-15}	10^{-15}
elektromagnetická	0	10^{-2}	10^{-2}	0
silná	0	0	1	1

relativní velikost pro vzdálenost 10^{-15}m





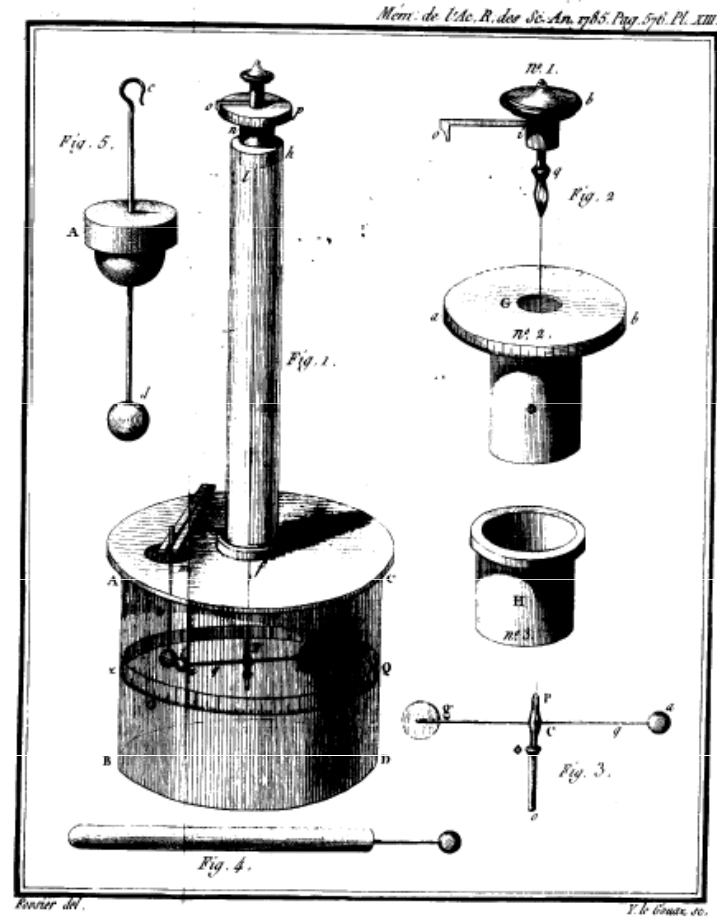
Isaac Newton 1643-1727

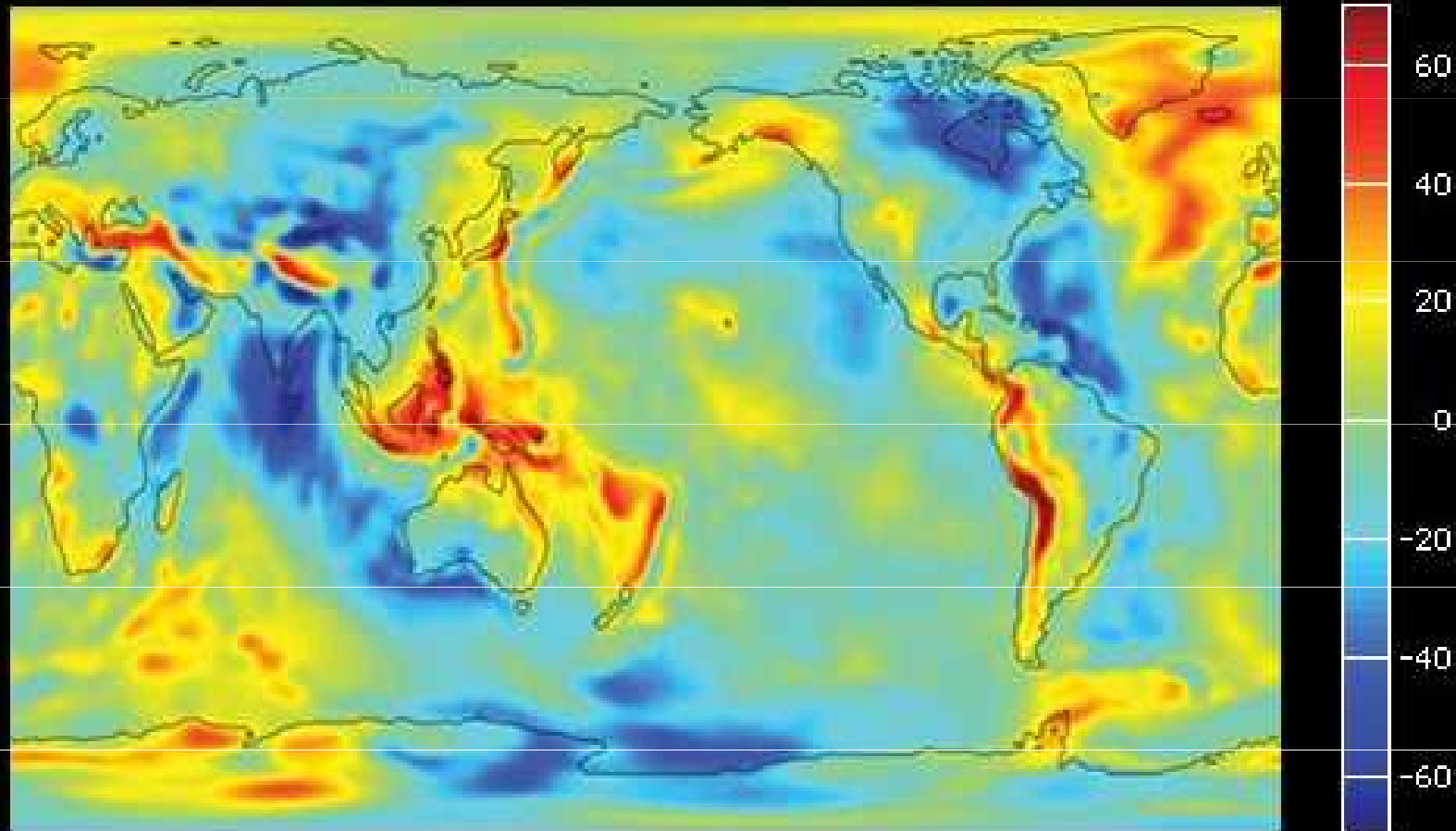


