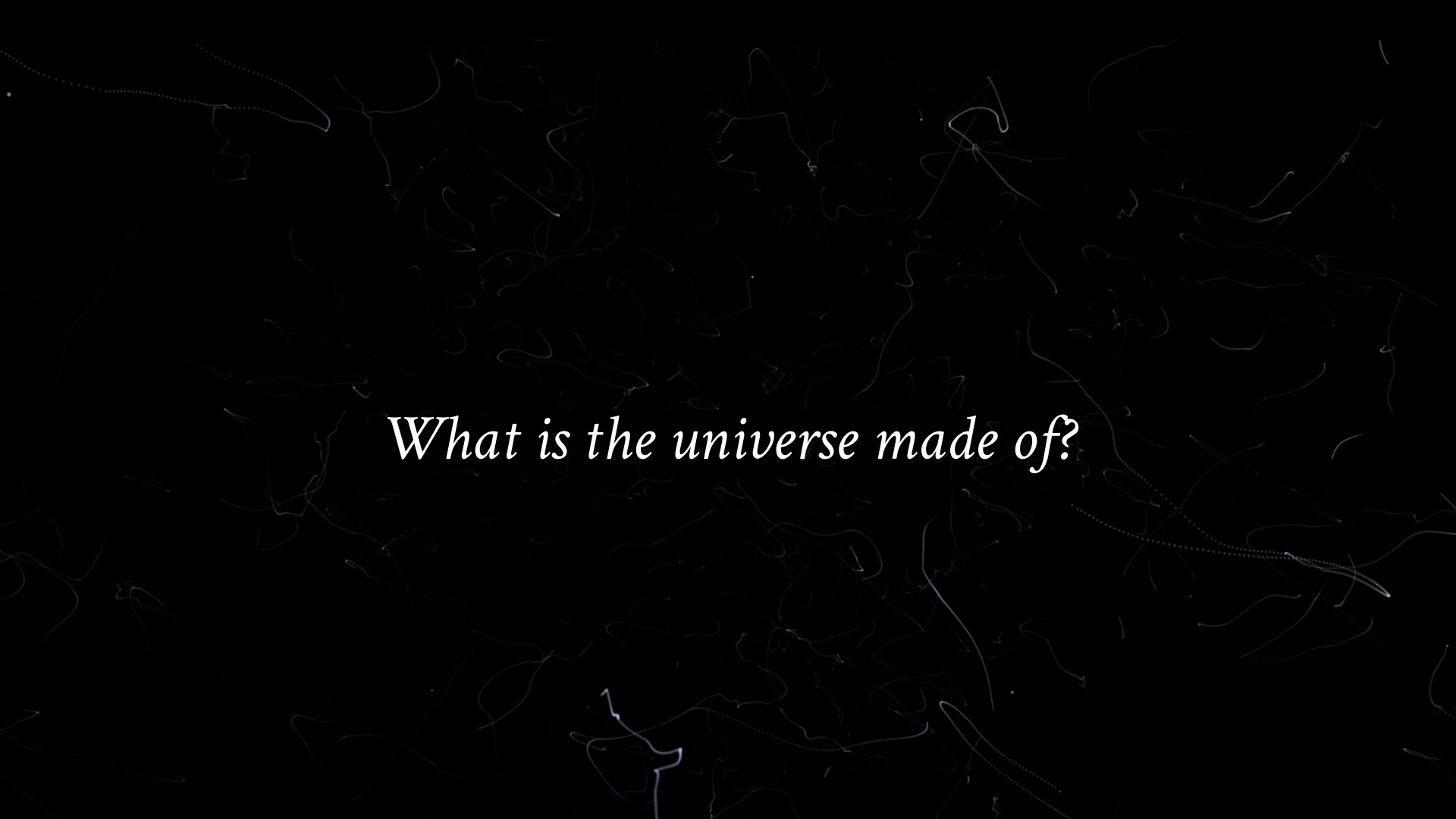


RPS Update Meeting

Bart Hommels

Cavendish Laboratory - Department of Physics (HEP)

Based on slides by Will Fawcett

The background of the image is a dark, black field filled with a complex, tangled network of thin, light-colored lines. These lines represent the cosmic web, showing the distribution of matter in the universe. Some lines are solid and bright, while others are dotted or fainter. The lines form a dense, interconnected web of filaments and nodes, with some areas appearing more concentrated than others. The overall effect is one of a vast, intricate, and somewhat chaotic structure.

What is the universe made of?



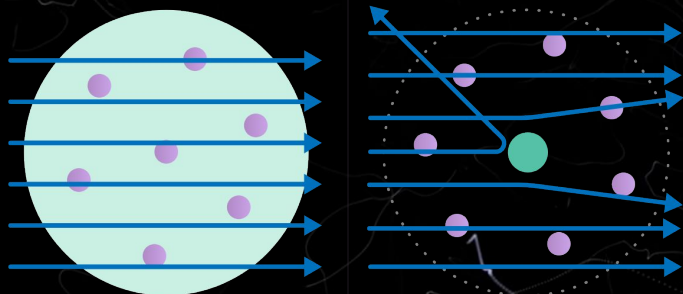
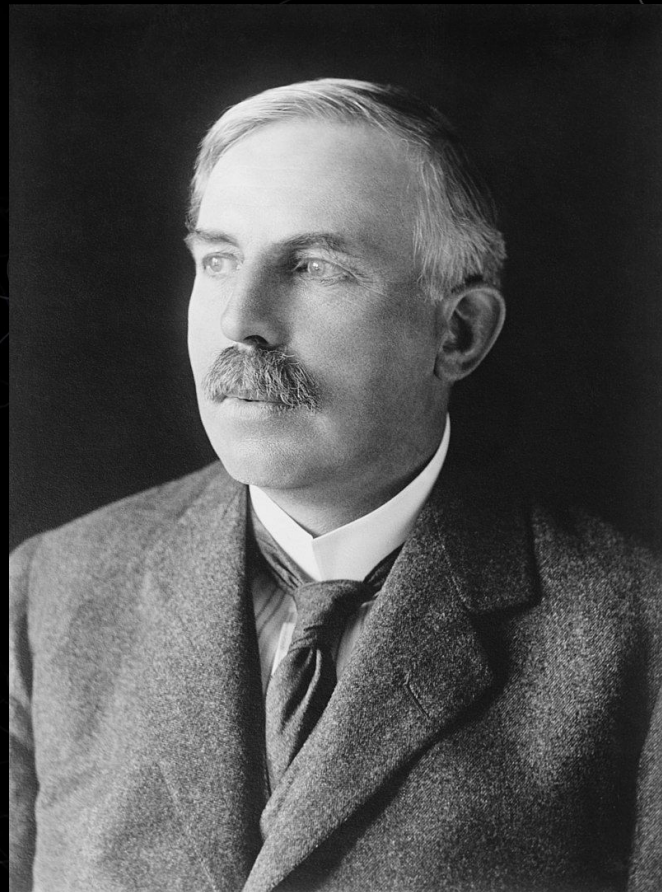
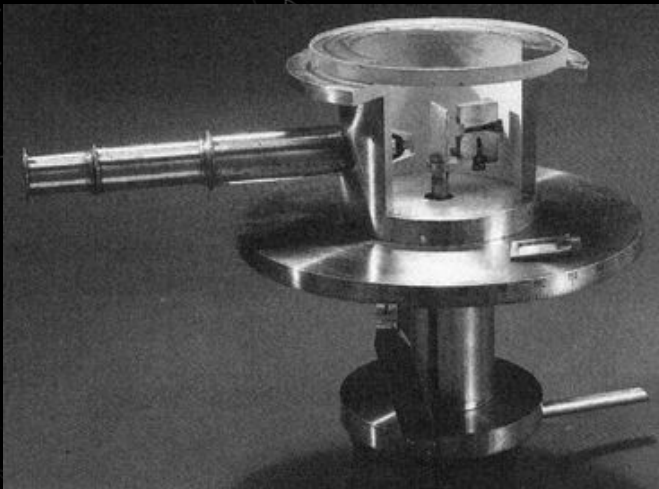
Atomic
Number

