Masterclass 2025 - Laboratori Nazionali di Frascati

3 - 7 marzo 2025

Spettro di Brocken,
Agosto 2019
Australia orientale

Rivelatori
di particelle

Istituto Nazionale di Fisica Nucleare
LABORATORI NAZIONALI DI FRASCATI

Barbara Sciascia (INFN)

Tre percorsi complementari

Standard Model

https://comedu.lnf.infn.it/ippog-2025/

	3 marzo	4 marzo	5 marzo	6 marzo	7 marzo
10.00 - 11.30	Introduzione [B. Sciascia] Rivelatori 1 [B. Sciascia]	Rivelatori 2 [B. Sciascia]	SM 3 [F. Dettori]	LHCb Esercizio di analisi dati [LHCb people]	AI [L. Pilni] Visita ai LNF
11.45 - 13.30	Complessità 1 [M. Giordano]	SM 2 [F. Dettori]	LHCb [M. Santimaria]		Complessità 5 [M. Giordano]
14.45 - 16.15	SM 1 [F. Dettori]	Complessità 2 [M. Giordano]	Complessità 3 [M. Giordano]	Complessità 4 [M. Giordano] LHCb Collegamento CERN	
16.30 - 18.00	Acceleratori 1 [D. Alesini]	Acceleratori 2 [D. Alesini]	Acceleratori 3 [D. Alesini]		

Modello standard

(Francesco Dettori - Università di Cagliari)

Rivelatori

(Barbara Sciascia - INFN / Frascati)

https://comedu.lnf.infn.it/ippog-2025/

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Acceleratori di particelle

https://comedu.lnf.infn.it/ippog-2025/

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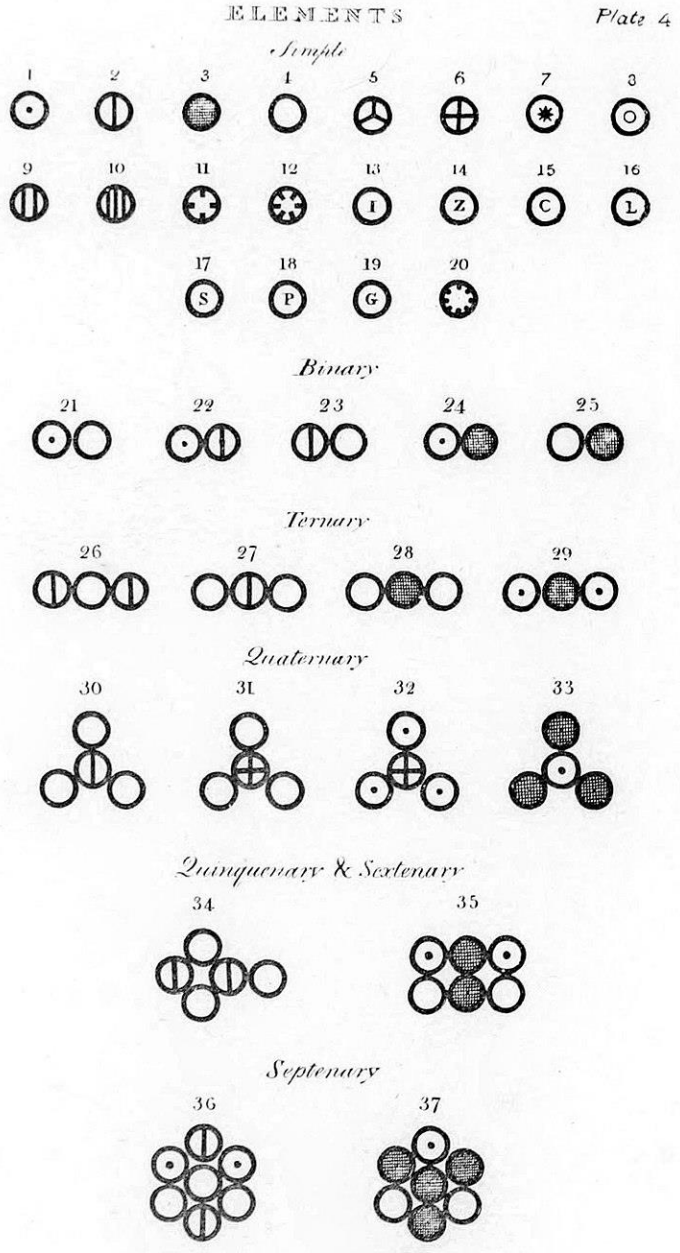
Acceleratori

(David Alesini - INFN / Frascati)

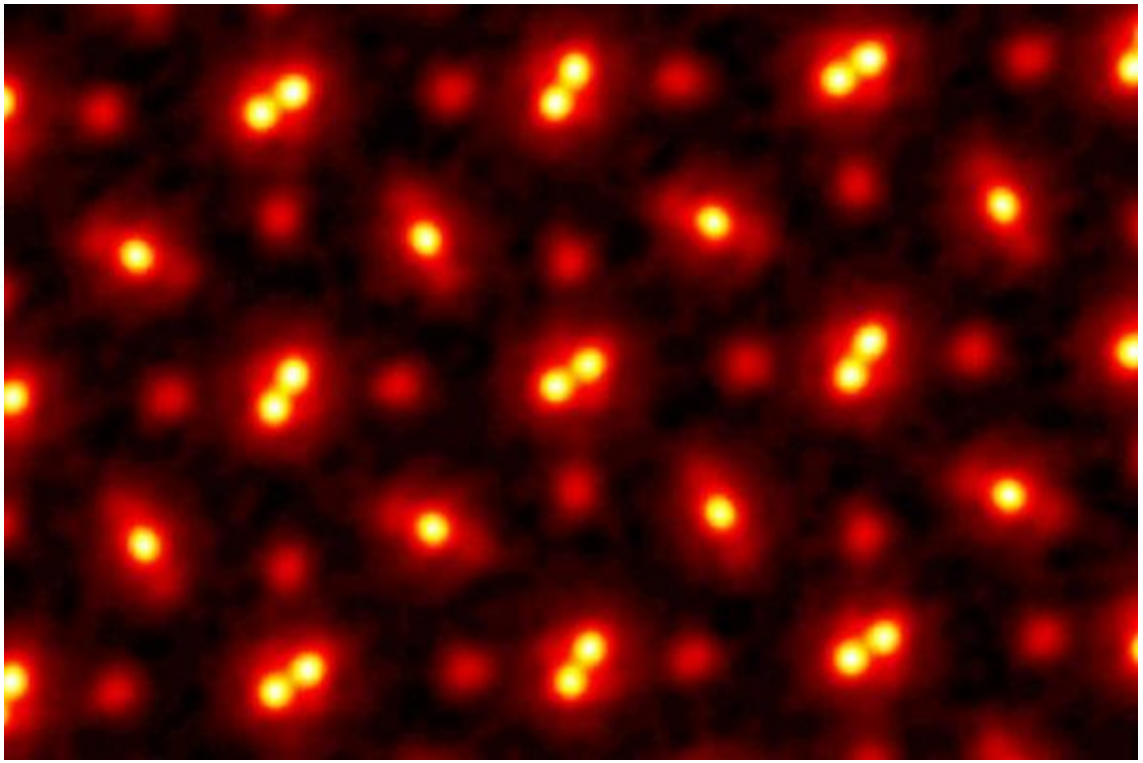

RINFRES

Dalton (1766-1844)

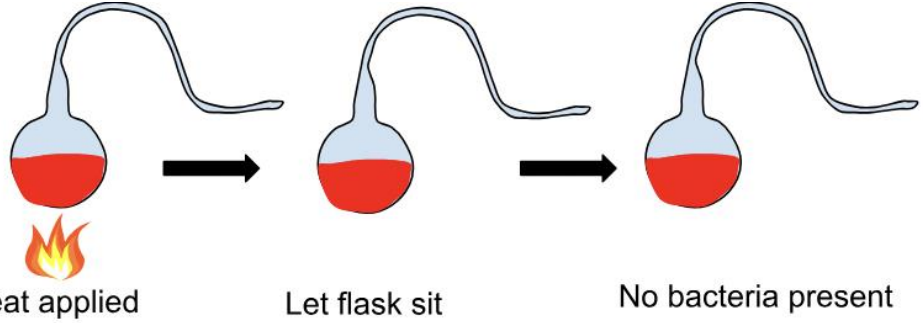


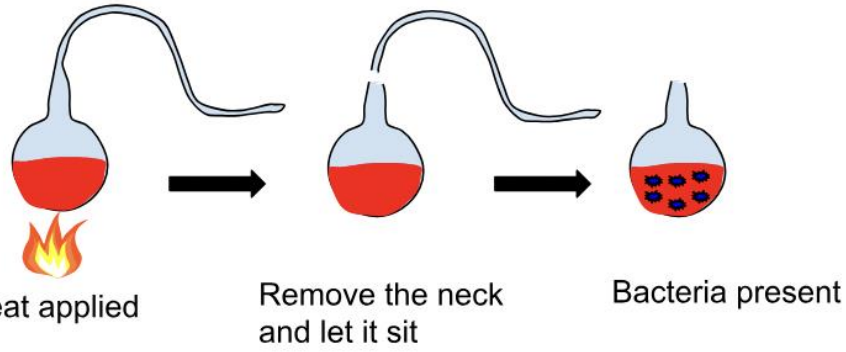
[By haade - https://commons.wikimedia.org/w/index.php?curid=1387026]

Image shows an electron ptychographic reconstruction of a praseodymium orthoscandate (PrScO3) crystal, zoomed in 100 million times. Cornell University



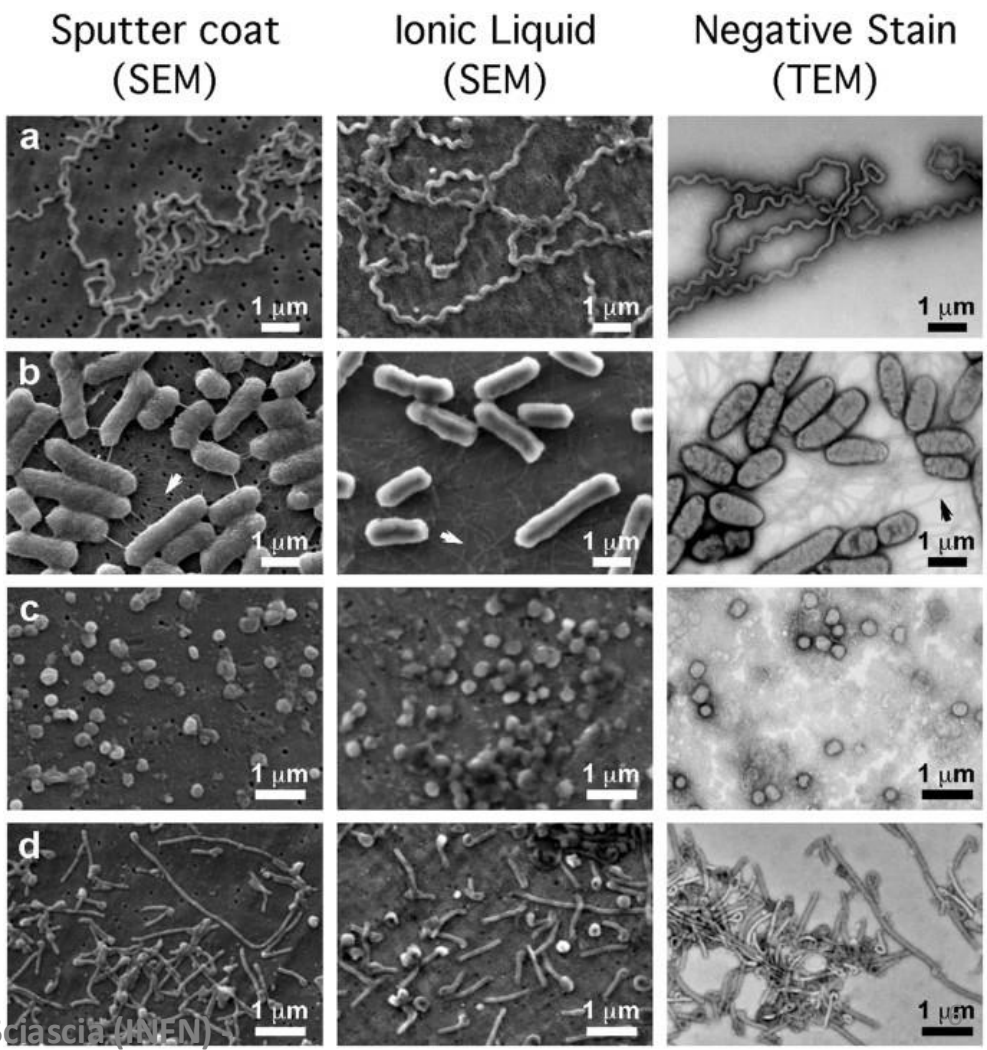
Pasteur (1822-1895)





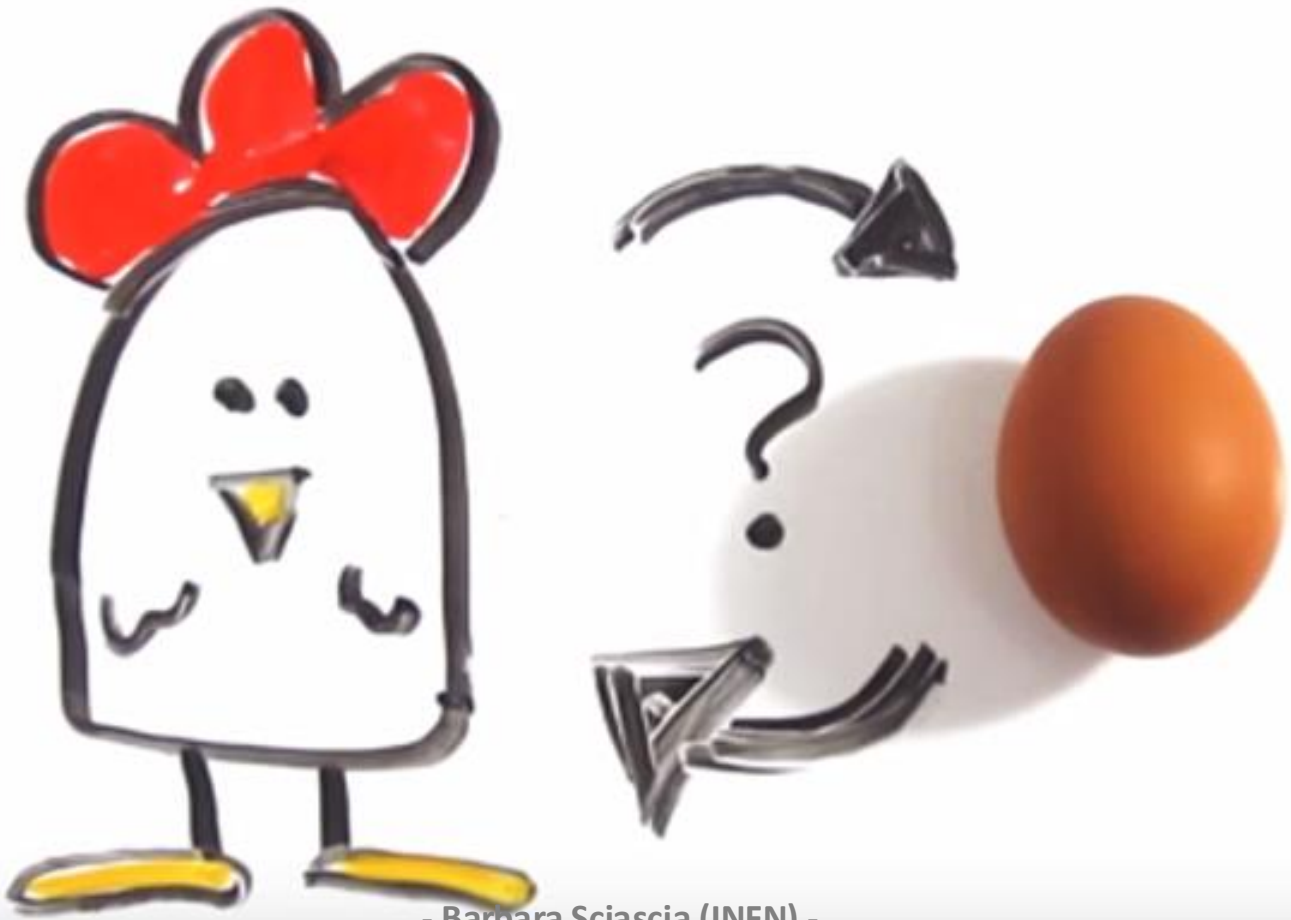
[https://upload.wikimedia.org/wikipedia/commons/0/02/Louis_Pasteur_Experiment.svg]

https://www.nature.com/articles/srep26516



Rivelatori

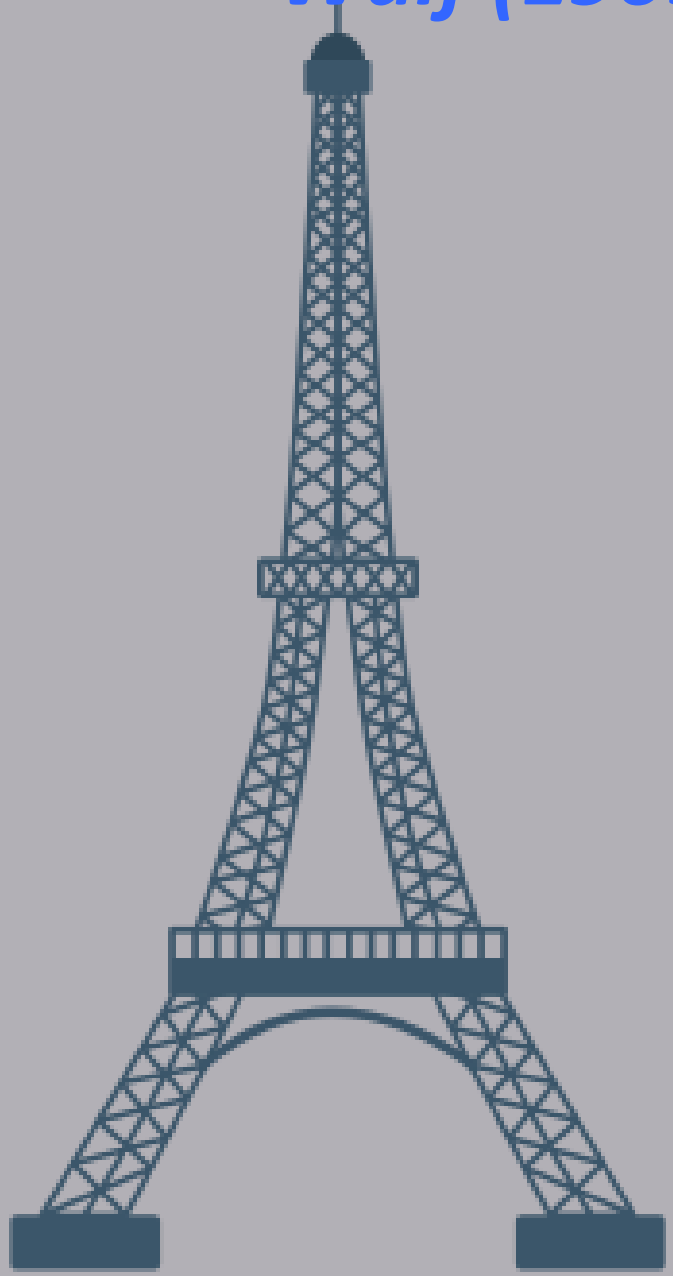
«Strumenti fondamentali per capire la materia e le sue interazioni, che usano anche la profonda comprensione della struttura della materia e delle sue interazioni.»