Henry Cavendish 1731-1810



Charles-Augustin de Coulomb
1736-1806

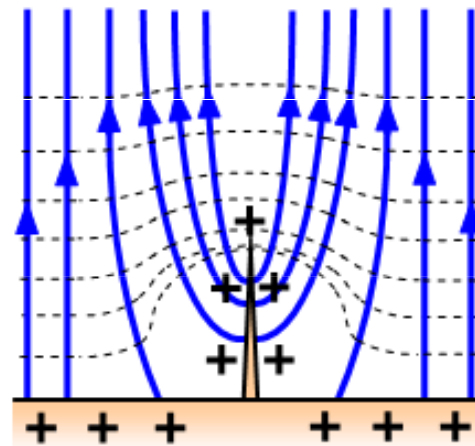
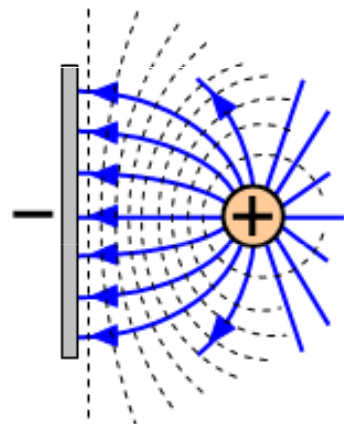
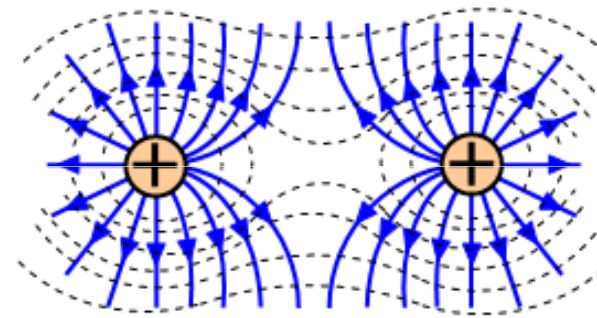
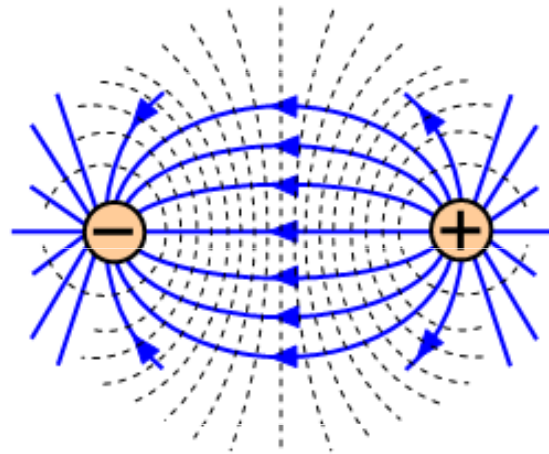