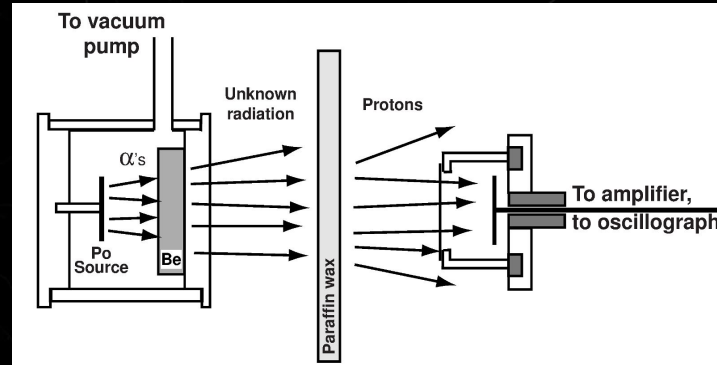
Symbol

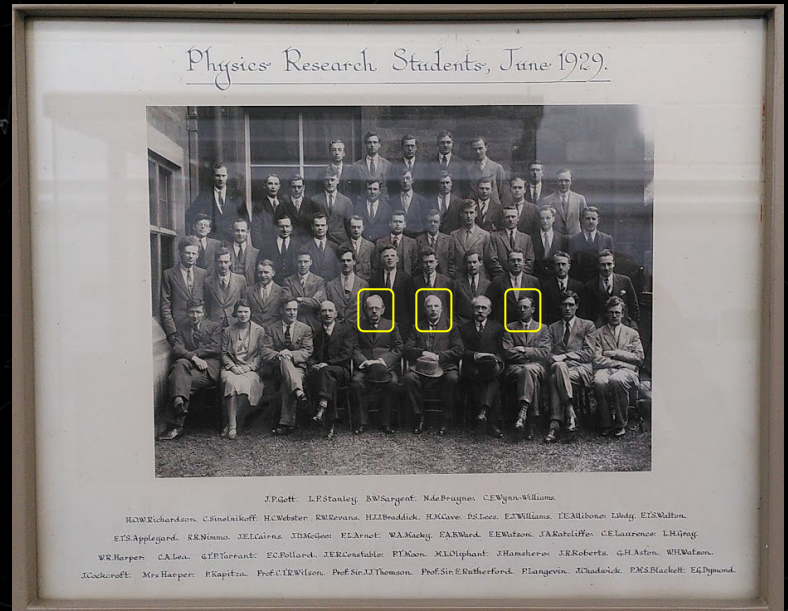
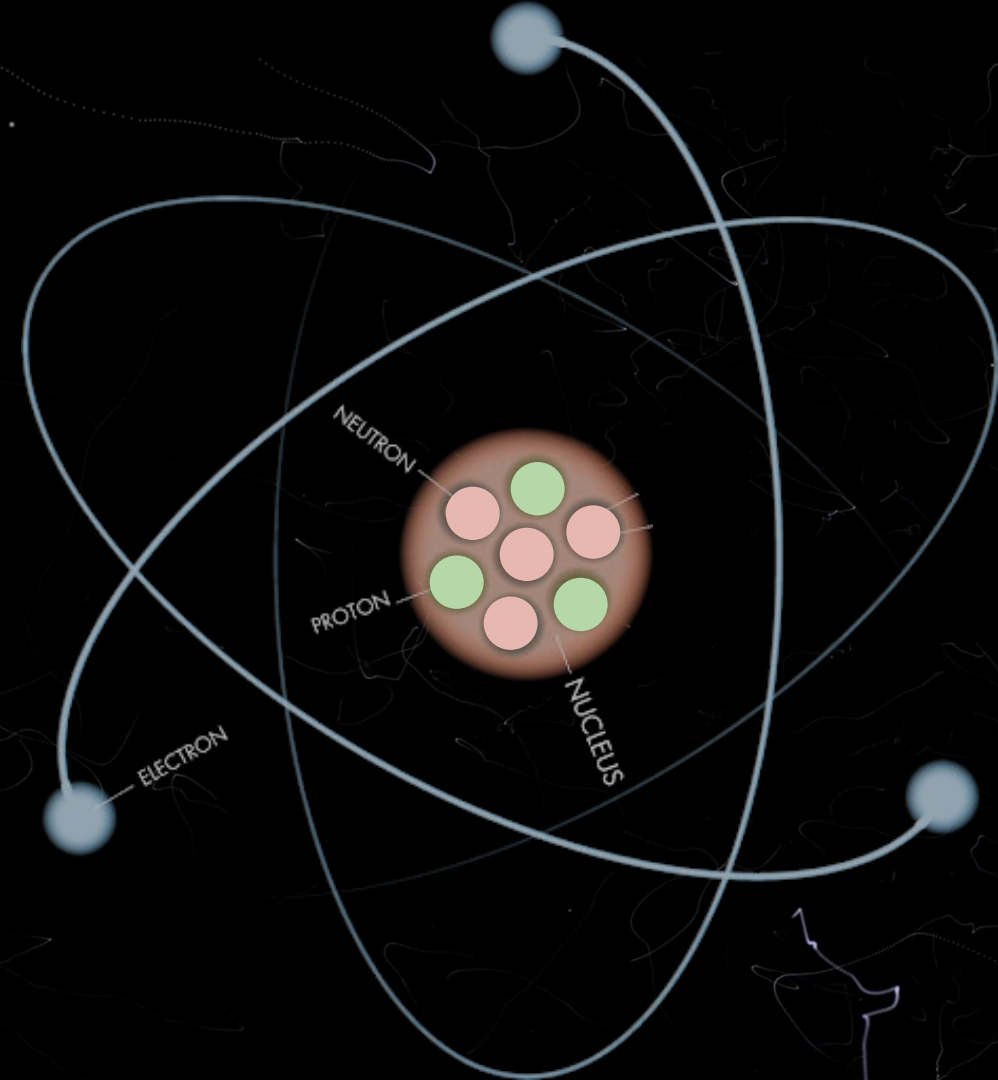
Name

