IMPACT of science on society and sustainable development

(showcased by CERN)

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CERN

World largest particle physics laboratory

Understanding of mysteries of universe

- What is everything made from?
- Dark matter
- Anti-matter
- Higgs boson
- Big theories, extra-dimensions, supersymmetry….

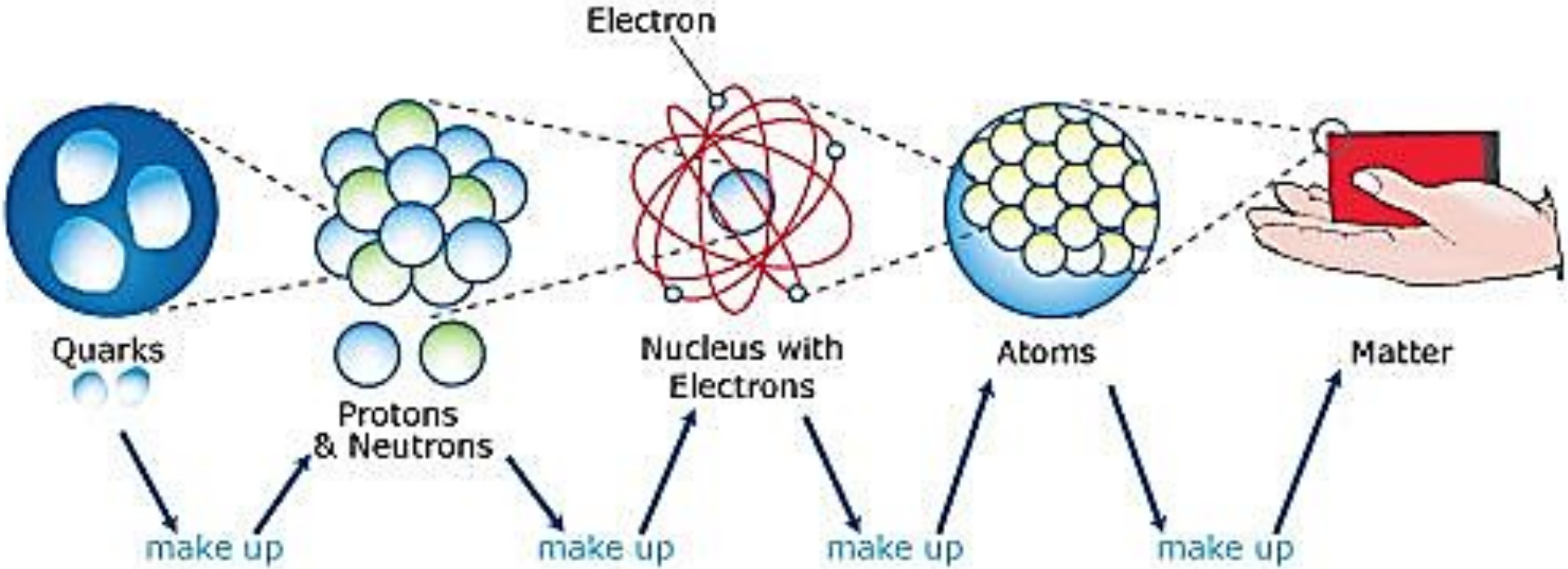
What are we made from?