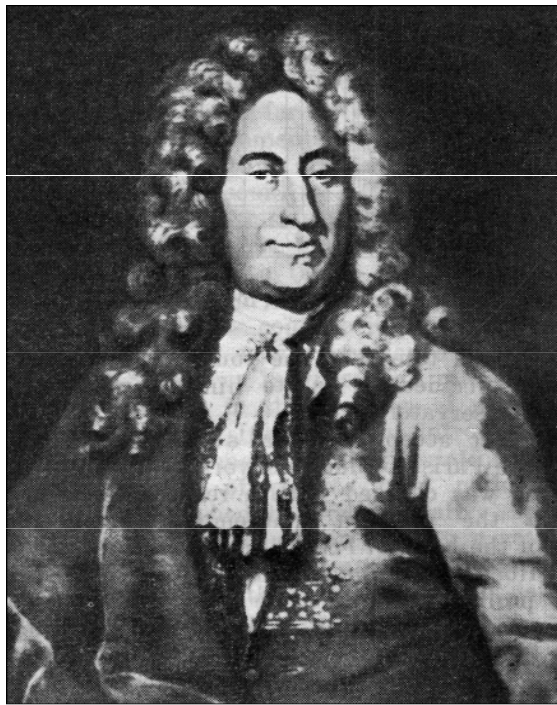
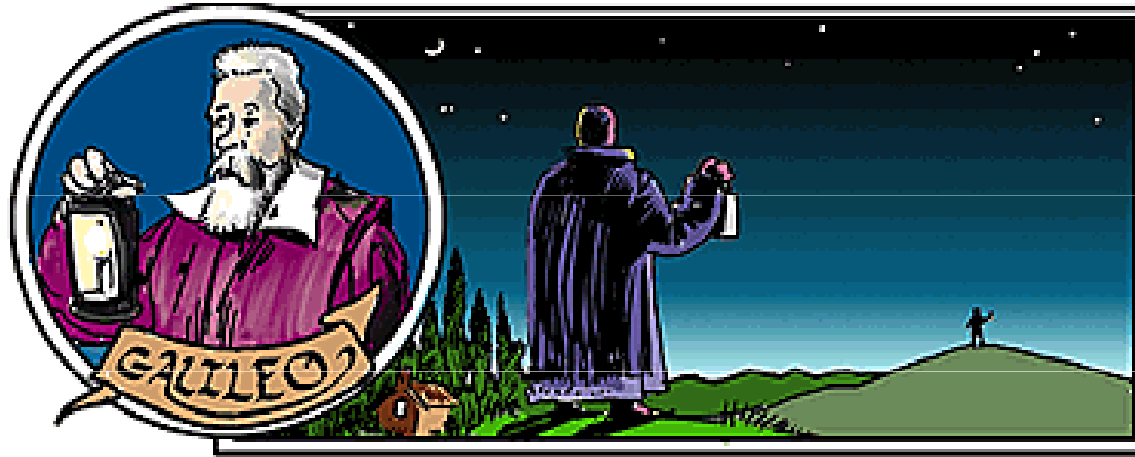
gravity anomaly (mGal)

Source : NASA/JPL/University of Texas Center for Space Research/GeoForschungsZentrum Potsdam

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(resourcefulphysics.org)



Olaf (Ole) Roemer (1644-1710)