https://www.ilpost.it/wp-content/uploads/2016/09/Schermata-09-2457658-alle-10.59.45.png

Wulf (1909)

Wikimedia Common



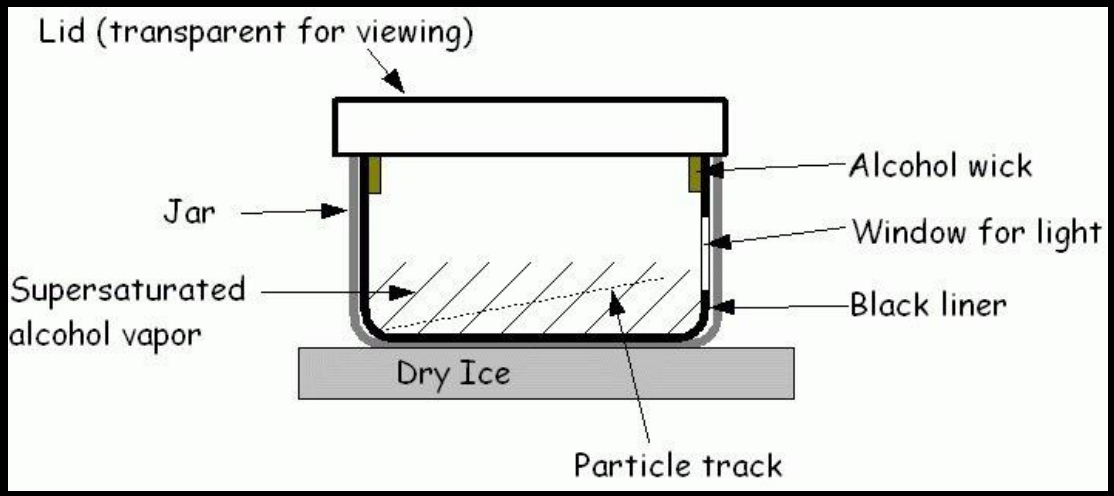
Wilson e lo spettro di Brocken (1911)

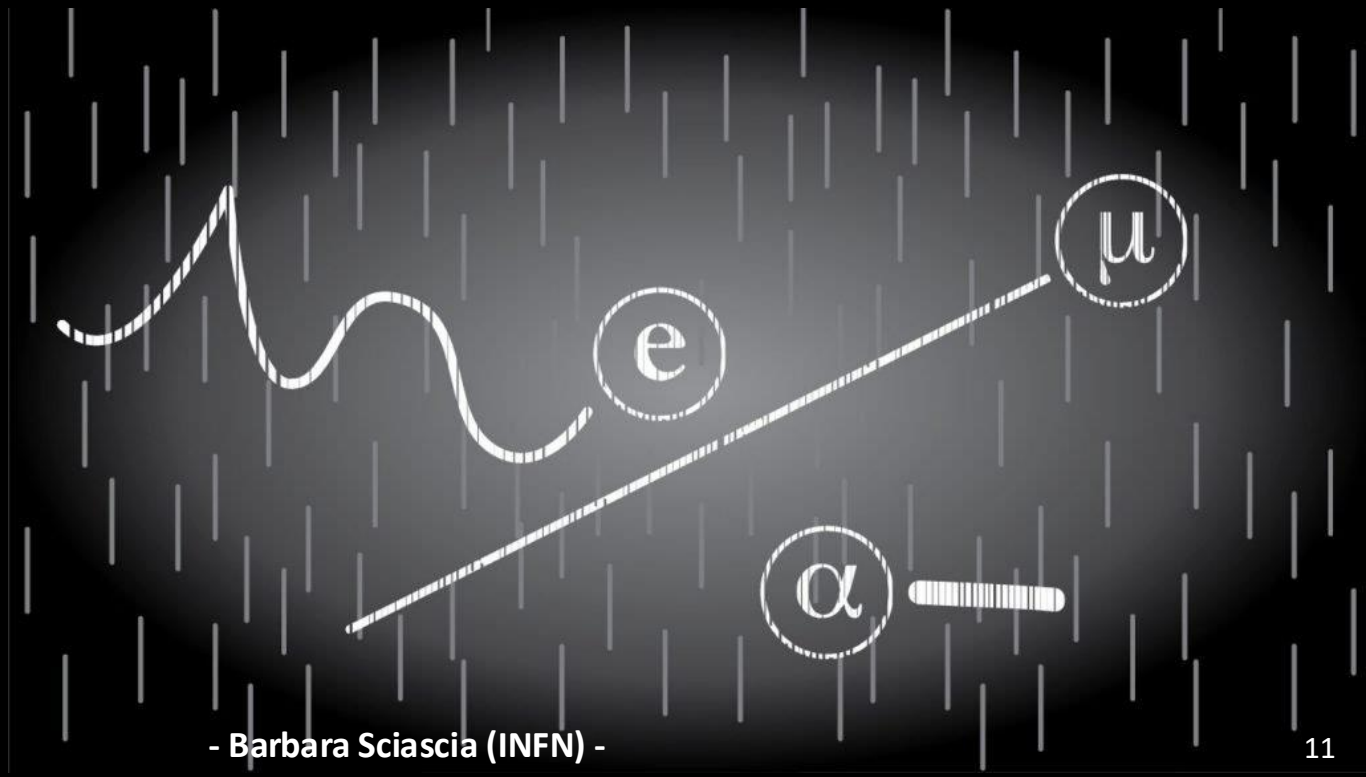
museo Cavendish di Cambridge

Camera a nebbia (o a nuvole)

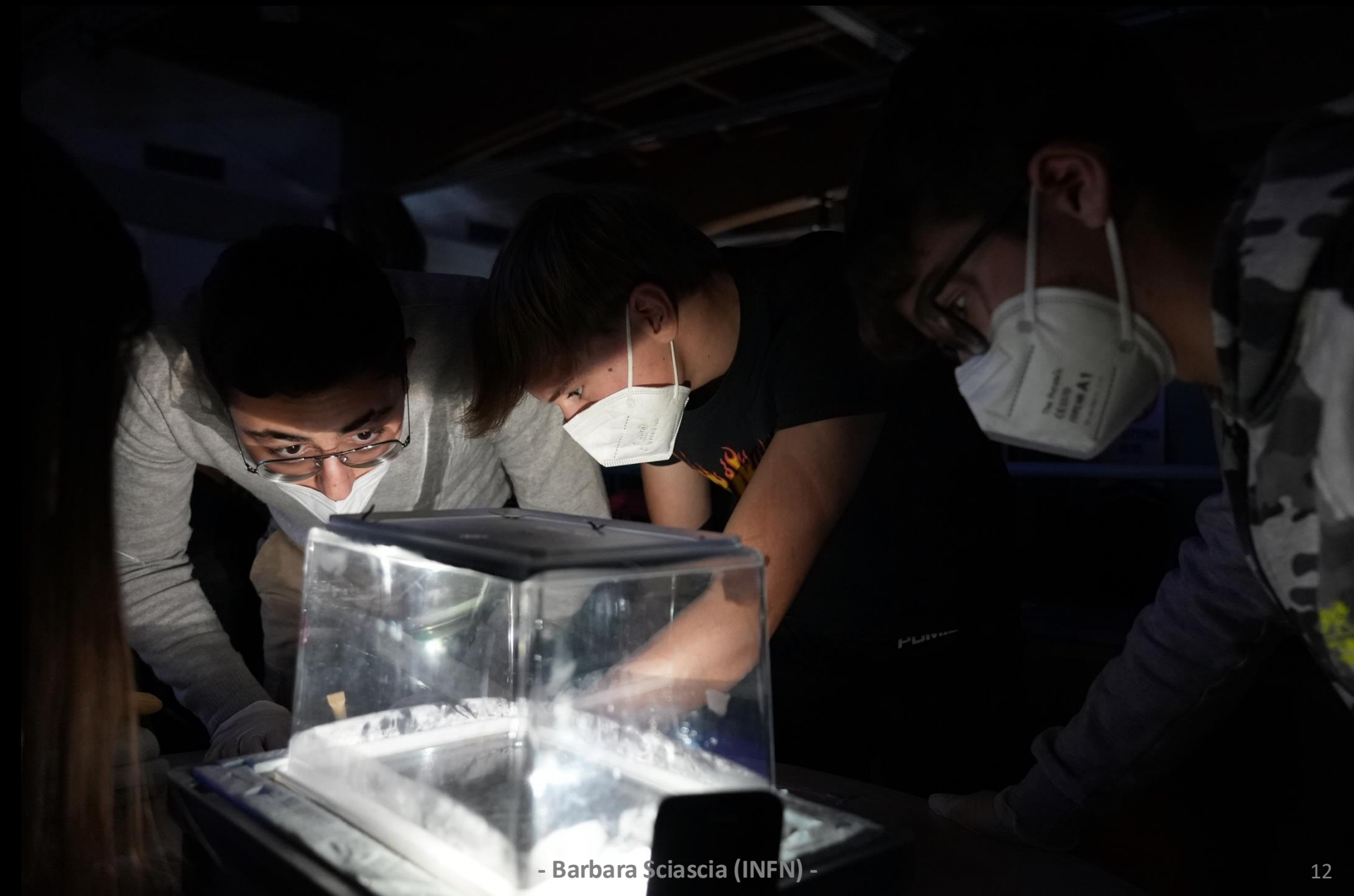
https://physicsopenlab.org/2017/05/05/cloud-chamber/
[(From SCoolLAB DIY Cloud Chamber CERN Manual)]

Camera a nebbia



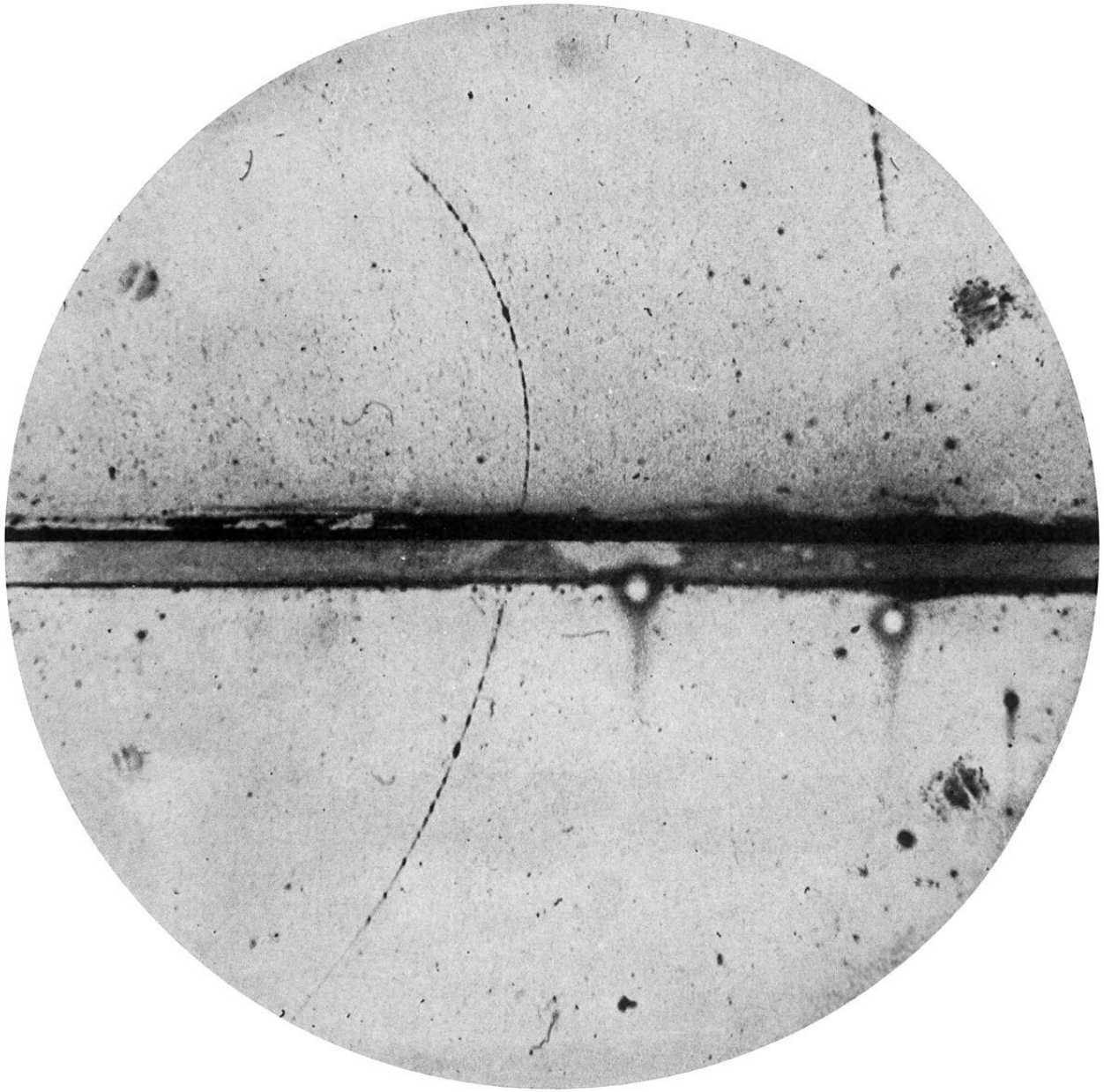


Camera a nebbia

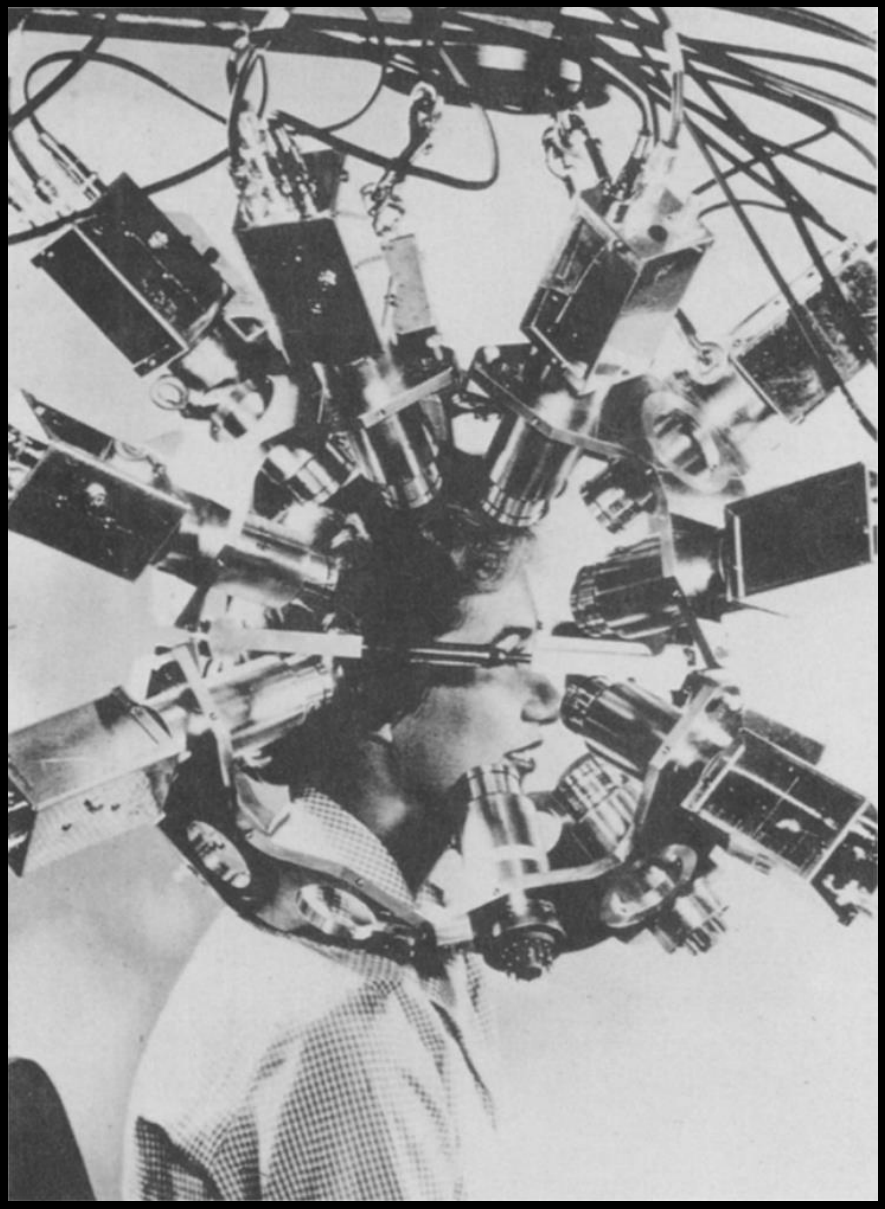


[Physical Review 43 (6) 491–494]