Atomic Mass

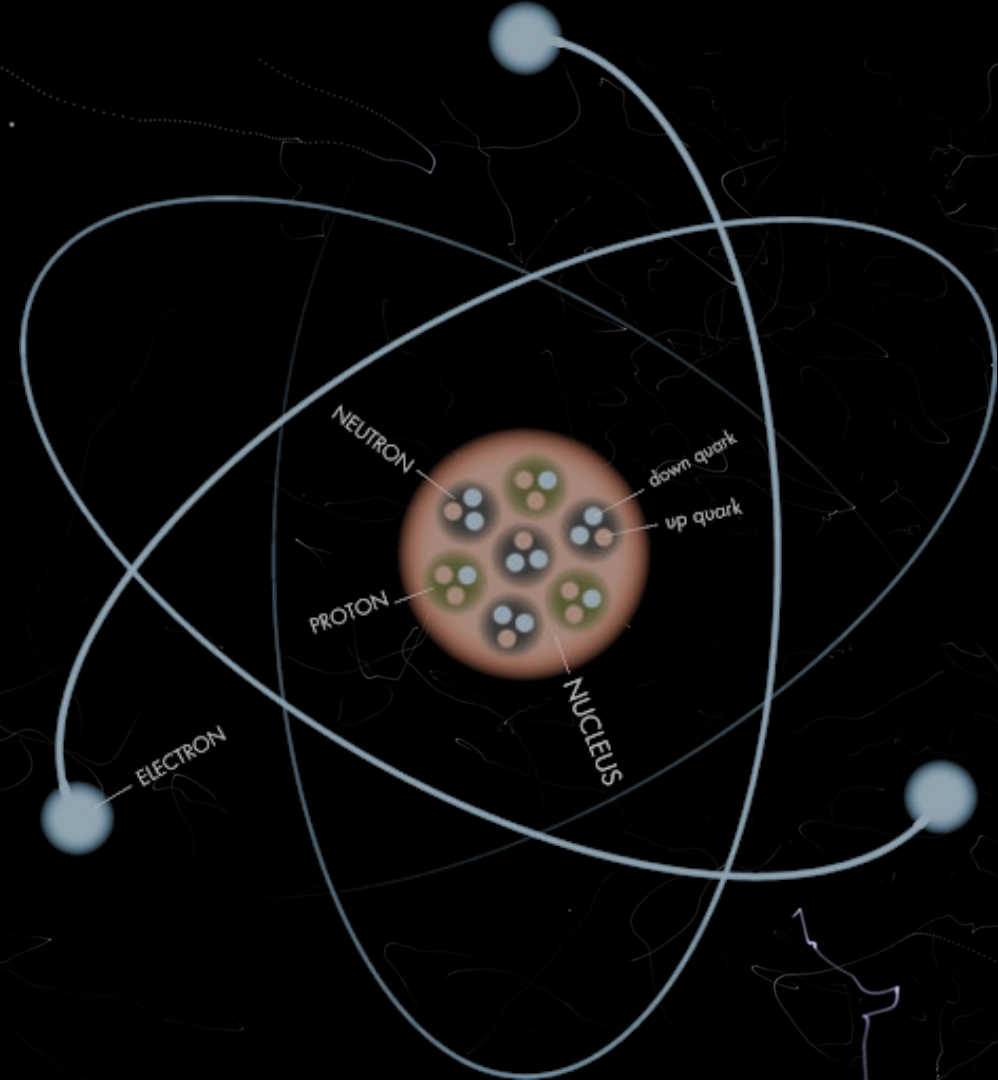








Further reading: Malcolm Longair (2021) Rutherford and the Cavendish Laboratory, Journal of the Royal Society of New Zealand, 51:3-4, 444-466, DOI: [10.1080/03036758.2021.1885452](https://doi.org/10.1080/03036758.2021.1885452)



CERN Accelerator Complex

Lake Geneva

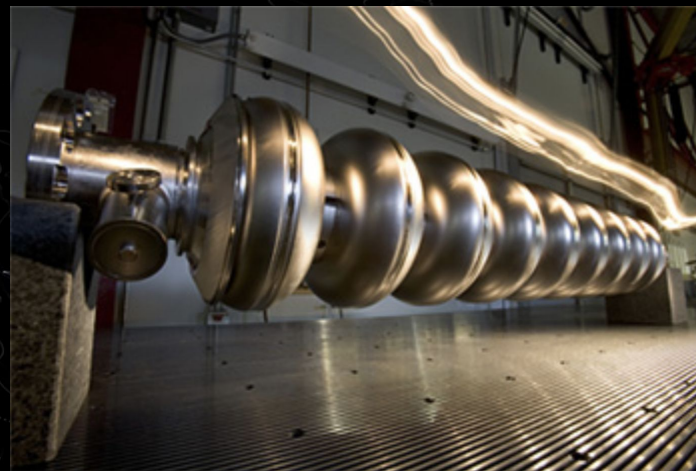
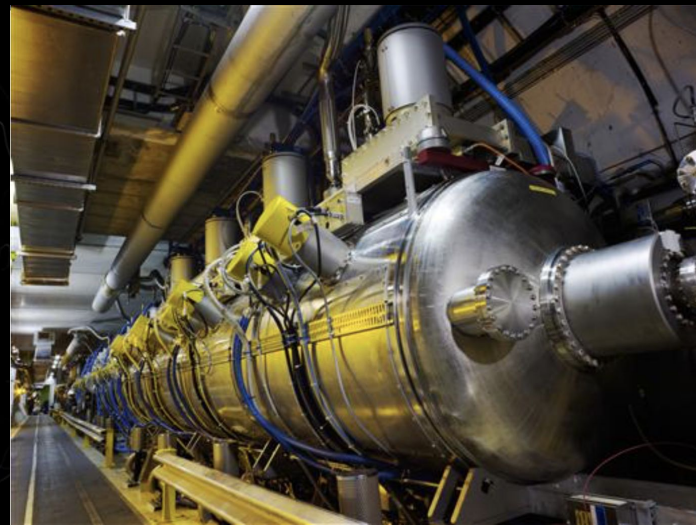
Geneva
Airport

27 km

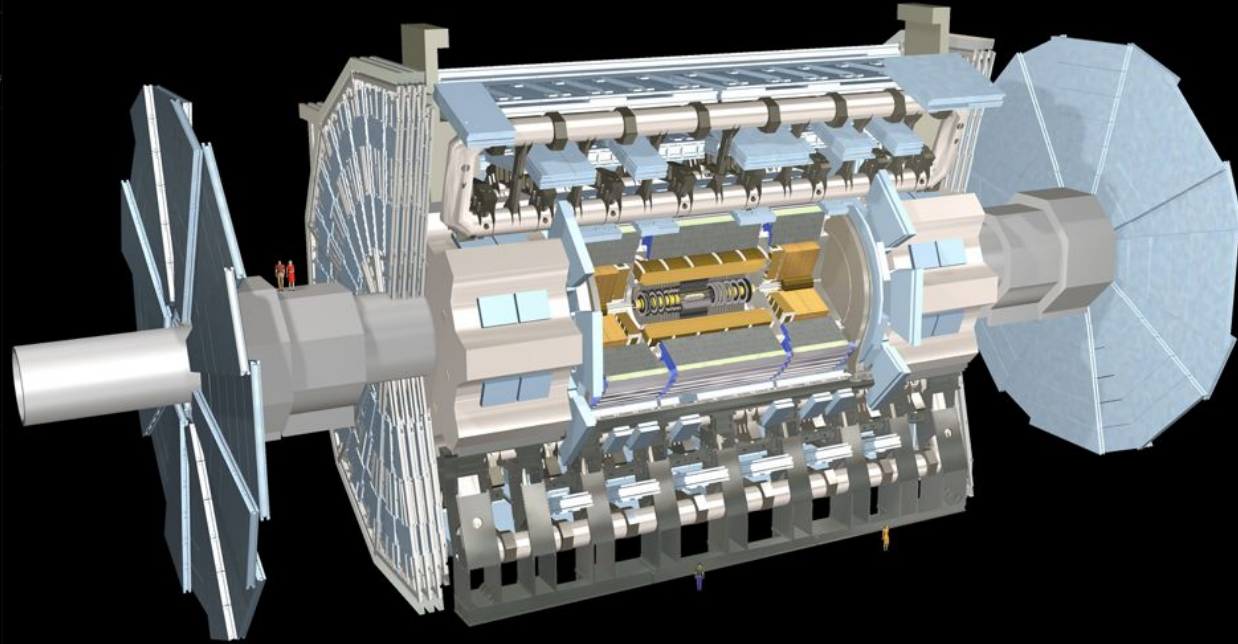
CERN LAB 2 (France)

CERN LAB 1 (Switzerland)