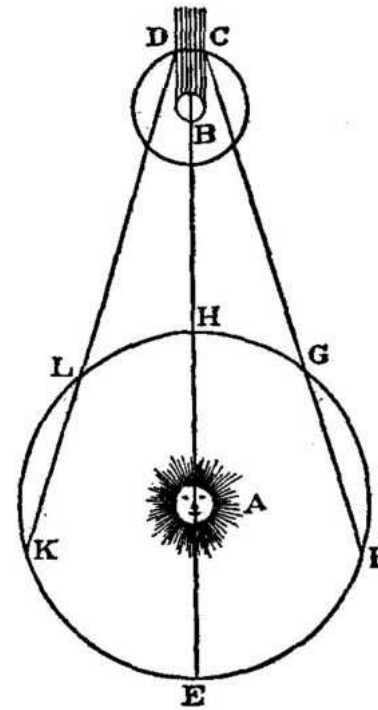
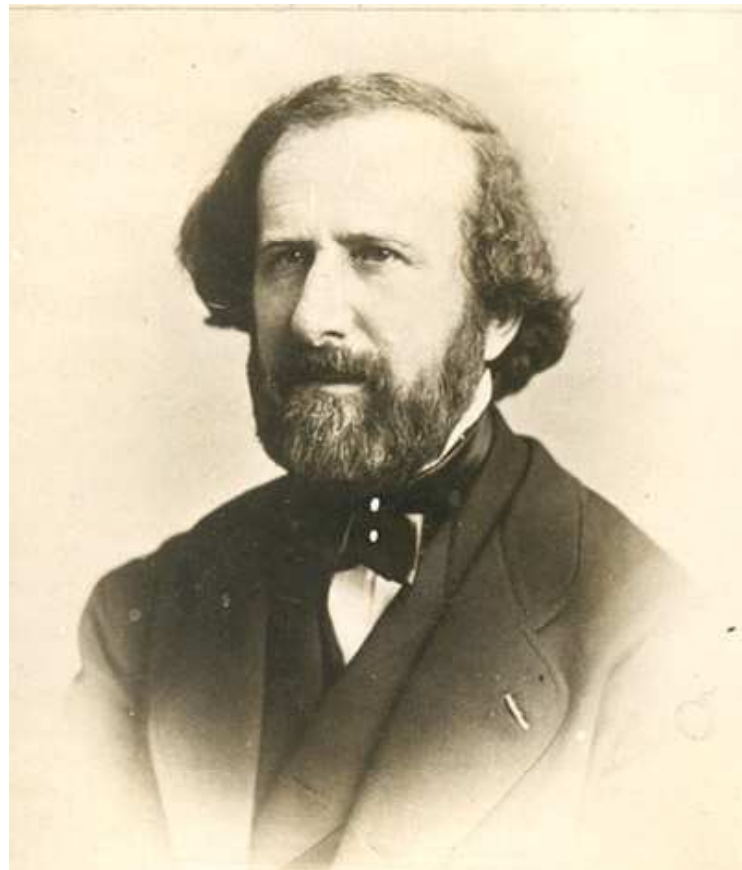
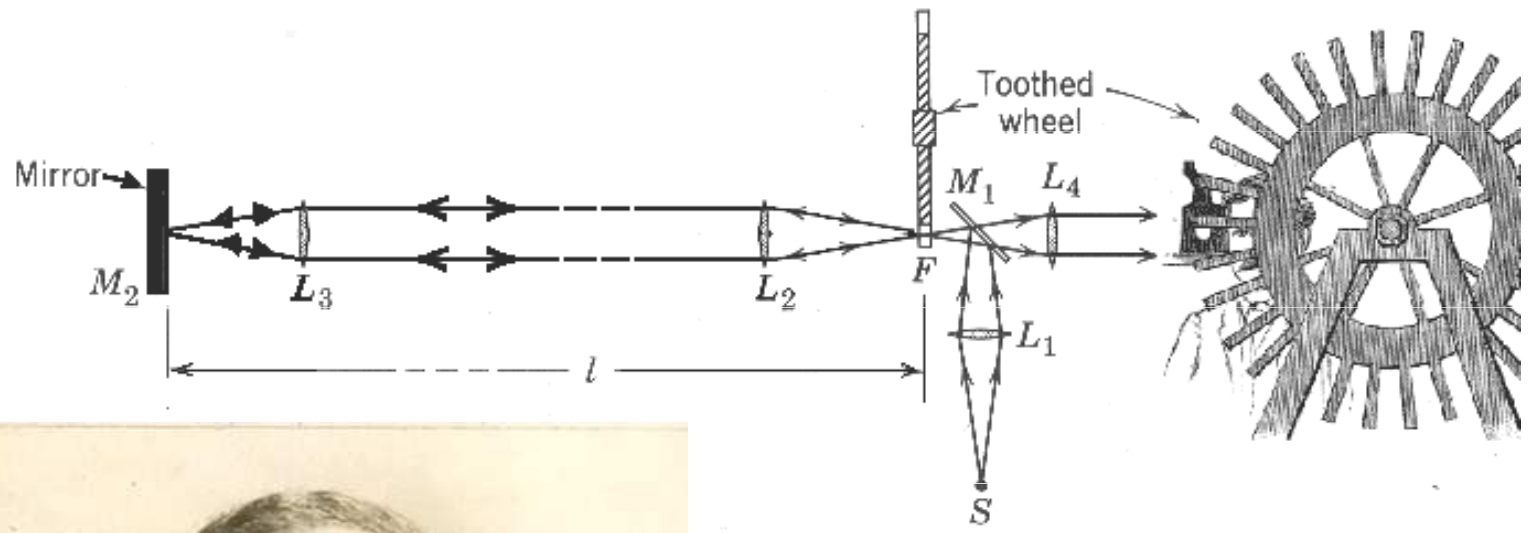


FIG. 70.



Hippolyte Fizeau 1919-1896

Literatura

D.Halliday, R.Resnick, J.Walker: Fyzika. Brno VUTIUM 2001

R.P.Feynman, R.B.Leighton, M.Sands : Feynmanovy přednášky z fyziky 1.-3.díl. Havlíčkův Brod: FRAGMENT 2000-2002.

<http://www.lightandmatter.com/>

<http://www.google.com/>

<http://scholar.google.com/>

<http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html#mechcon>