Camera a nebbia



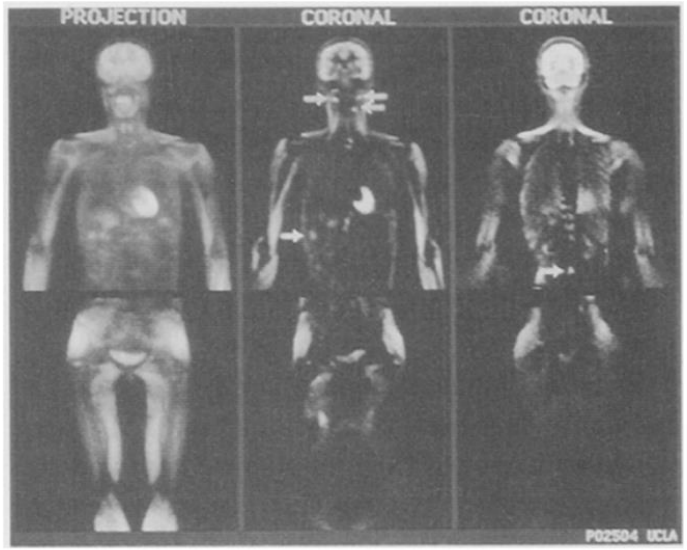
Positron Emission Tomography



The Journal of Nuclear Medicine

JNM

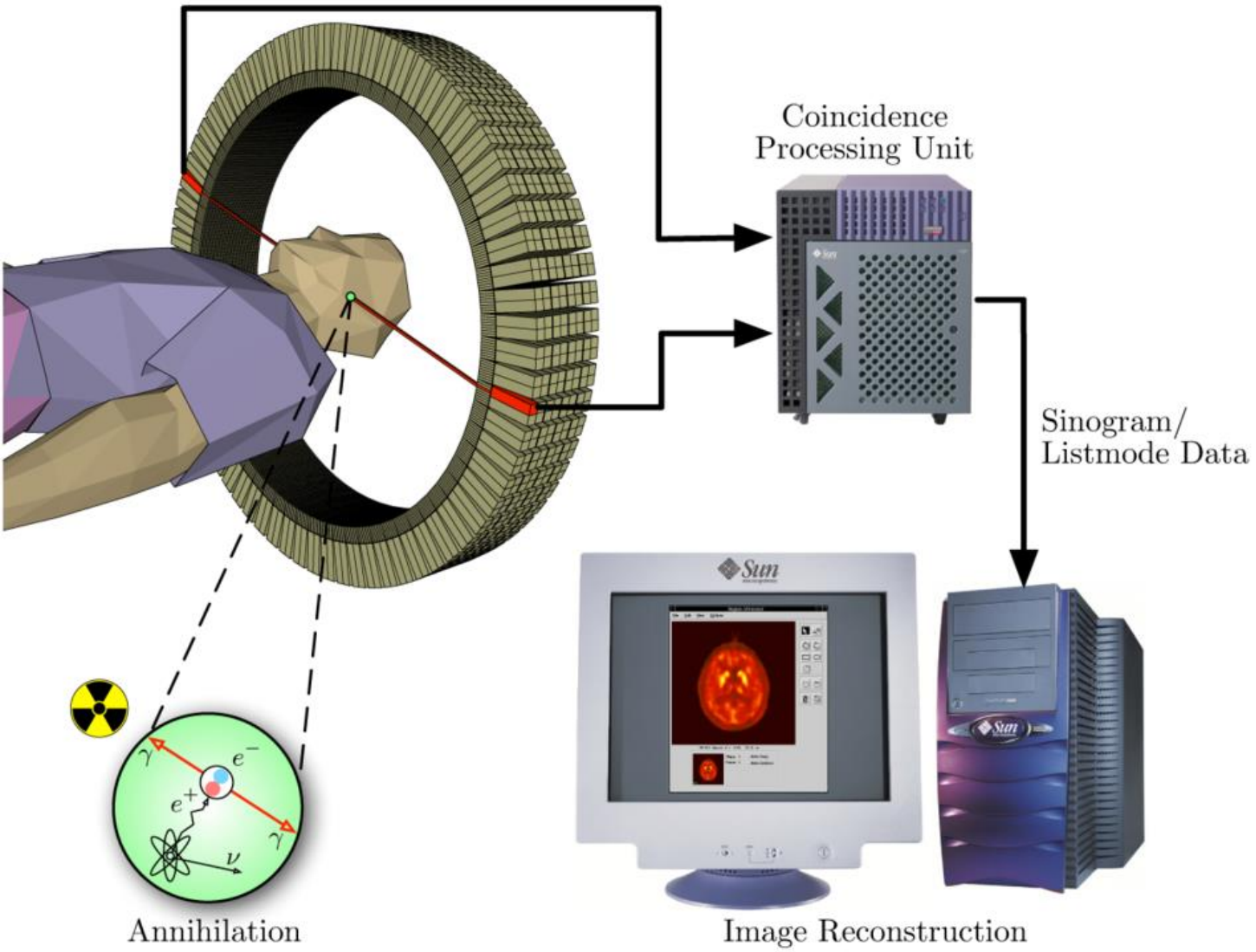
Volume 32, Number 4 • April 1991



Clinical PET: Its Time Has Come

Seminars in Nuclear Medicine Volume 28, Issue 3, July 1998, Pages 213-220

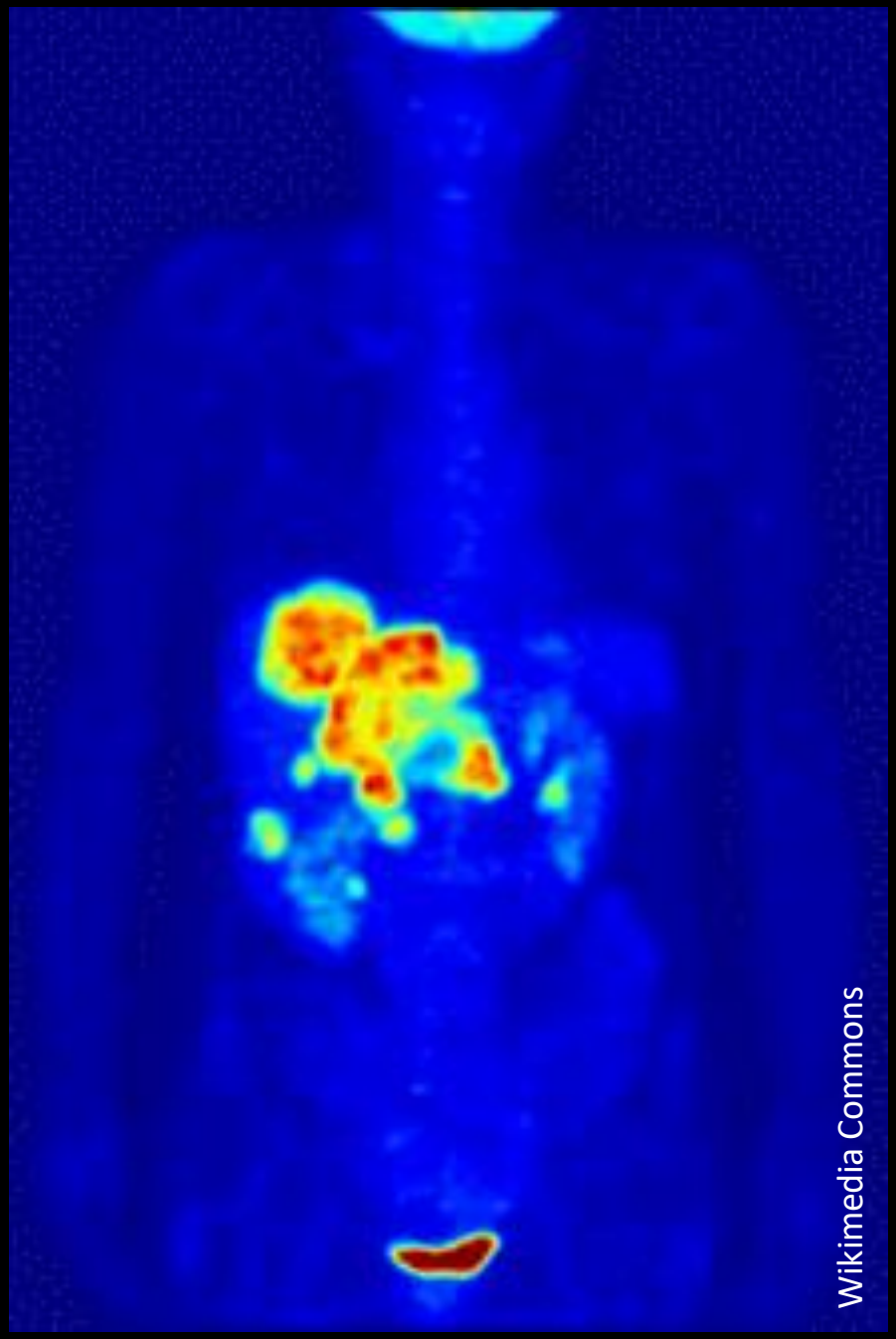
Positron Emission Tomography



[By Jens Maus (http://jens-maus.de/) - own work - Public Domain, https://commons.wikimedia.org/w/index.php?curid=401252]

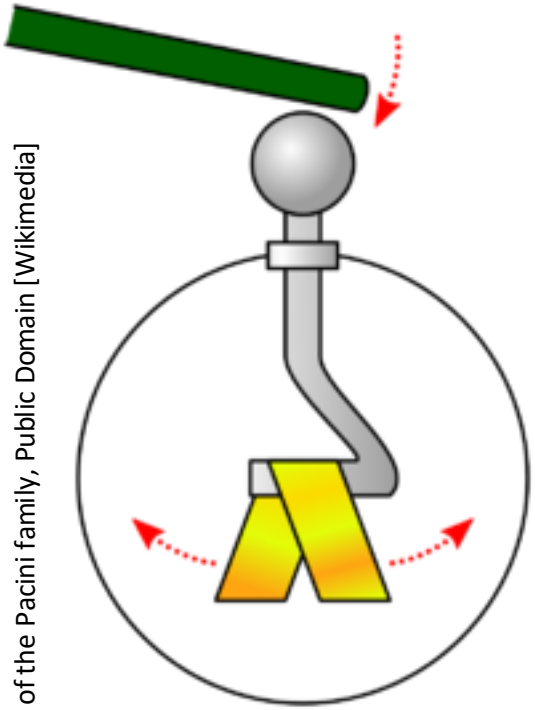
Positron Emission Tomography

Courtesy of Siemens



Wikimedia Commons

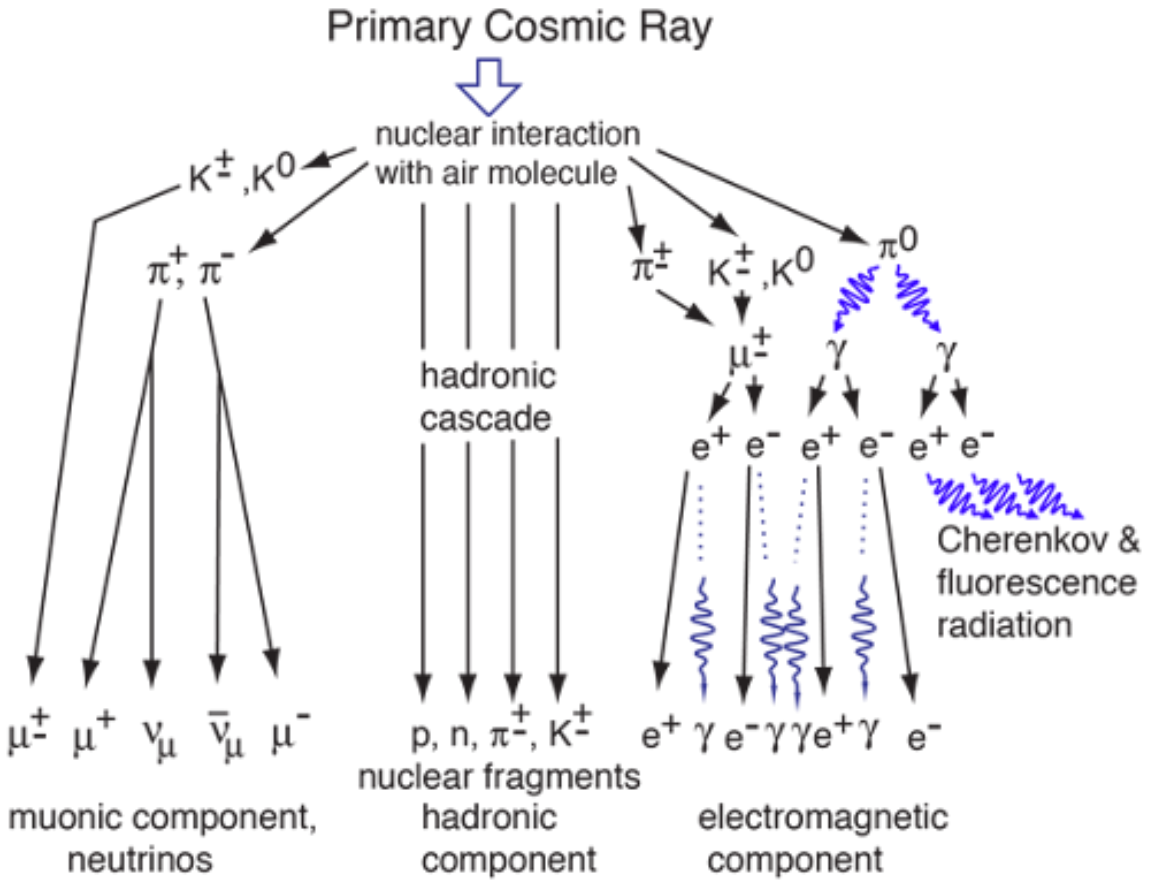
Pacini (1911)



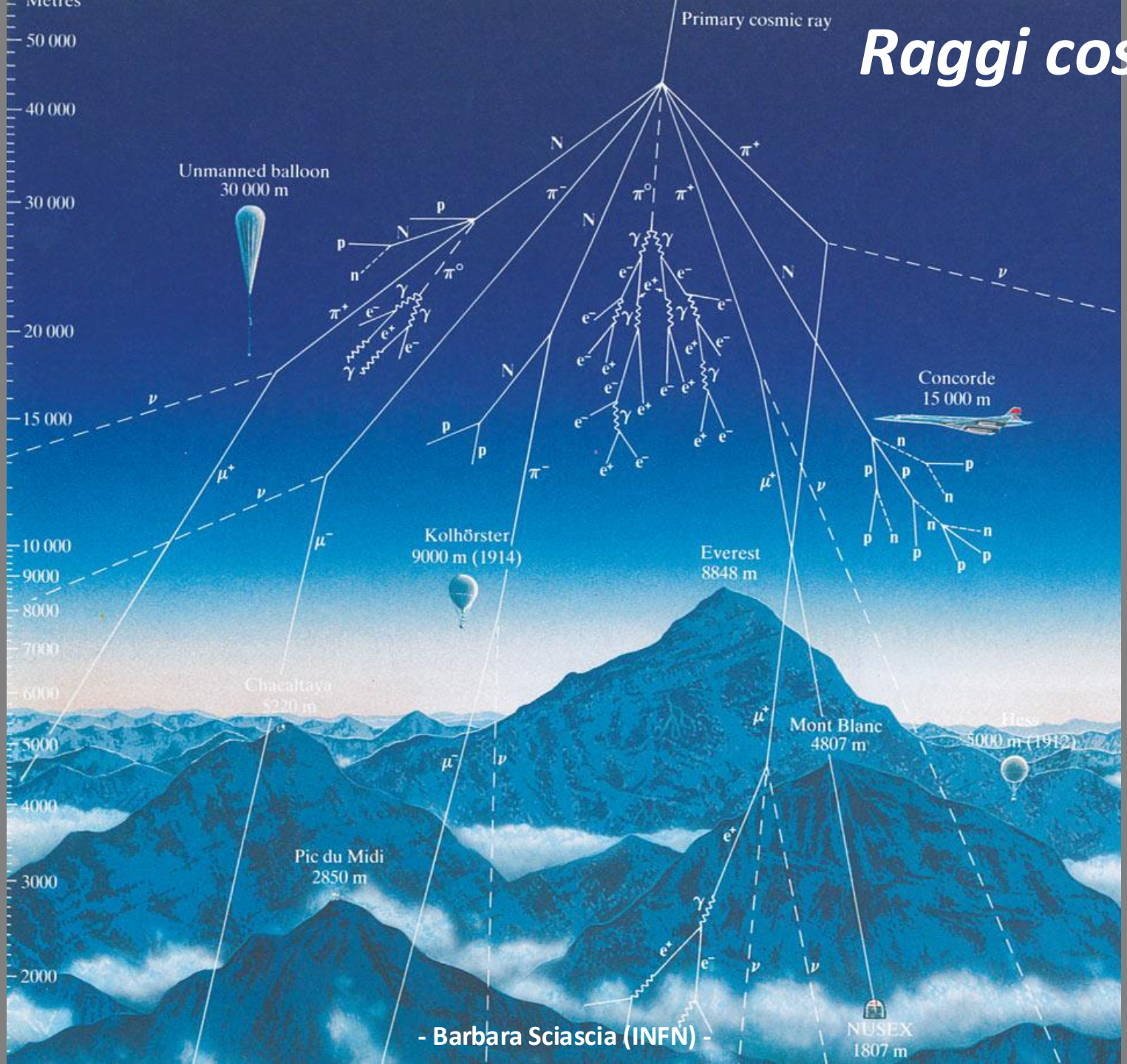
By Pacini family - Alessandro De Angelis, courtesy of the Pacini family, Public Domain [Wikimedia]

[]