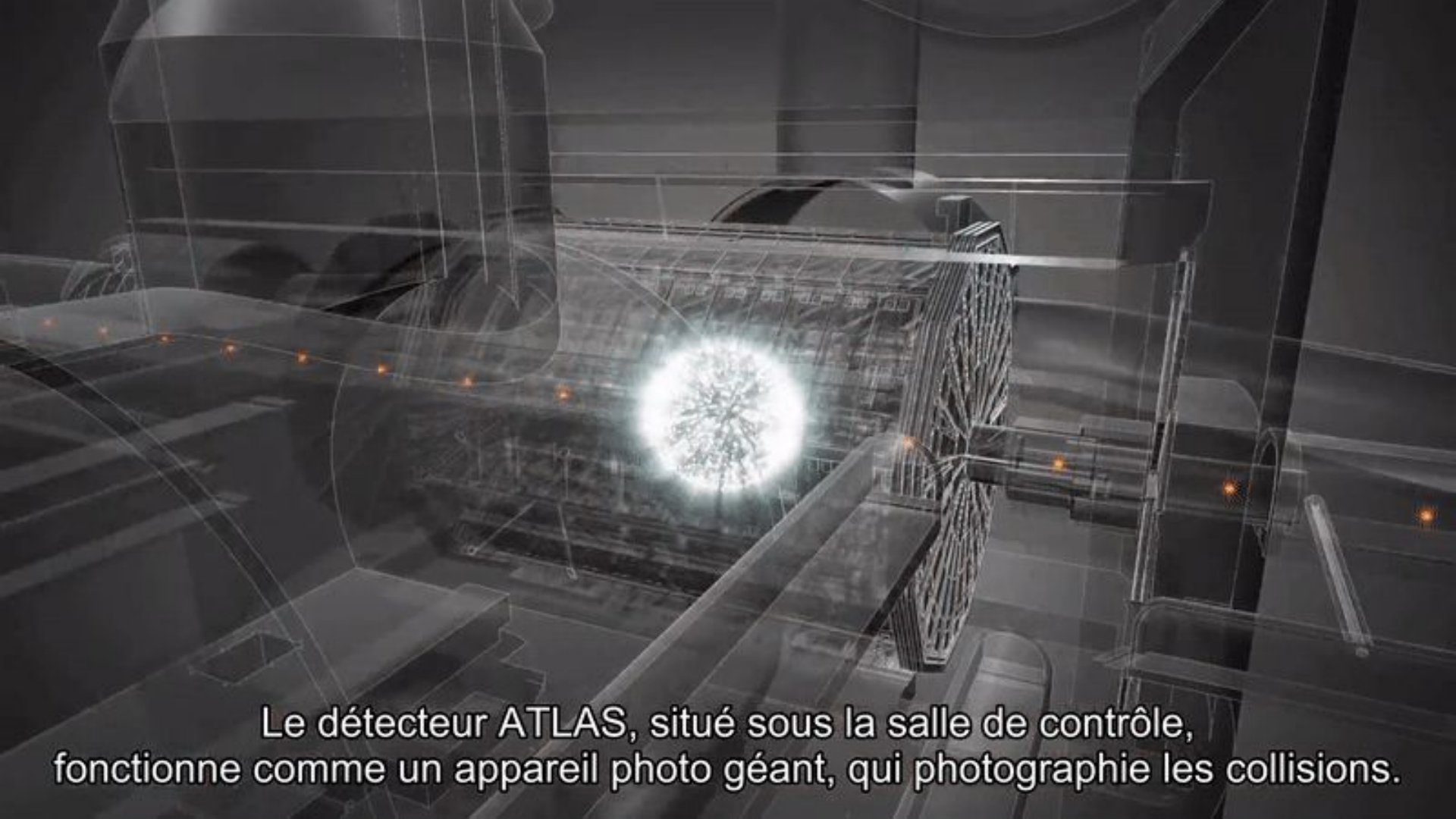








- 12 stories high, 46m long
- ~ 5000 physicists + engineers
- 7000 tonnes
- 160 Megapixel
40M snapshots / second



Le détecteur ATLAS, situé sous la salle de contrôle, fonctionne comme un appareil photo géant, qui photographie les collisions.

13 TeV collisions

Run: 265545

Event: 2501742

2015-05-21 09:58:30 CEST

Quarks

u up	c charm	t top
d down	s strange	b bottom

Leptons

e electron	μ muon	τ tau
ν_e electron neutrino	ν_μ muon neutrino	ν_τ tau neutrino

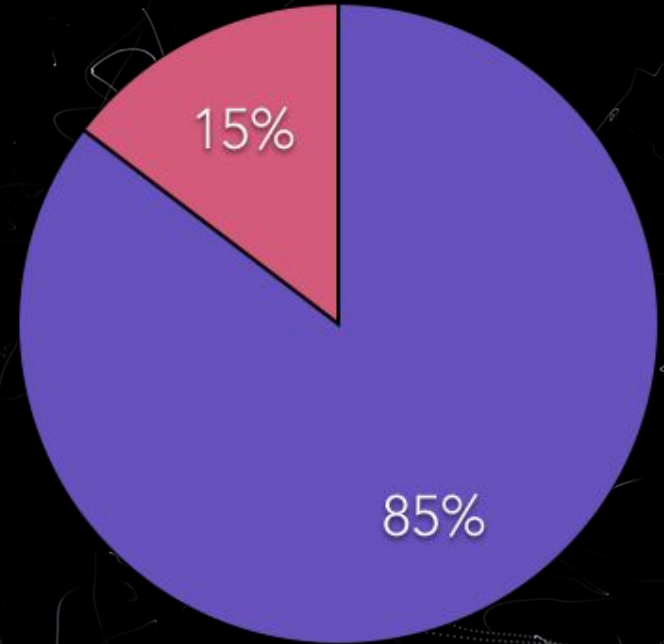
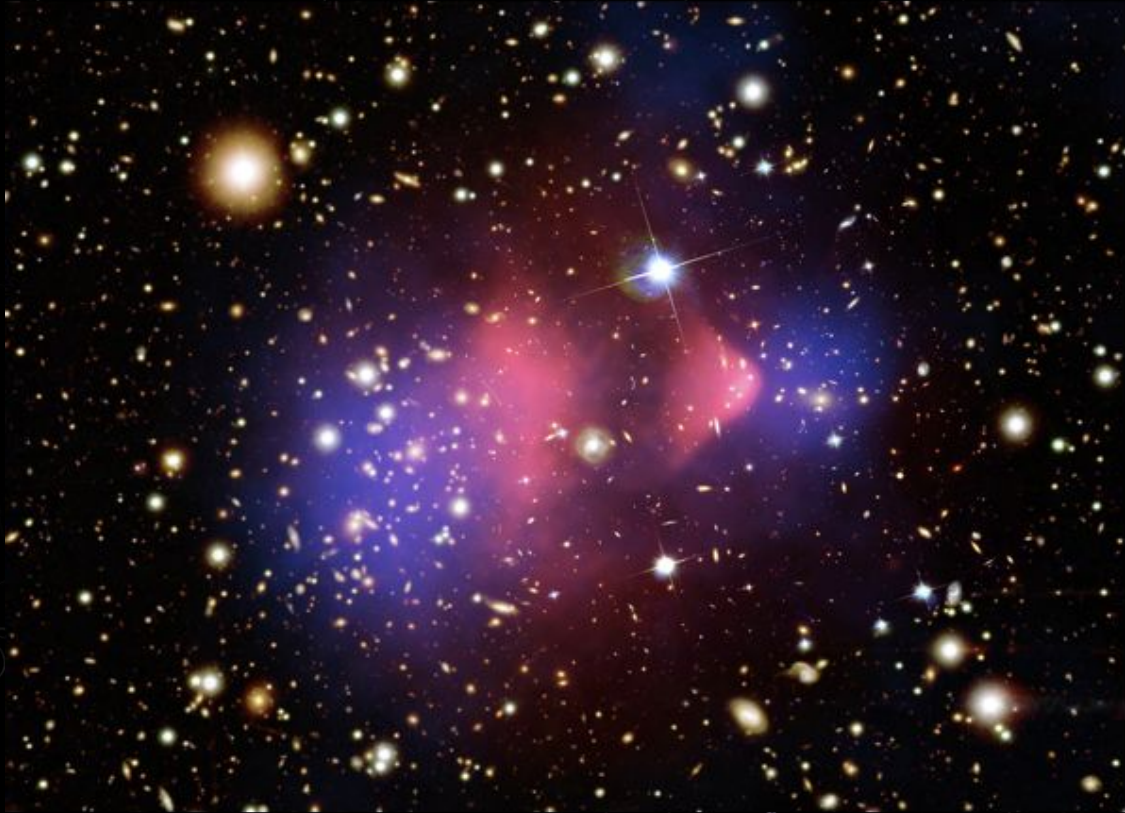
H
Higgs boson

Force Carriers

Z Z boson	γ photon
W W boson	g gluon

Problem solved?