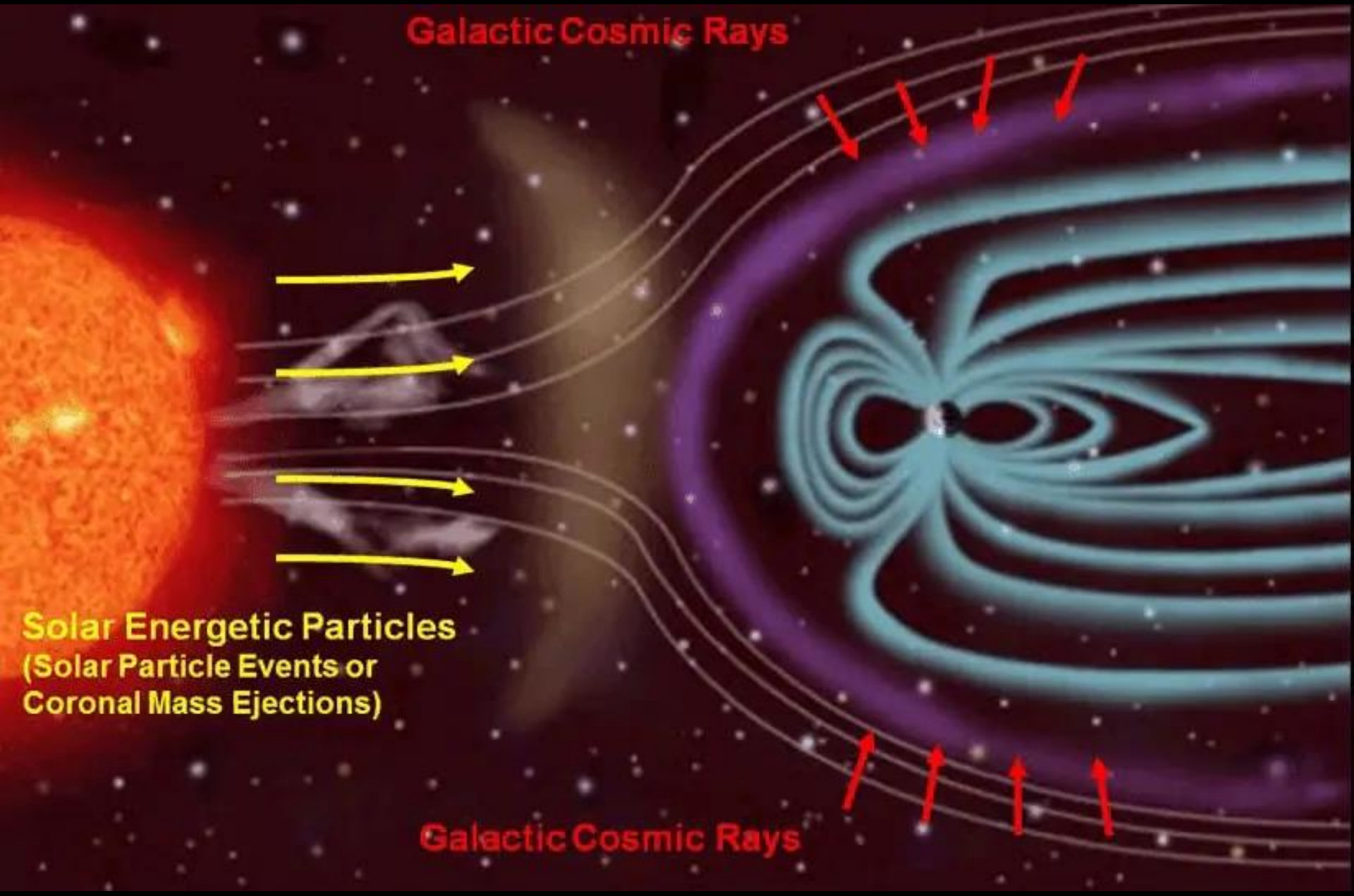
Hess (1911)


Primary Cosmic Ray
nuclear interaction
with air molecule
$K^{\pm}, K^0$
π^+, π^-
$\pi^{\pm}$
$K^{\pm}, K^0$
π^0
$\mu^{\pm}$
γ
γ
hadronic
cascade
e^+ e^- e^+ e^- e^+ e^-
Cherenkov &
fluorescence
radiation
$\mu^{\pm}$ μ^+ ν_μ $\bar{\nu}_\mu$ μ^-
p, n, $\pi^{\pm}$, $K^{\pm}$
nuclear fragments
e^+ γ e^- γ γ e^+ γ e^-
muonic component,
neutrinos
hadronic
component
electromagnetic
component

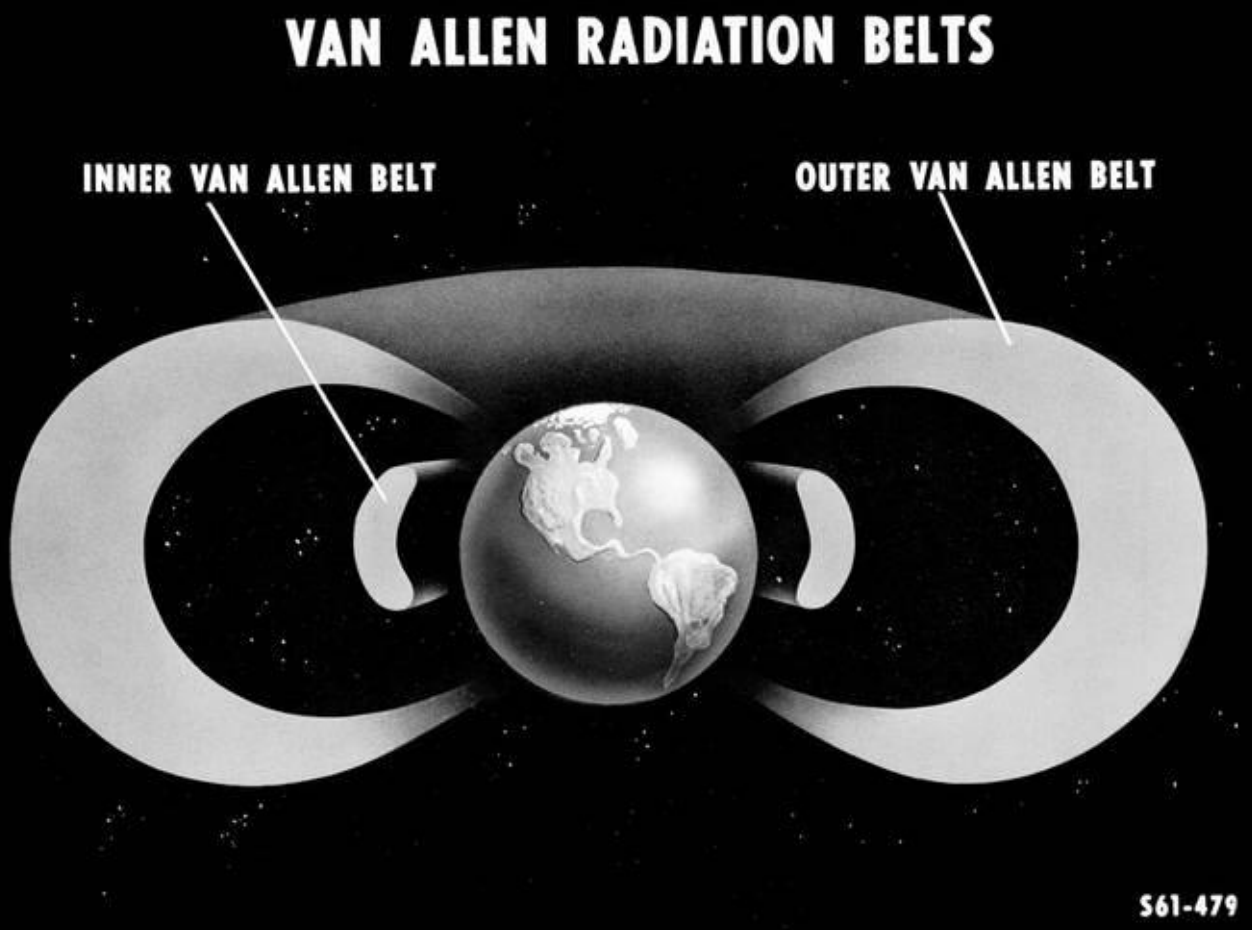
Raggi cosmici



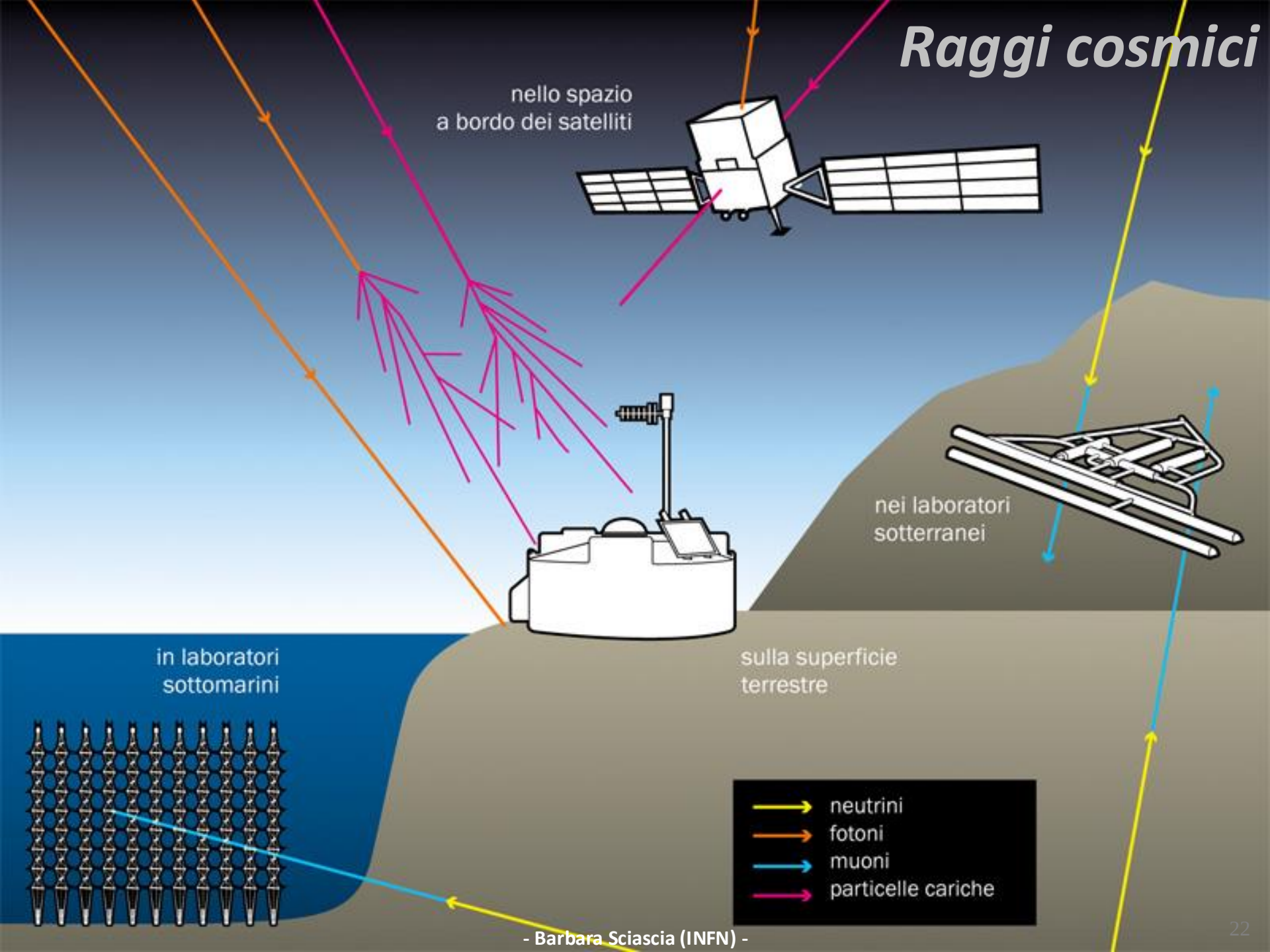
Raggi cosmici



Van Allen (1958)

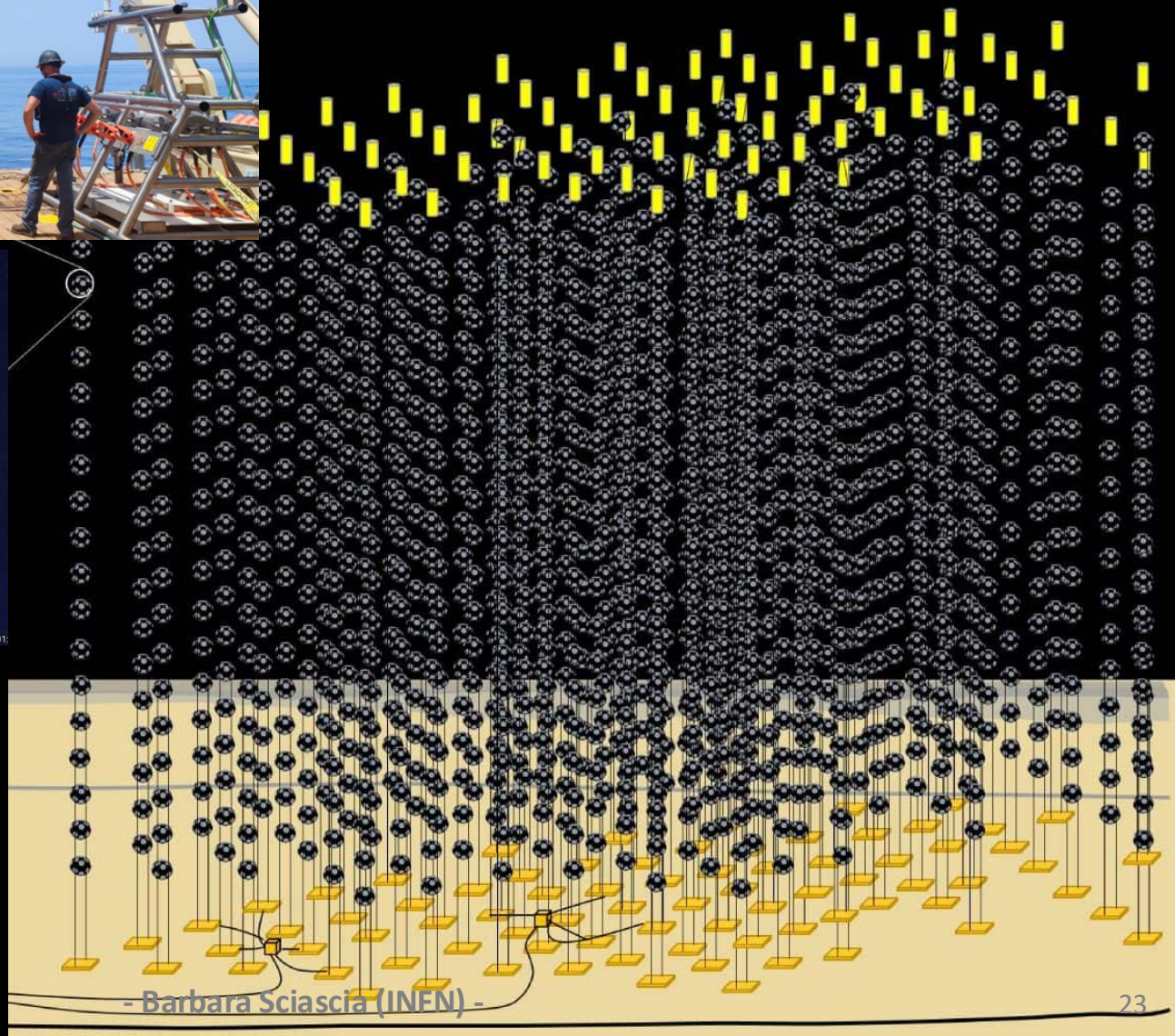


Raggi cosmici

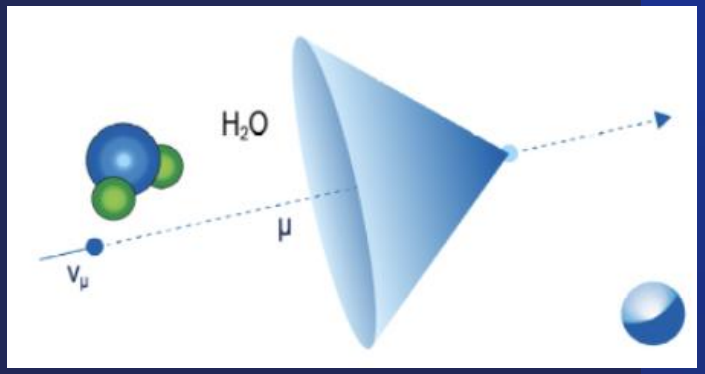


[© KM3NeT collaboration]

KM3Net

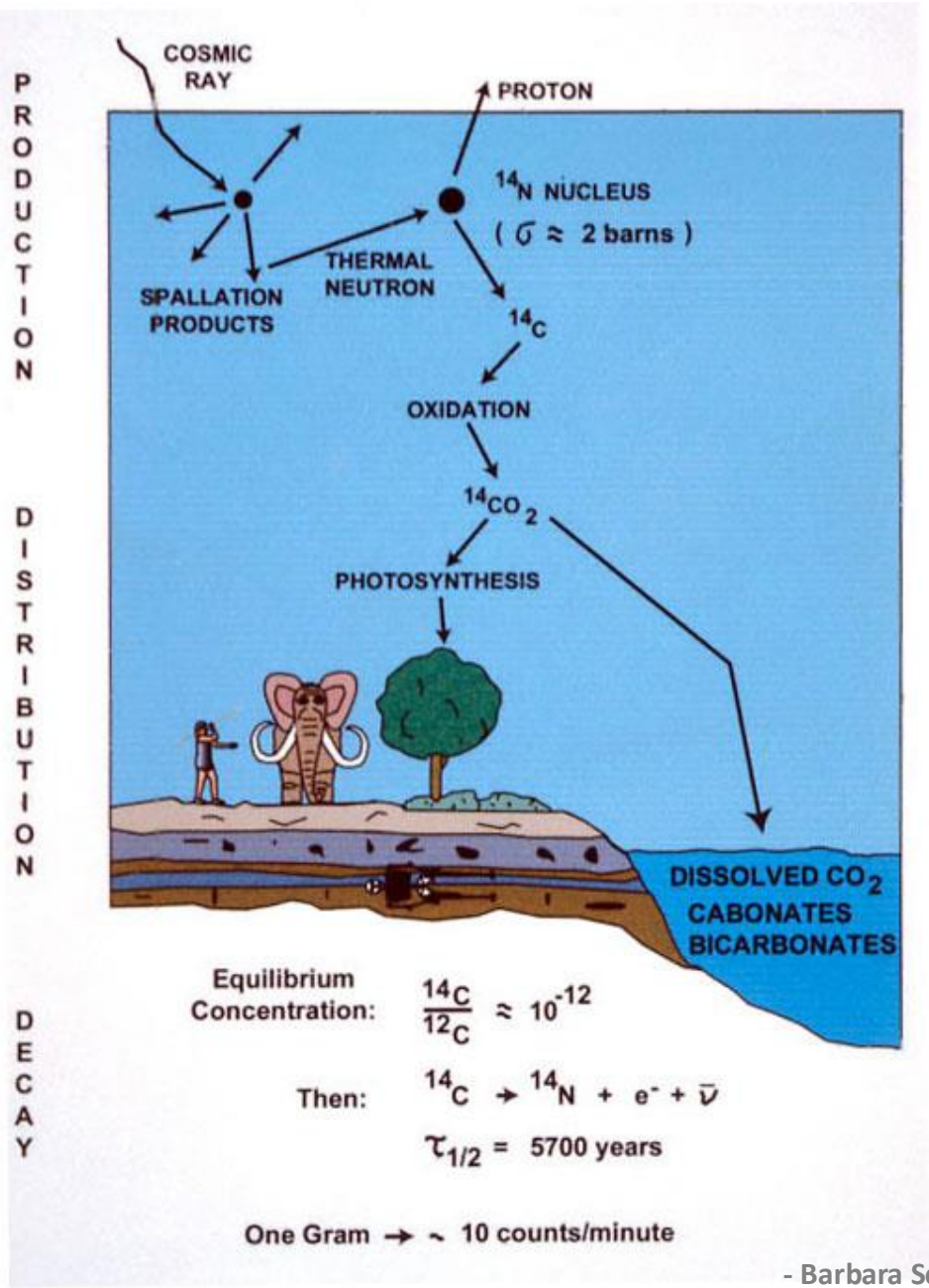


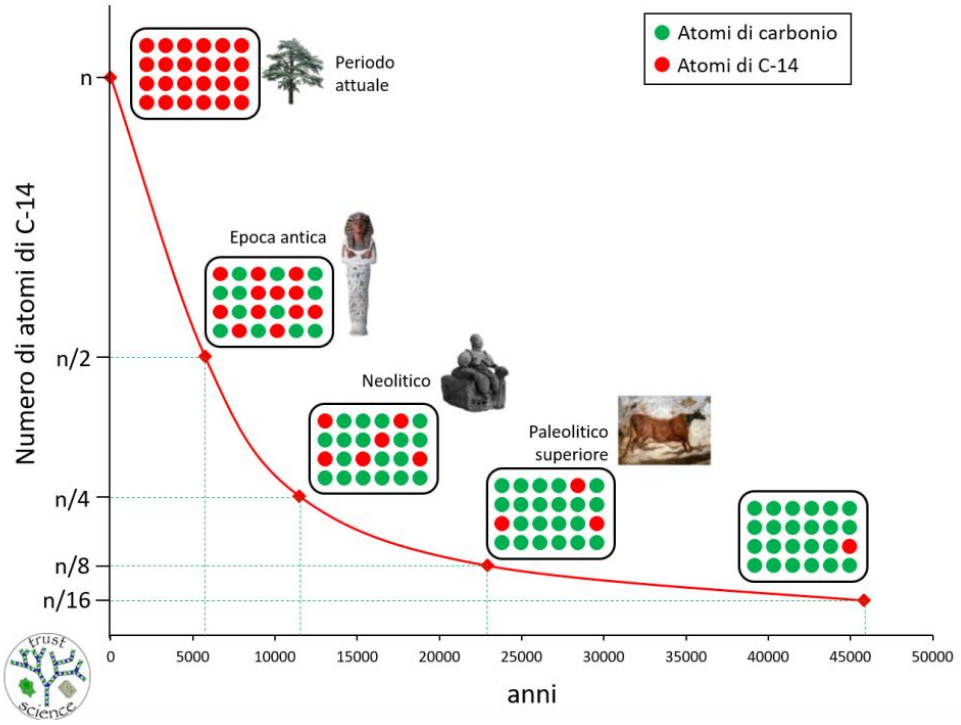
KM3Net -230213A



https://www.scienzaescuola.eu/images/articoli/nucl4_5.jpg

Datazione con C-14

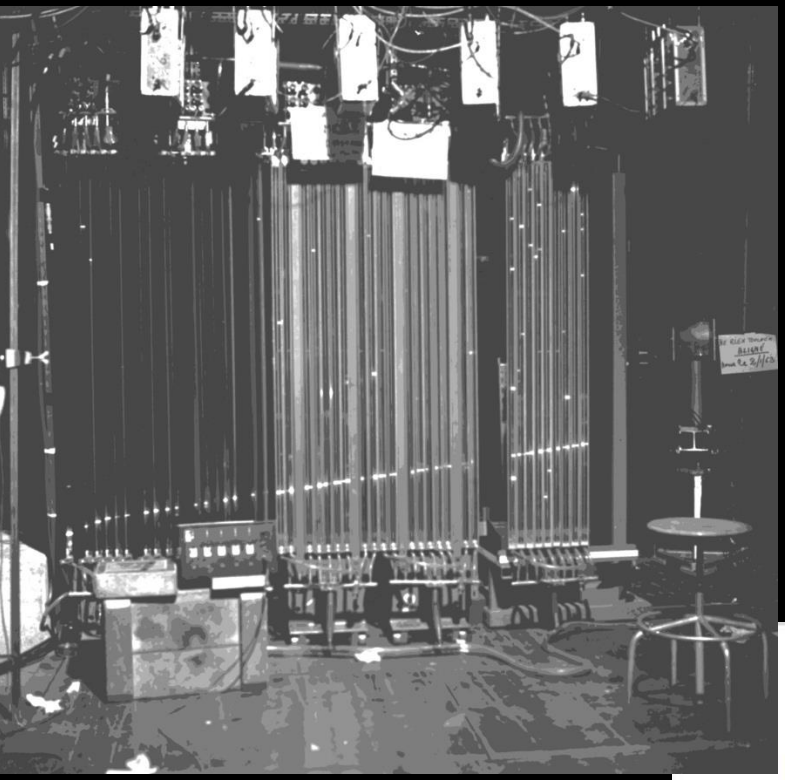


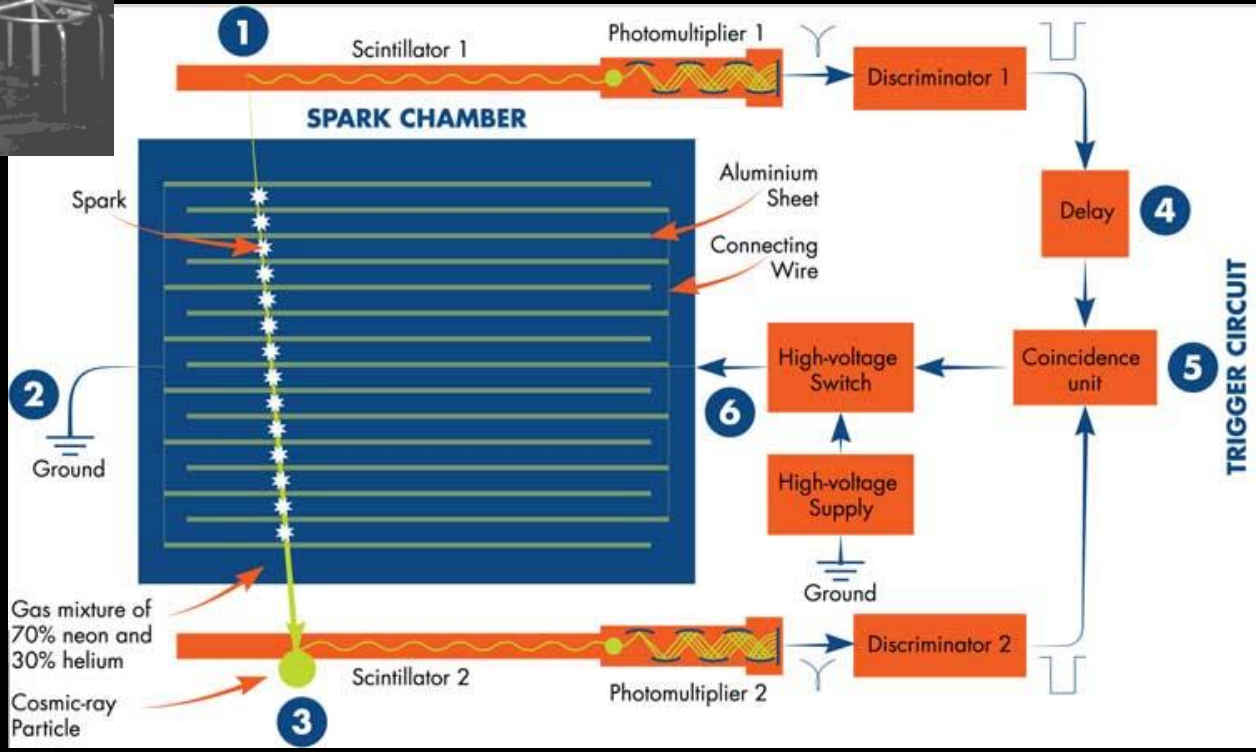


Camera a bolle (1952)

(Image: Gargamelle/CERN)

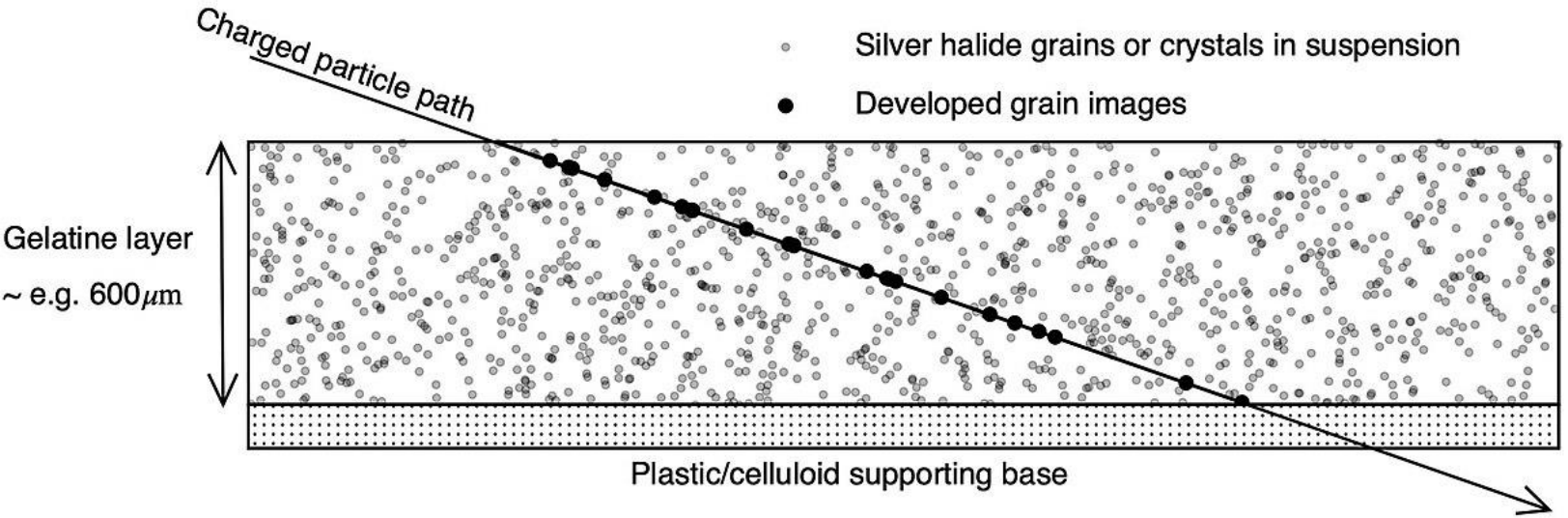
Camera a scintille (1958)





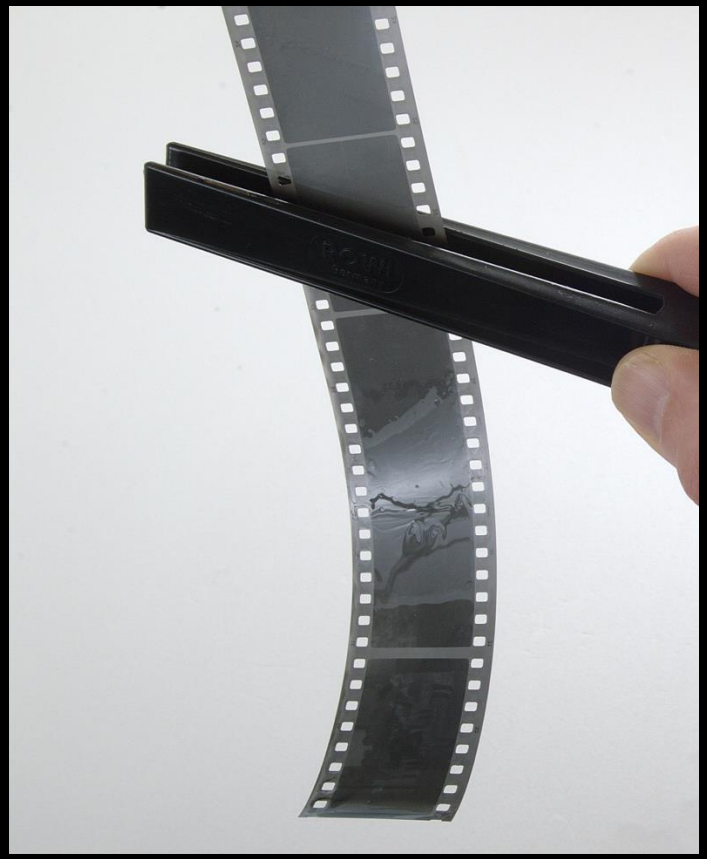
(Image: CERN)

Emulsioni fotografiche (1851)



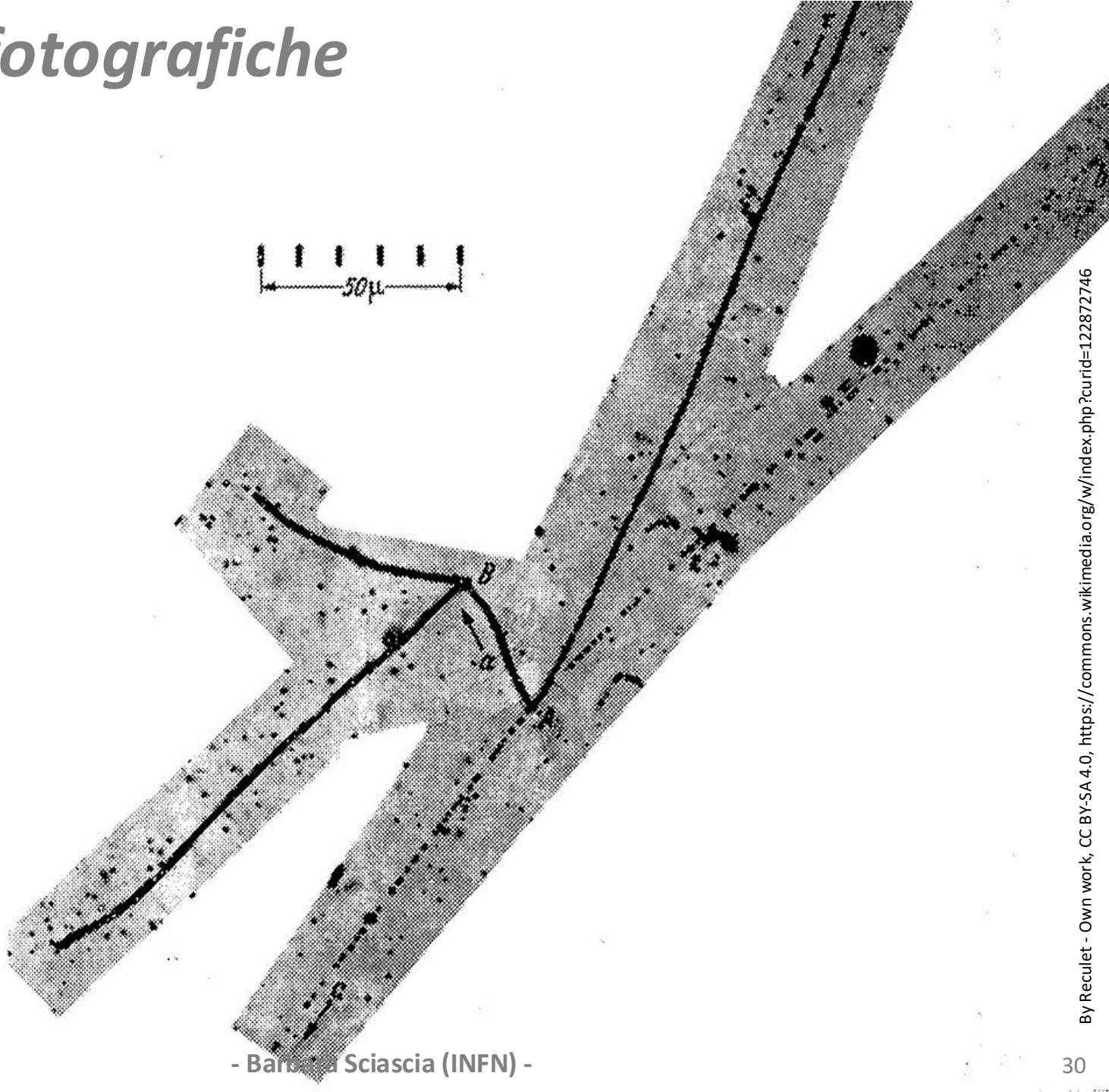
By Reculet - Own work, CC0, https://commons.wikimedia.org/w/index.php?curid=143700253