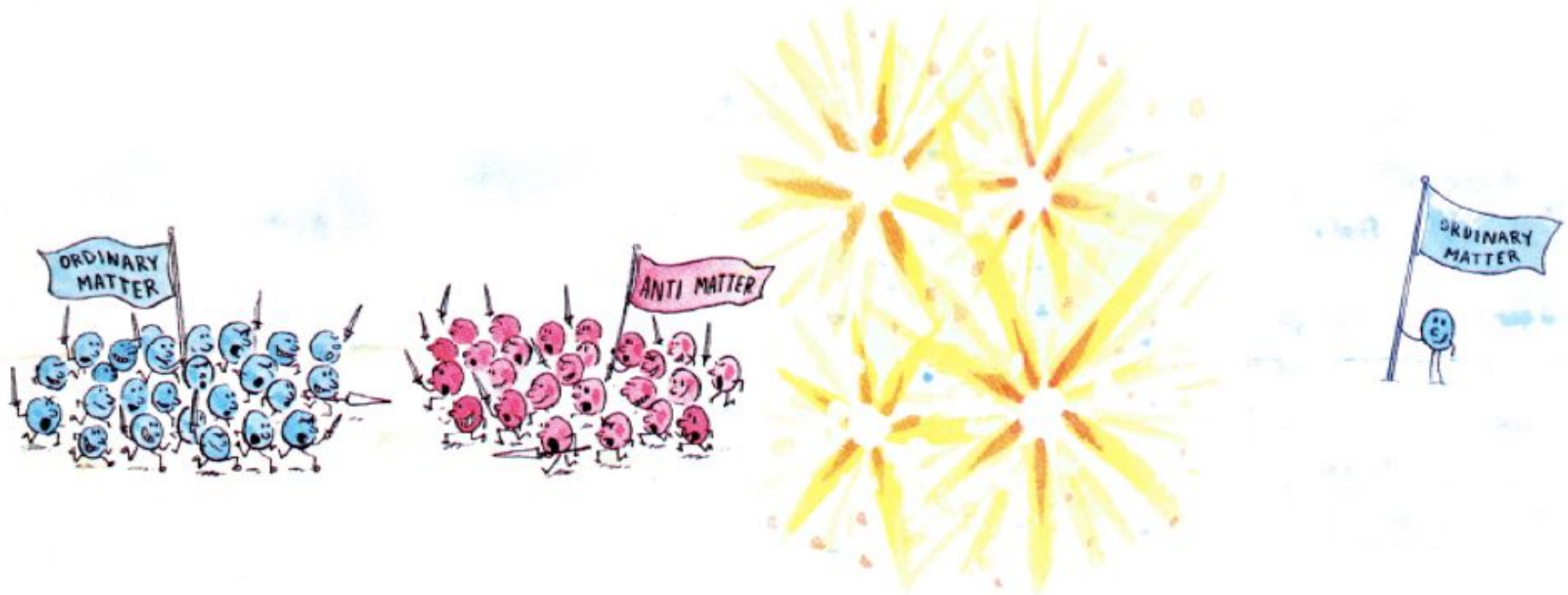
Problem 1: dark matter



- Dark Matter
- Ordinary Matter

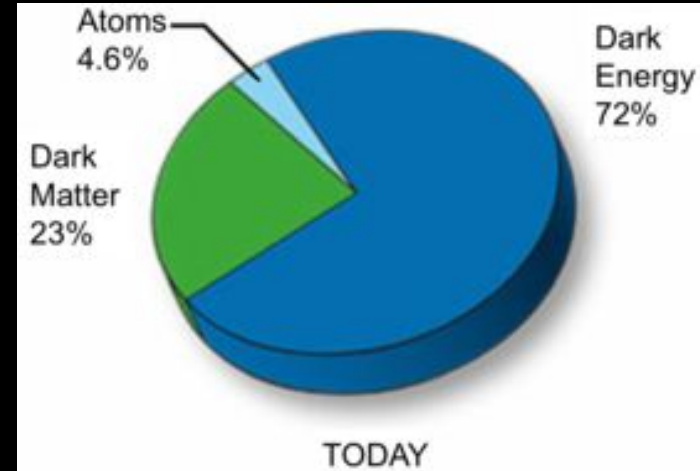
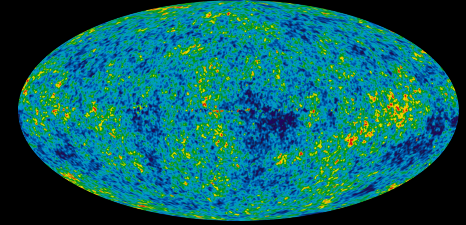
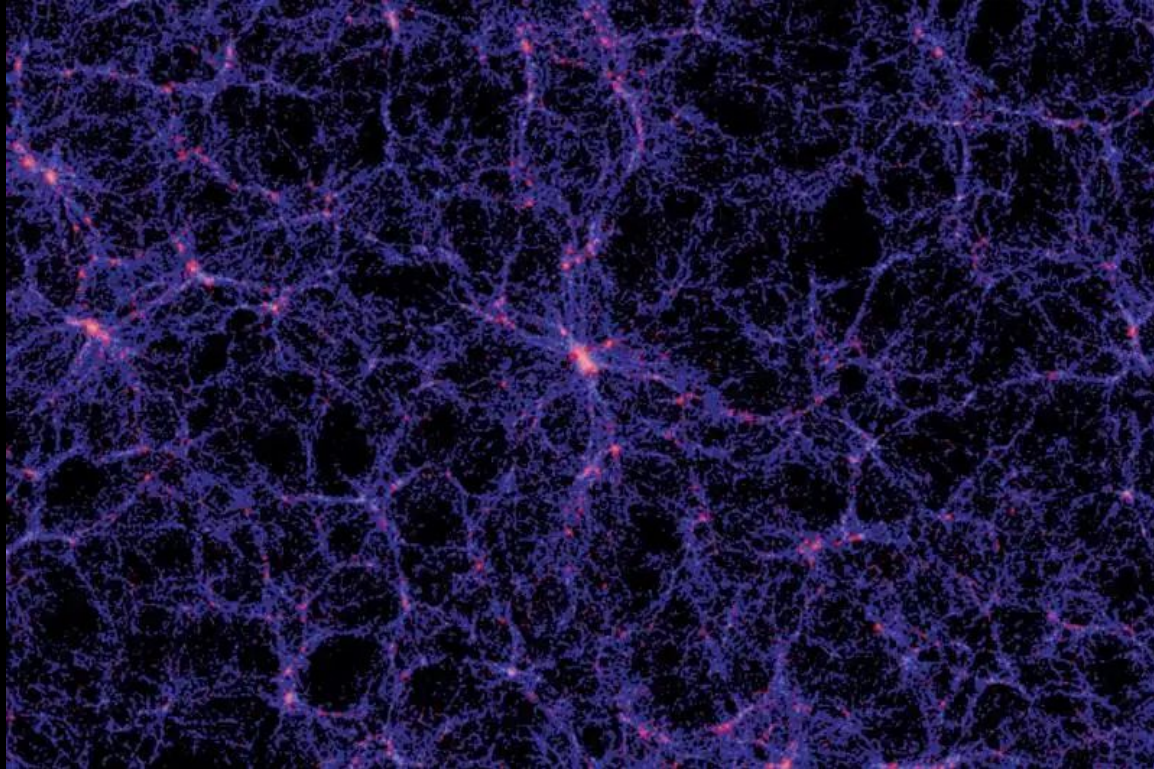
Visible mass (gass) + dark mass

Problem 2: dark matter

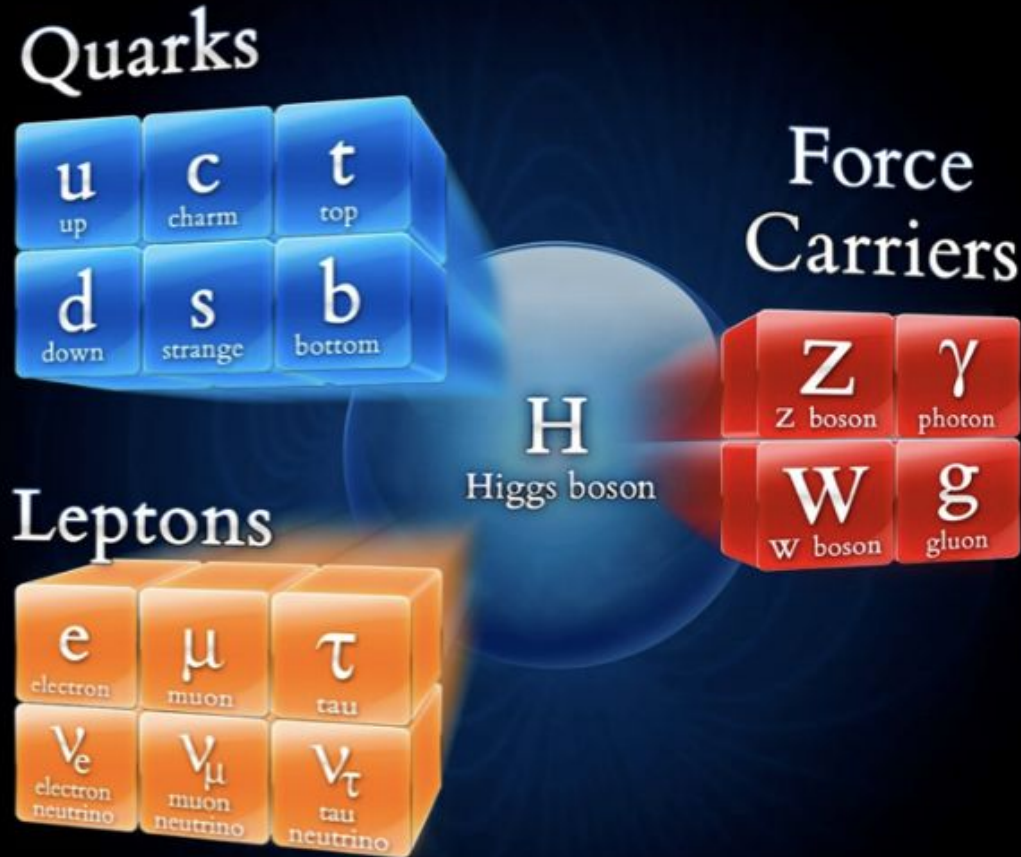


For every billion ordinary particles annihilating with antimatter in the early Universe, one extra was left “standing.”

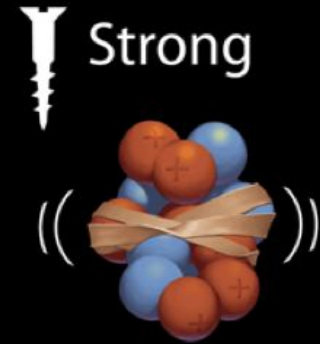
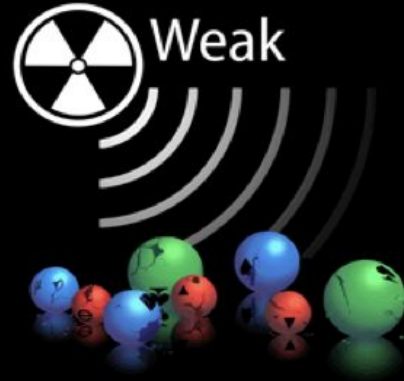
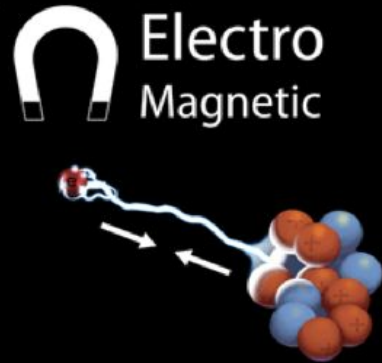
Problem 3: dark energy and the acceleration of the universe



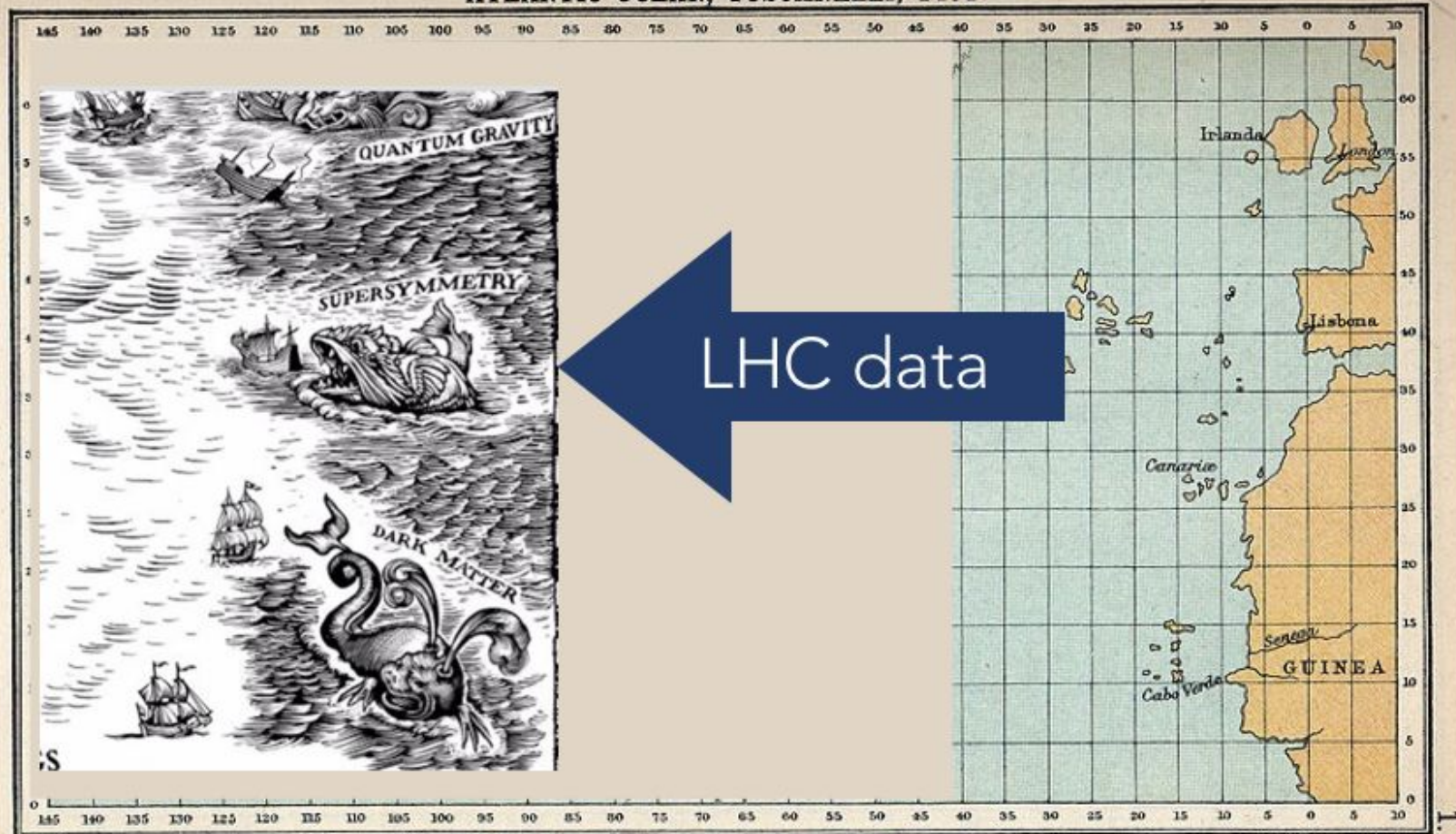
Problem 4: why the structure, why only three generations, why do the particles have the masses they do?



Problem 4: ...and where is gravity?