Emulsioni fotografiche

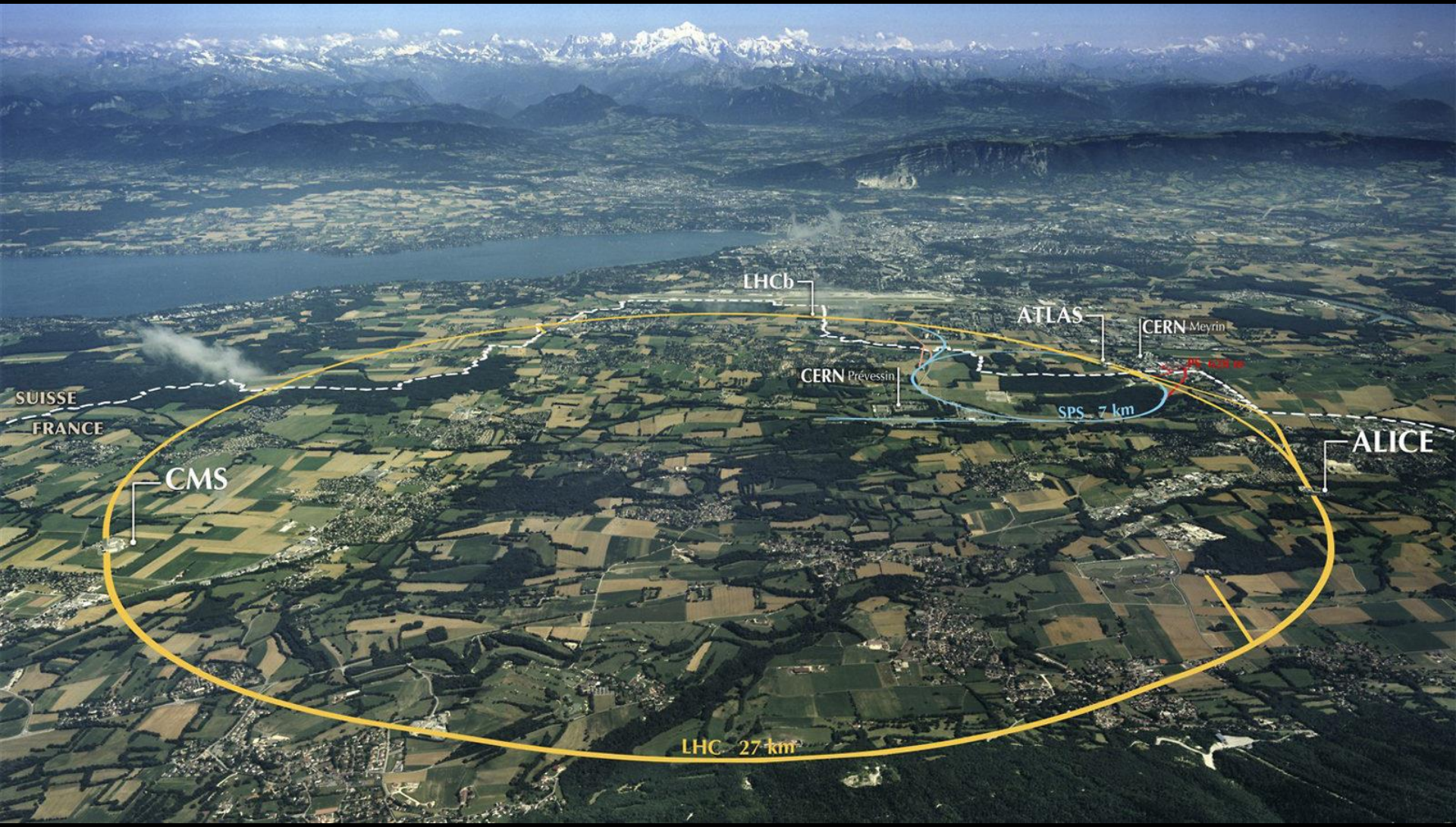


https://commons.wikimedia.org/

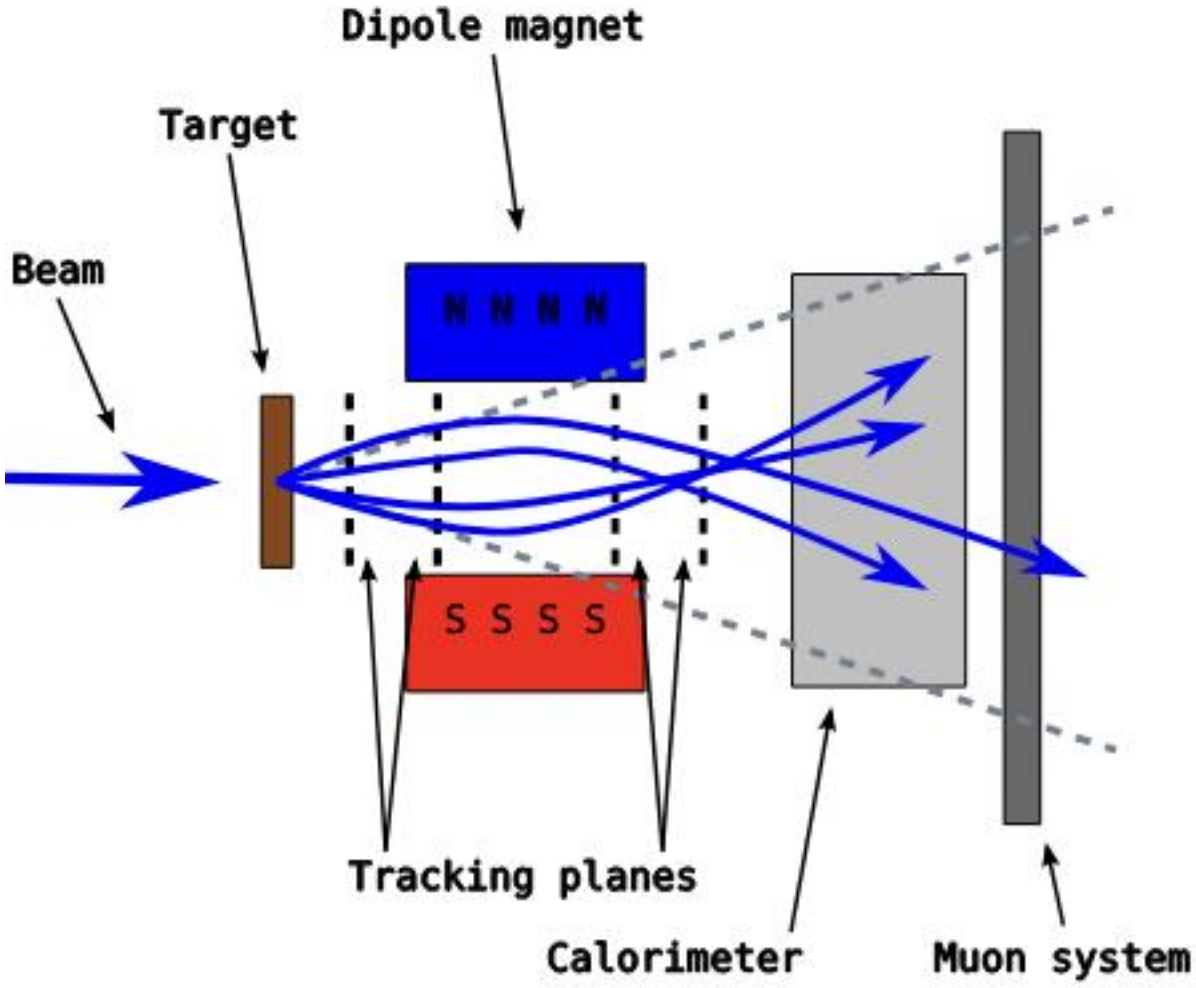
Emulsioni fotografiche



By Reculet - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=122872746

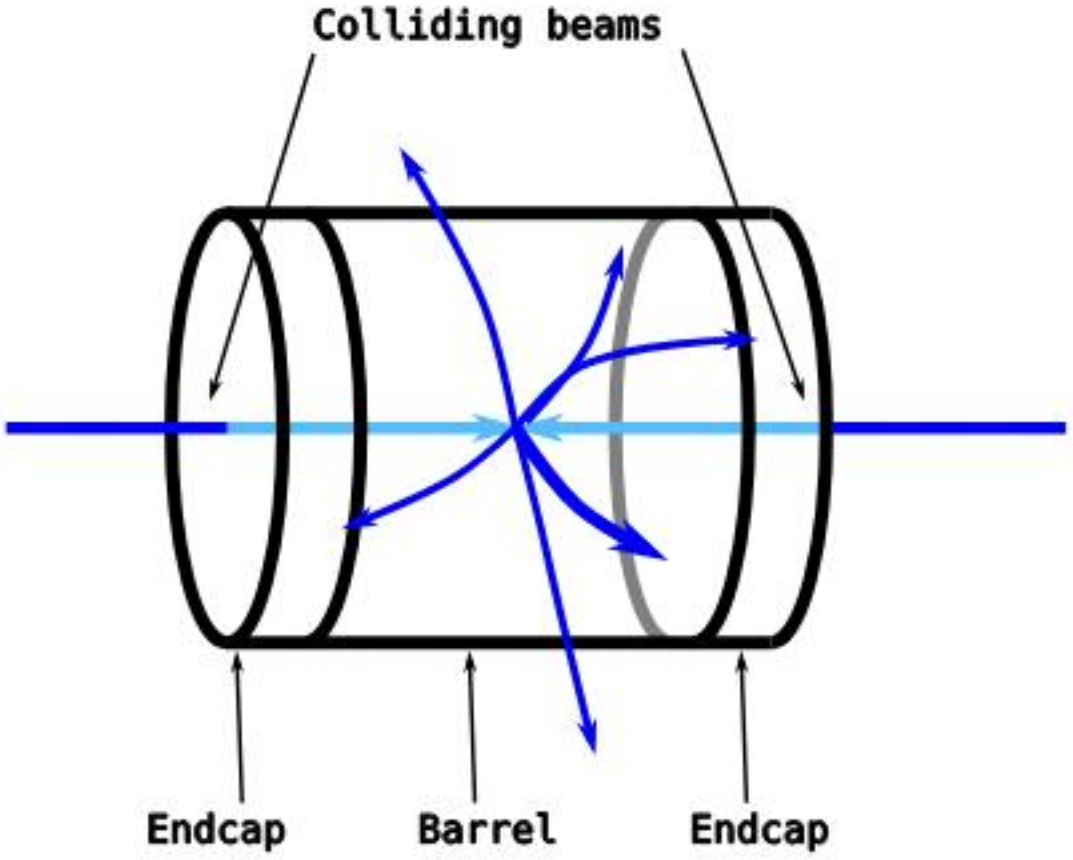

LHCb
ATLAS
CERN Meyrin
CERN Prévessin
SPS 7 km
SUISSE
FRANCE
CMS
ALICE
LHC 27 km

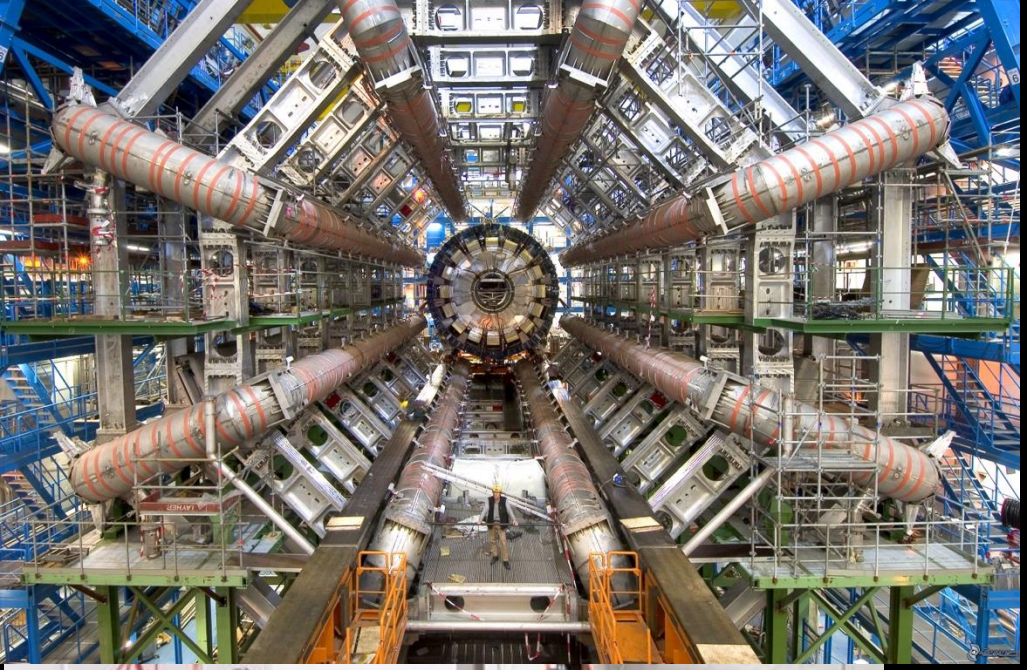
A bersaglio fisso - spettrometro

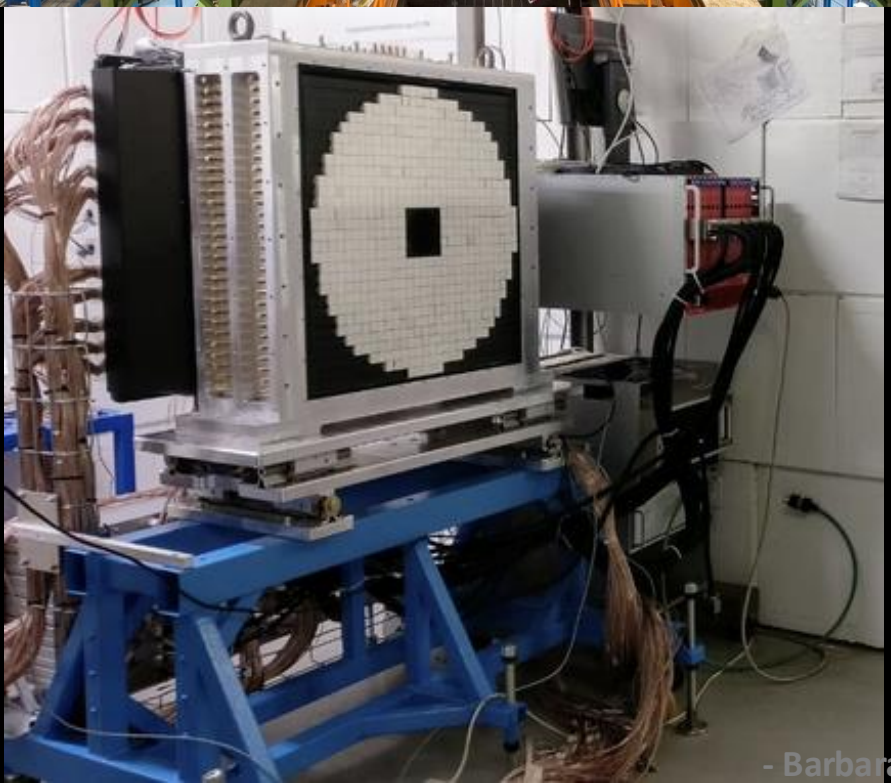


https://indico.cern.ch/event/130206/

Collisore - geometria ermetica (a 4π)

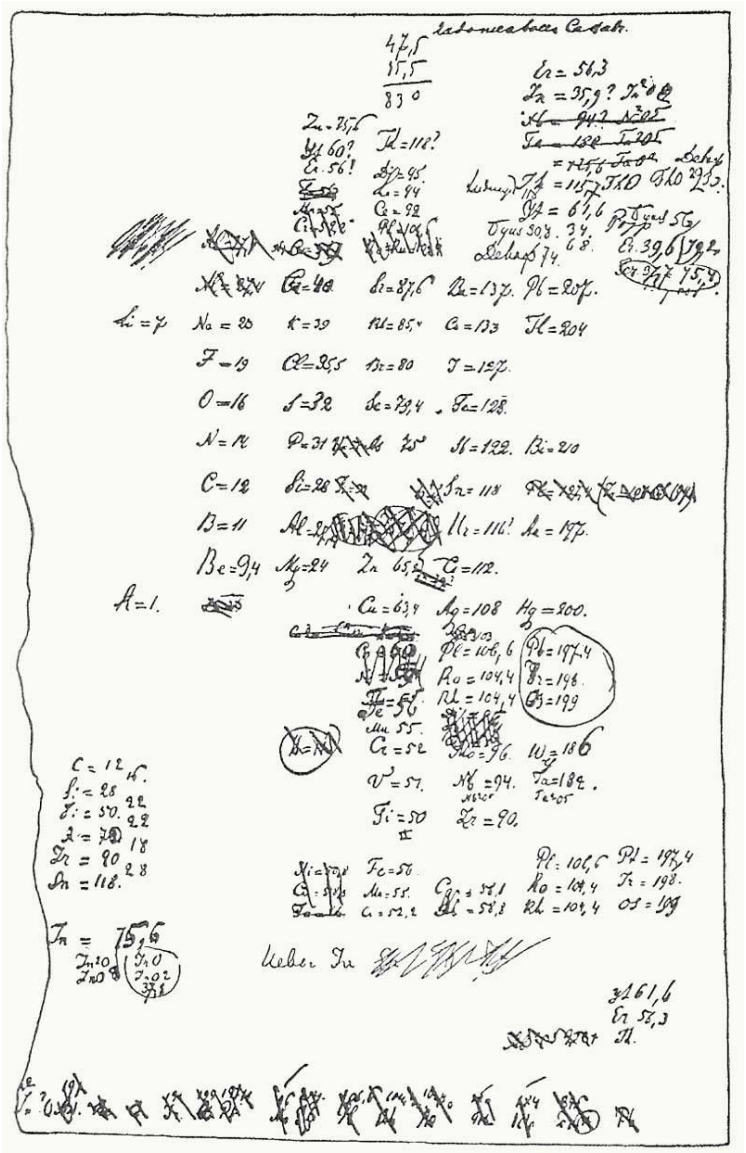







PADME
CONSTRUCTION
OERLIKON

(1869)