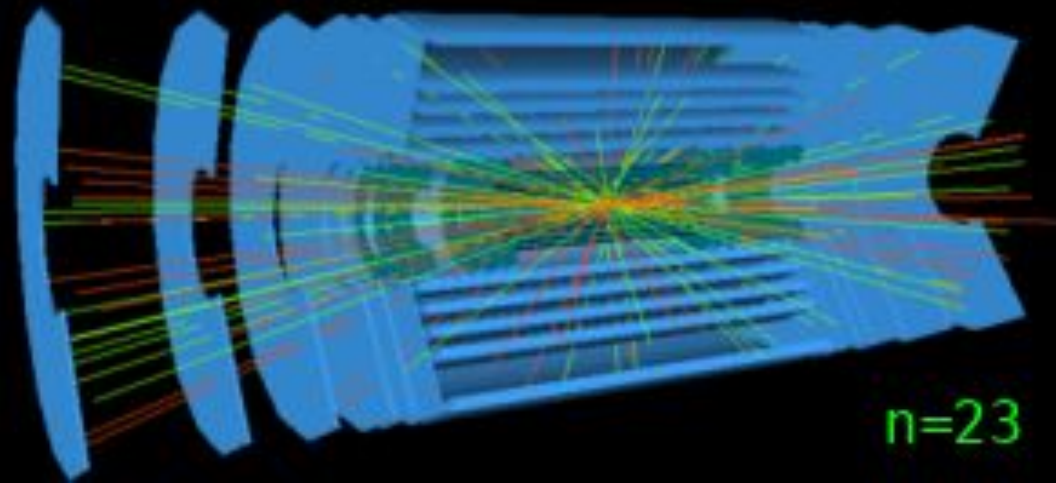


ATLANTIC OCEAN, TOSCANELLI, 1474

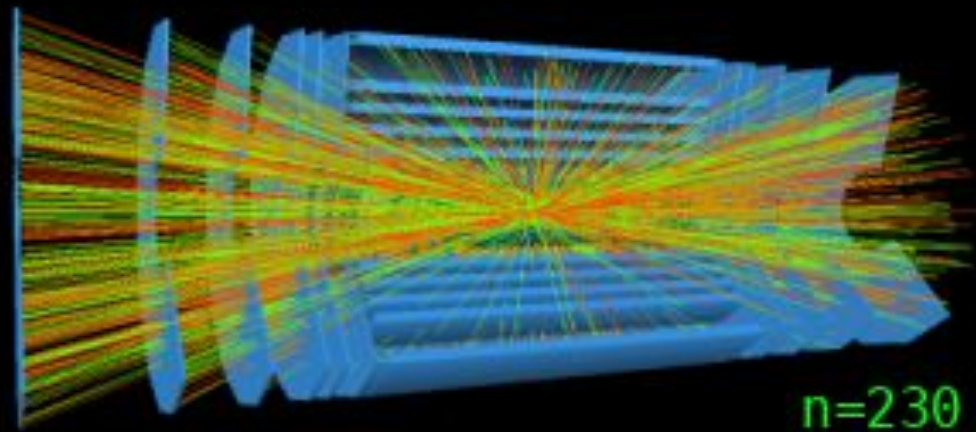


The Correct outline of North America is shown in light blue tint

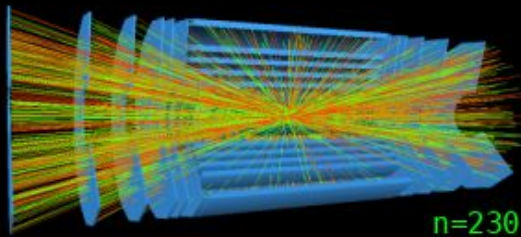
John Bartholomew & Co. Edinb



$n=23$

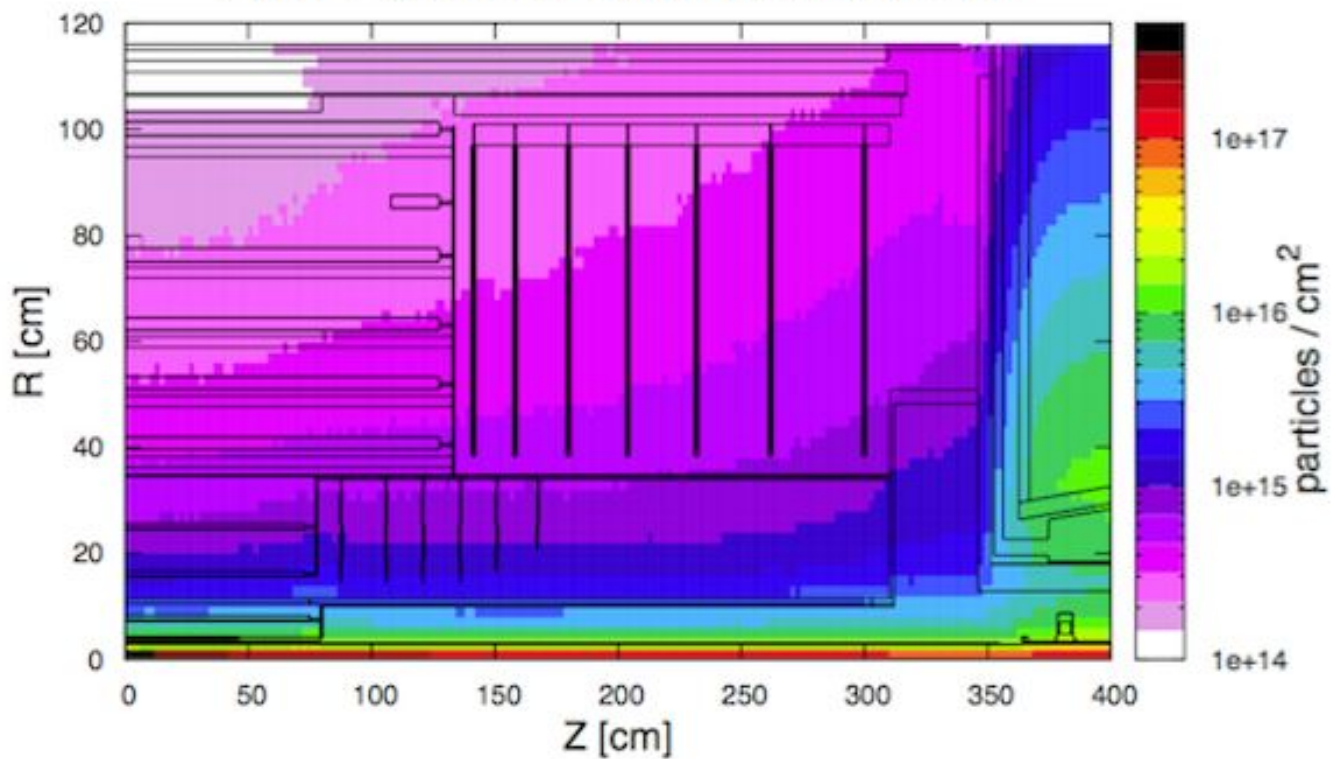


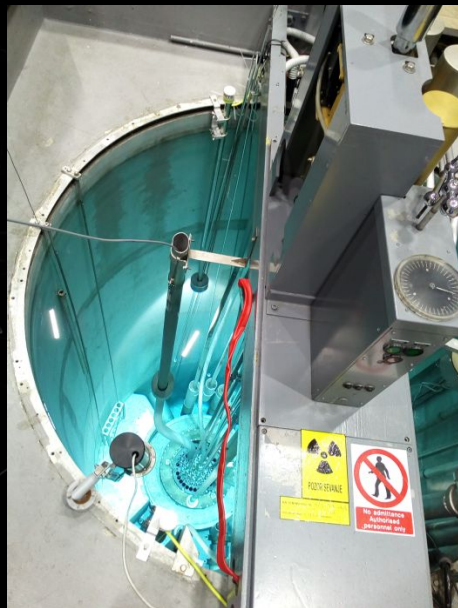
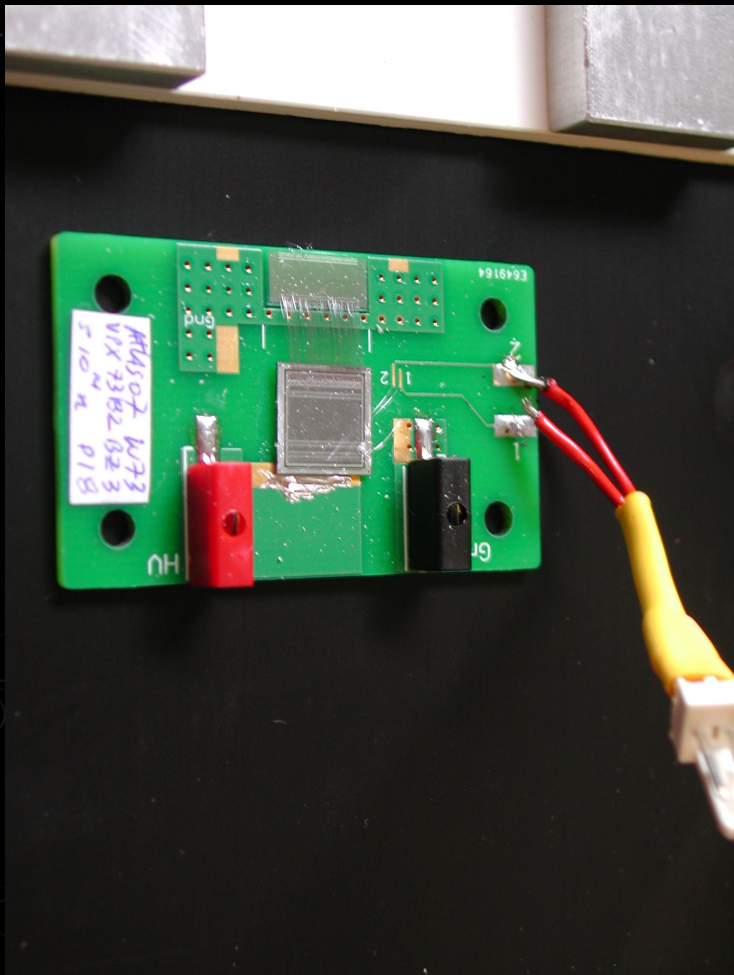
$n=230$

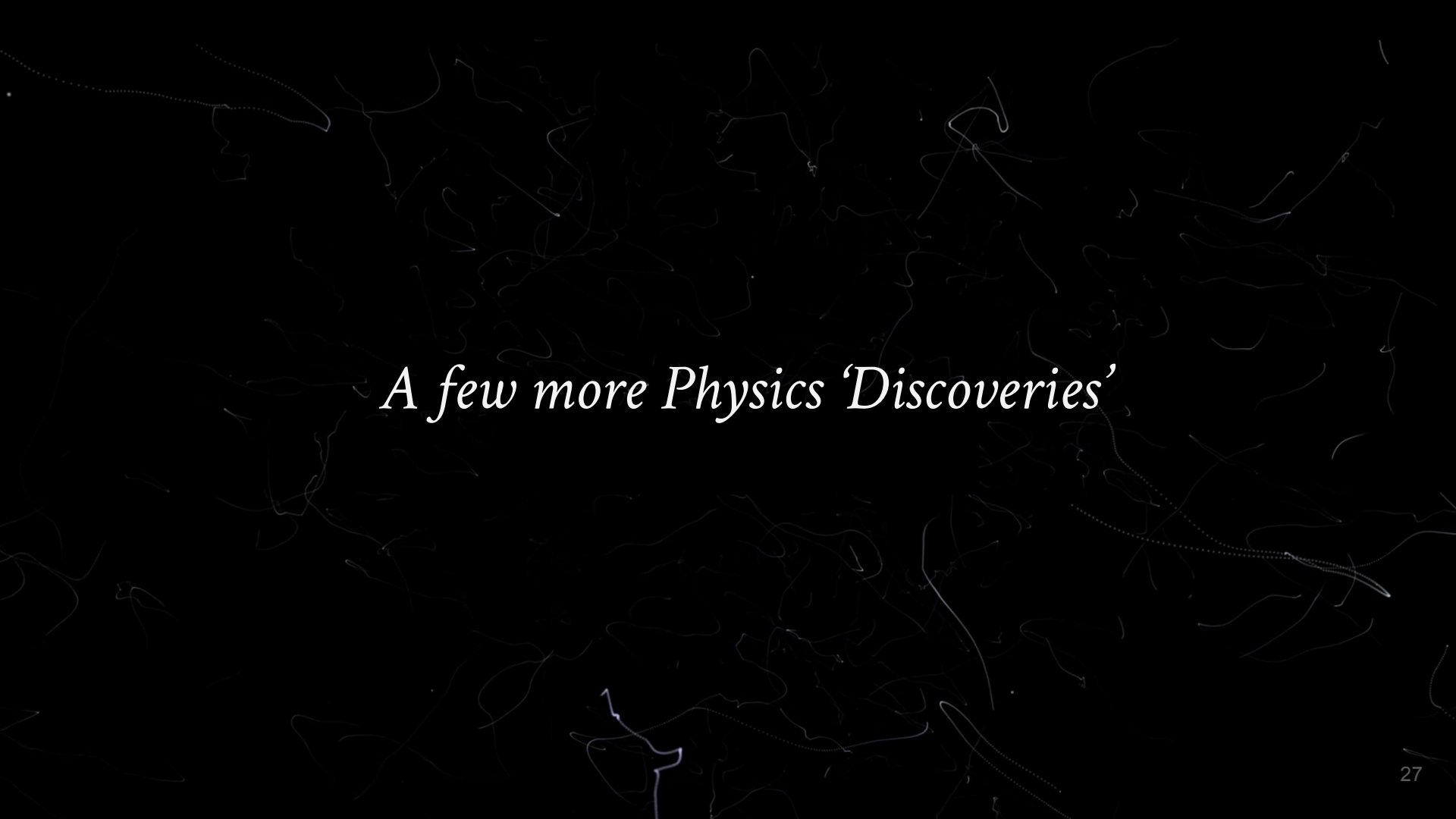


$n=230$

1 MeV neutron equivalent fluence



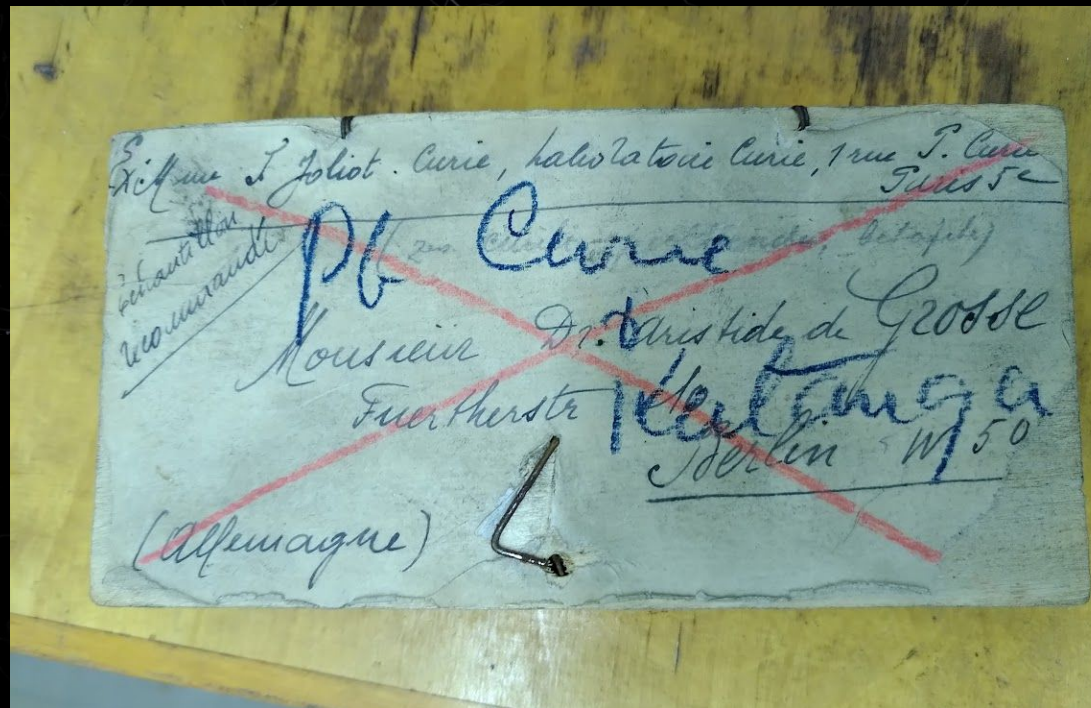


The background of the slide is black, featuring a complex pattern of thin, white, hand-drawn lines and dots. These lines are mostly vertical and wavy, resembling a stylized representation of particle tracks or a dense network of connections. Some lines are straight, while others are highly curved and looped. Small white dots are scattered throughout the black space, some appearing as isolated points and others as part of the line patterns.

A few more Physics 'Discoveries'









?