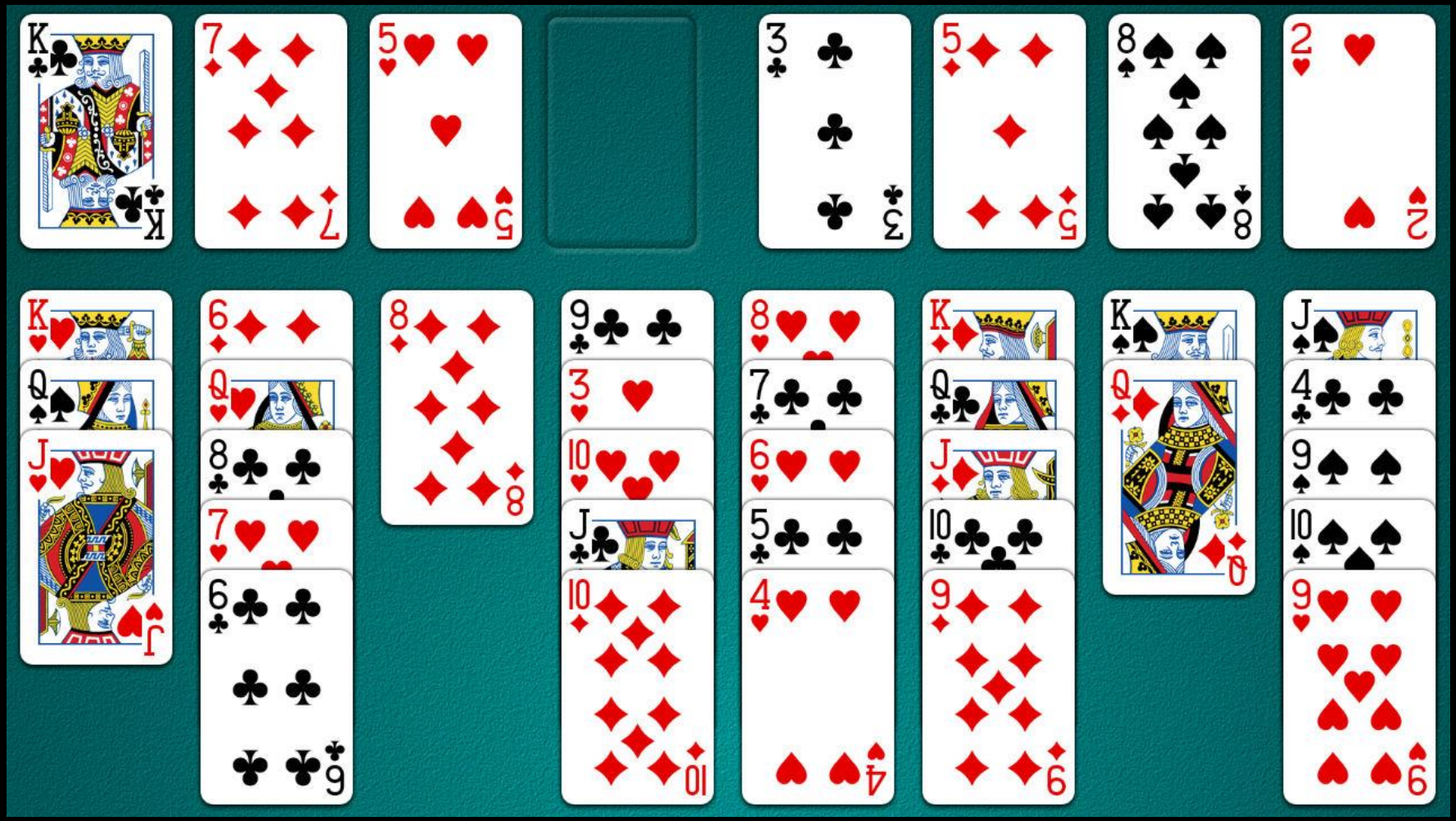
ОПЫТЪ СИСТЕМЫ ЭЛЕМЕНТОВЪ.

ОСНОВАННОЙ НА ИХЪ АТОМНОМЪ ВѢСѢ И ХИМИЧЕСКОМЪ СХОДСТВѢ.

			Ti = 50	Zr = 90	? = 180.
			V = 51	Nb = 94	Ta = 182.
			Cr = 52	Mo = 96	W = 186.
			Mn = 55	Rh = 104,4	Pt = 197,1.
			Fe = 56	Ru = 104,4	Ir = 198.
			Ni = Co = 59	Pl = 106,6	Os = 199.
H = 1			Cu = 63,4	Ag = 108	Hg = 200.
	Be = 9,4	Mg = 24	Zn = 65,2	Cd = 112	
	B = 11	Al = 27,4	? = 68	Ur = 116	Au = 197?
	C = 12	Si = 28	? = 70	Sn = 118	
	N = 14	P = 31	As = 75	Sb = 122	Bi = 210?
	O = 16	S = 32	Se = 79,4	Te = 128?	
	F = 19	Cl = 35,6	Br = 80	I = 127	
Li = 7	Na = 23	K = 39	Rb = 85,4	Cs = 133	Tl = 204.
		Ca = 40	Sr = 87,6	Ba = 137	Pb = 207.
		? = 45	Ce = 92		
		?Er = 56	La = 94		
		?Yt = 60	Di = 95		
		?In = 75,6	Th = 118?		

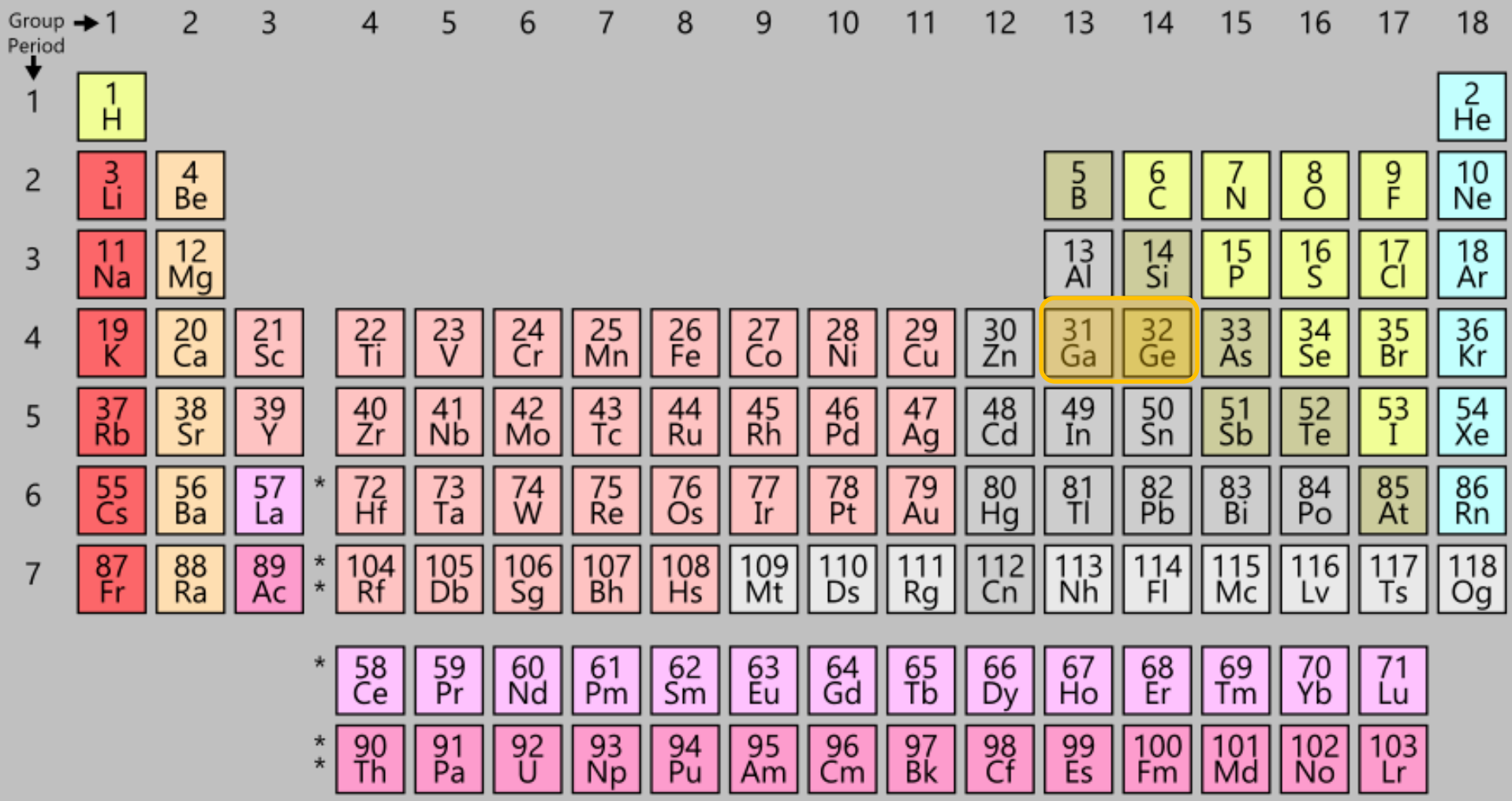
Д. Менделѣевъ

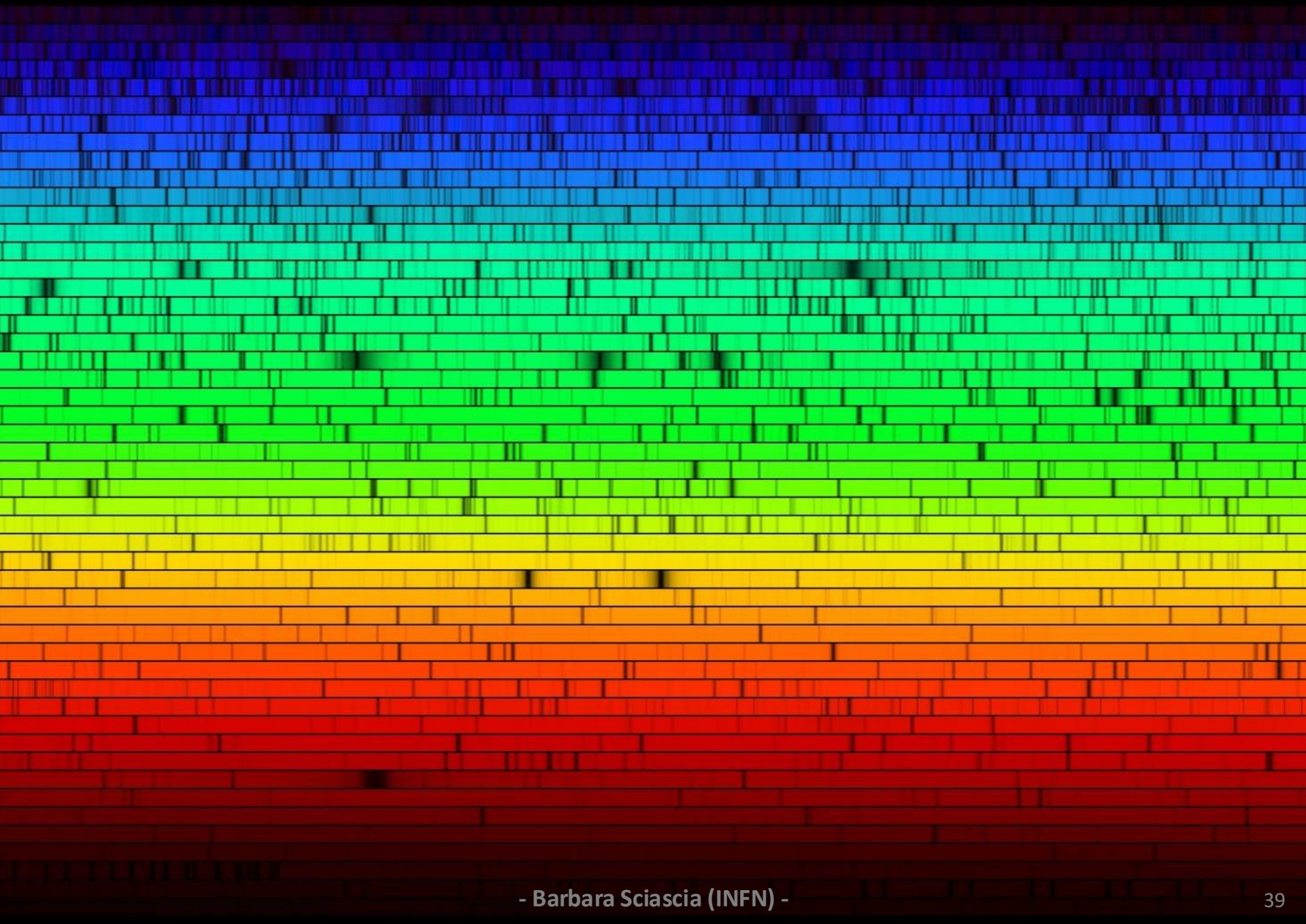
Classificare



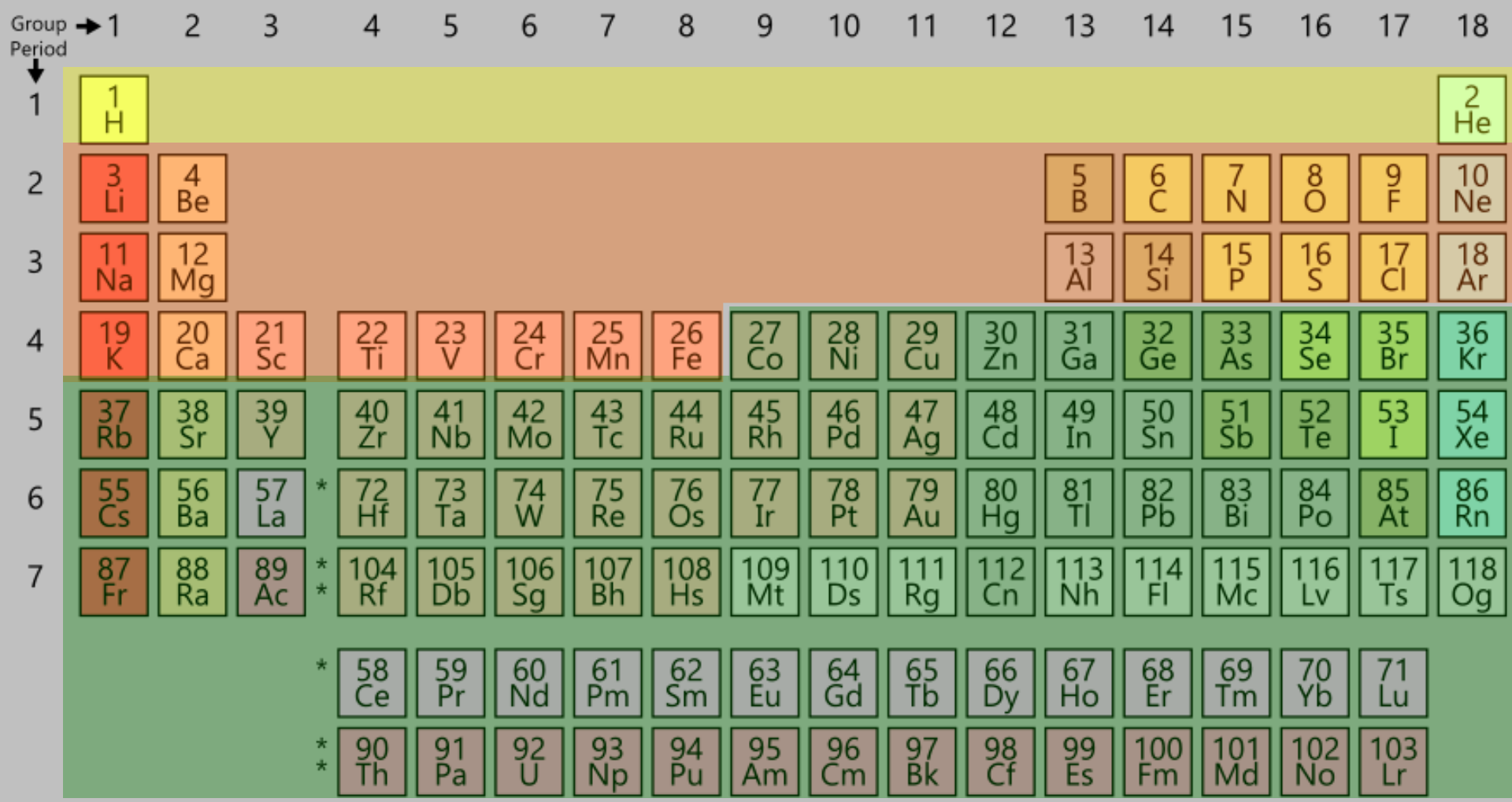
http://www.odesys.com/games/freecell/

[https://en.wikipedia.org/wiki/Periodic_table]





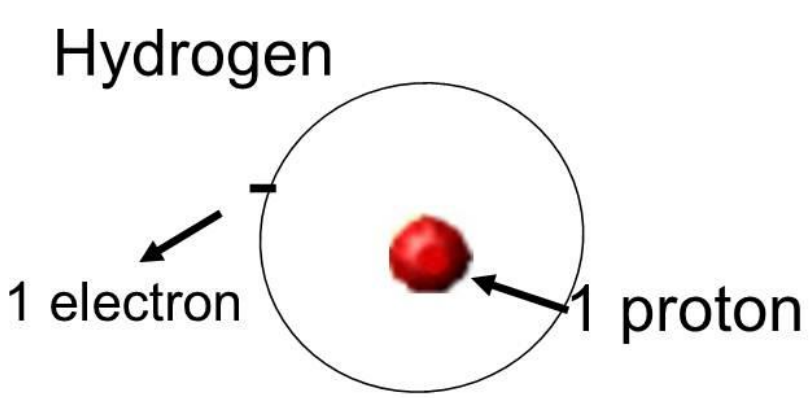
[https://en.wikipedia.org/wiki/Periodic_table]

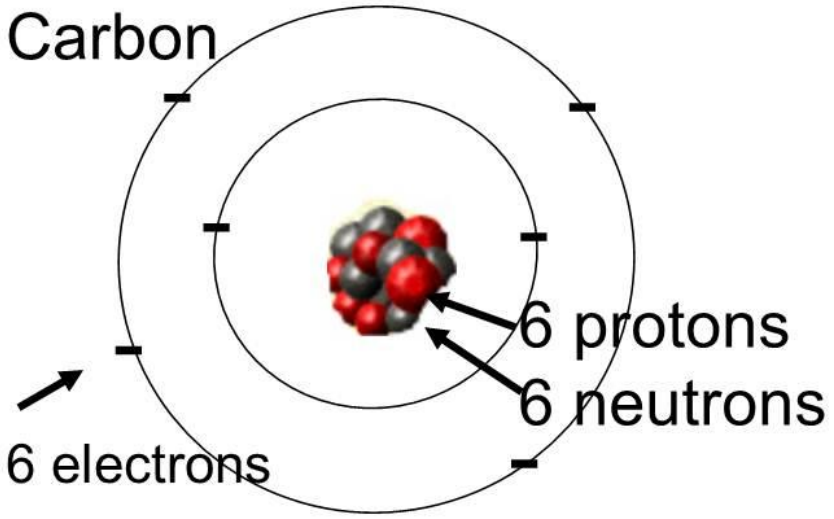


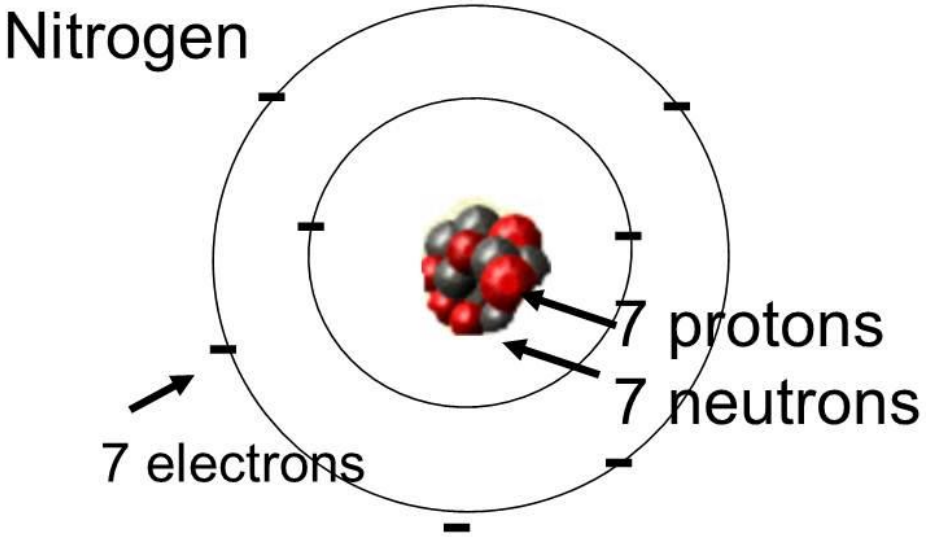
Primordiali

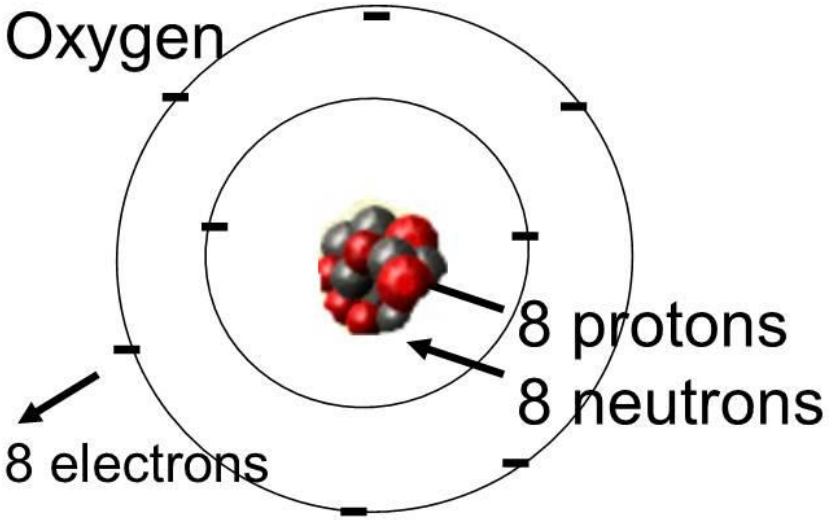
Nelle stelle

Fuori dalle stelle (Supernovae, scontri di stelle di neutroni, scontri di buchi neri, artificiali)

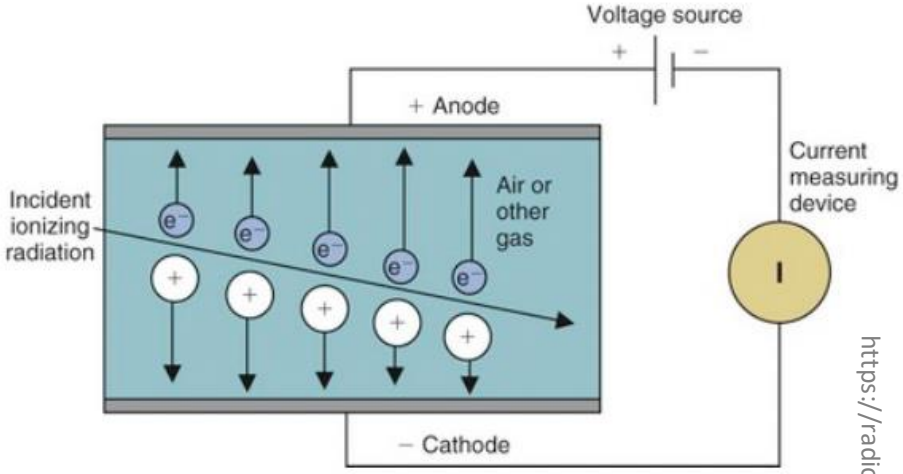

Hydrogen
1 electron
1 proton

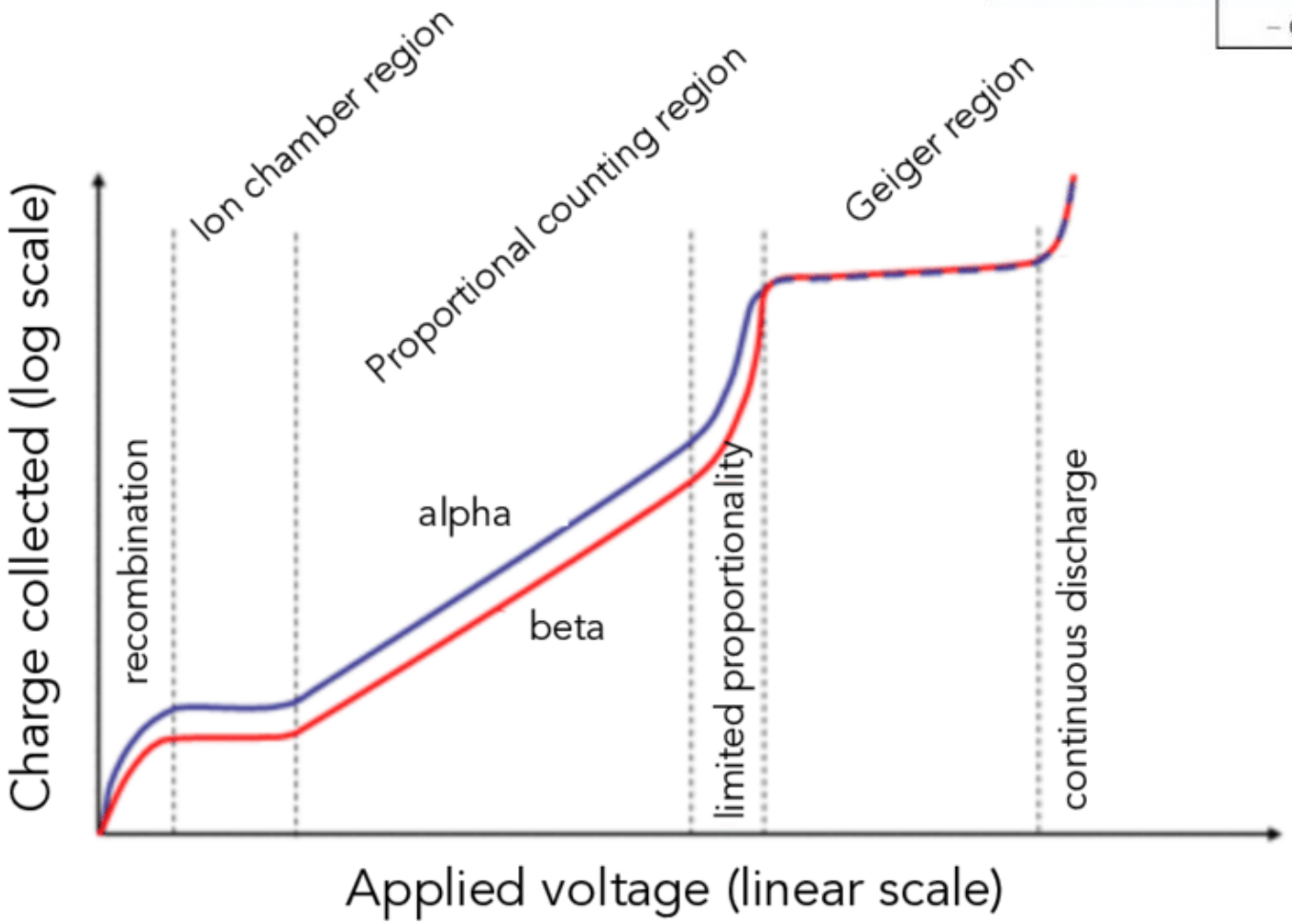

Carbon
6 protons
6 neutrons
6 electrons


Nitrogen
7 protons
7 neutrons
7 electrons


Oxygen
8 protons
8 neutrons
8 electrons

Ionizzazione

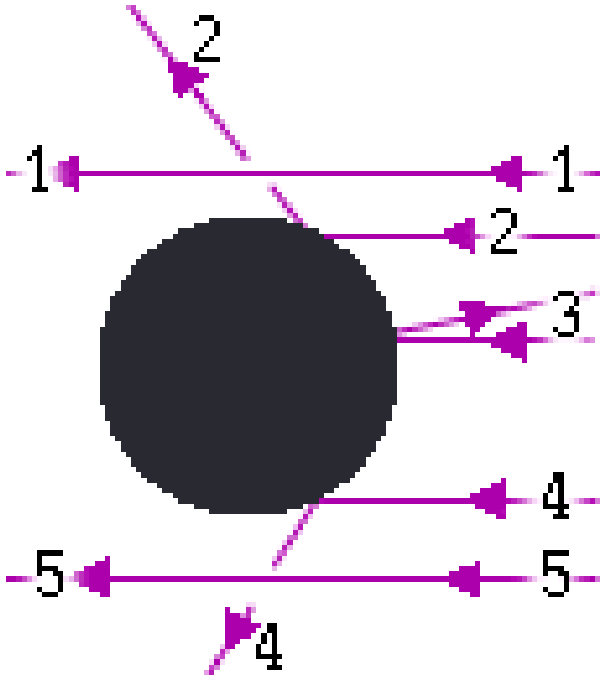


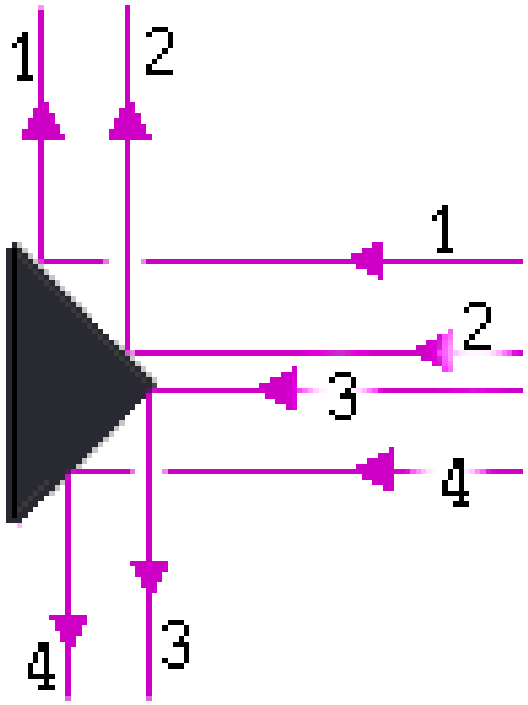


https://www.researchgate.net/profile/Giacomo-Mauri

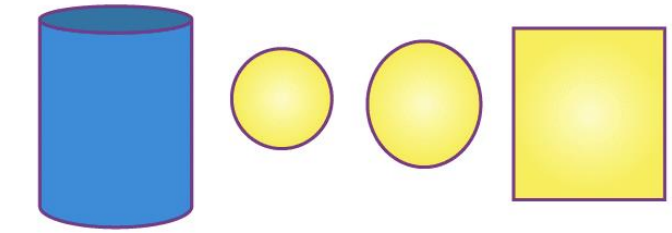
https://radiologykey.com/radiation-detectors/

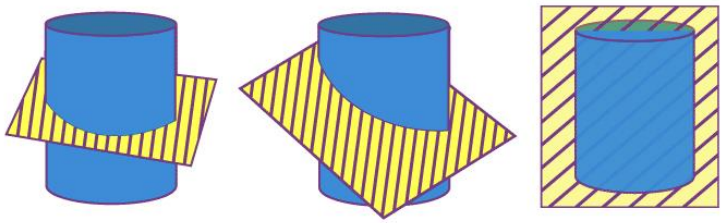
Rimbalzi... rivelatori

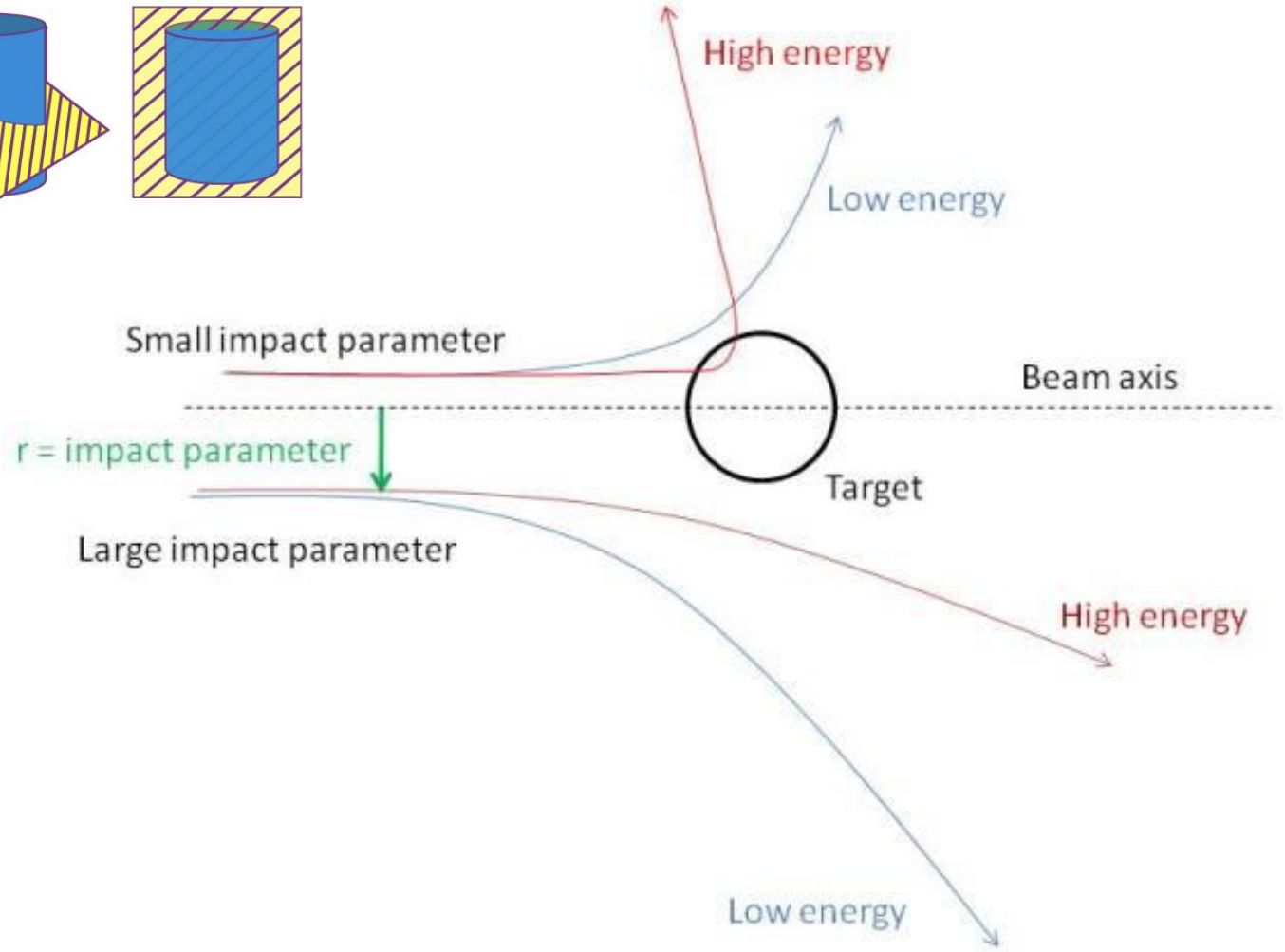




Sezione d'urto







Dosimetri