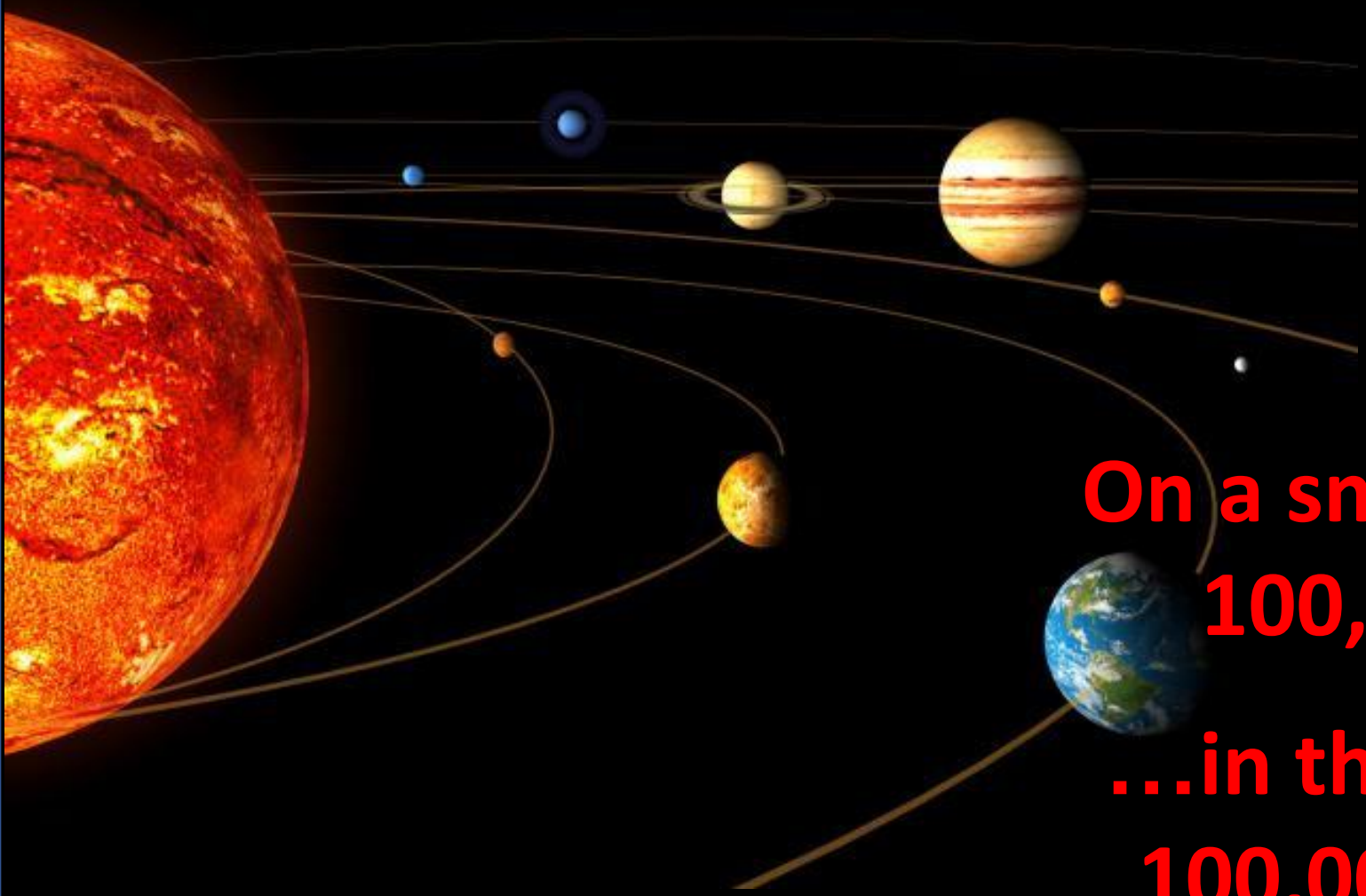
I am made of

100 000 000 000 000 000 000 000 000 000 000

QUARKS &

ELECTRONS

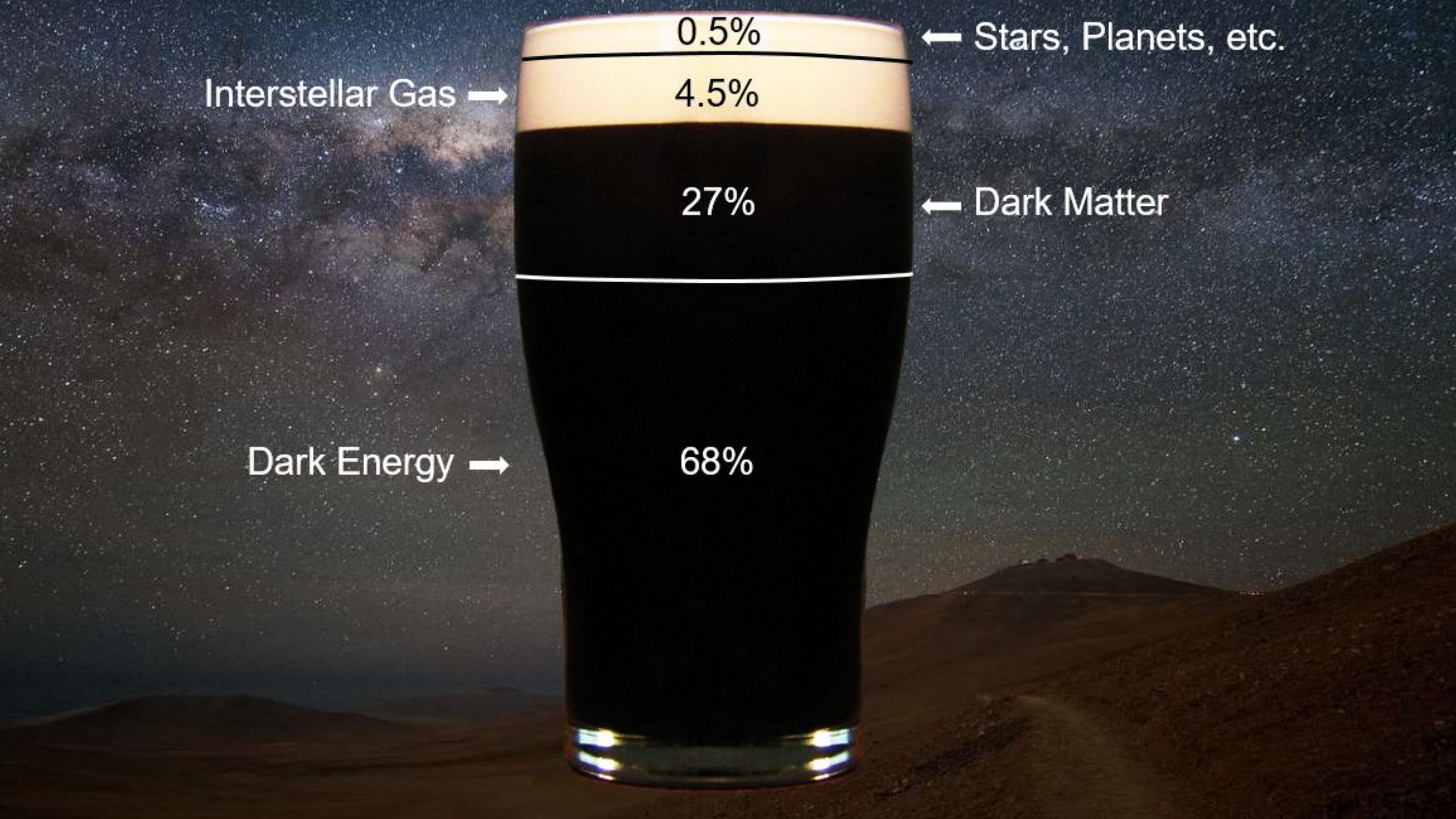

Electron
Quarks
Protons
& Neutrons
Nucleus with
Electrons
Atoms
Matter
make up
make up
make up
make up



On a small planet orbiting 1 of 100,000,000,000 stars…

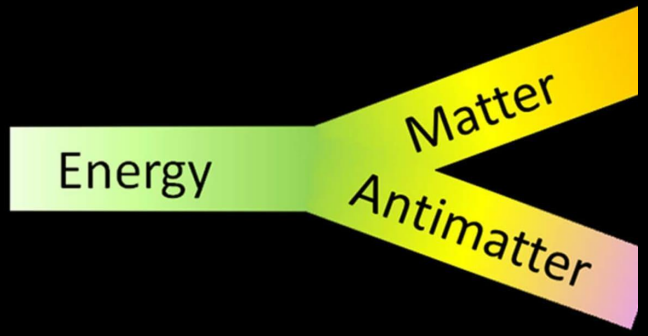
…in the middle of 1 of about 100,000,000,000 galaxies…

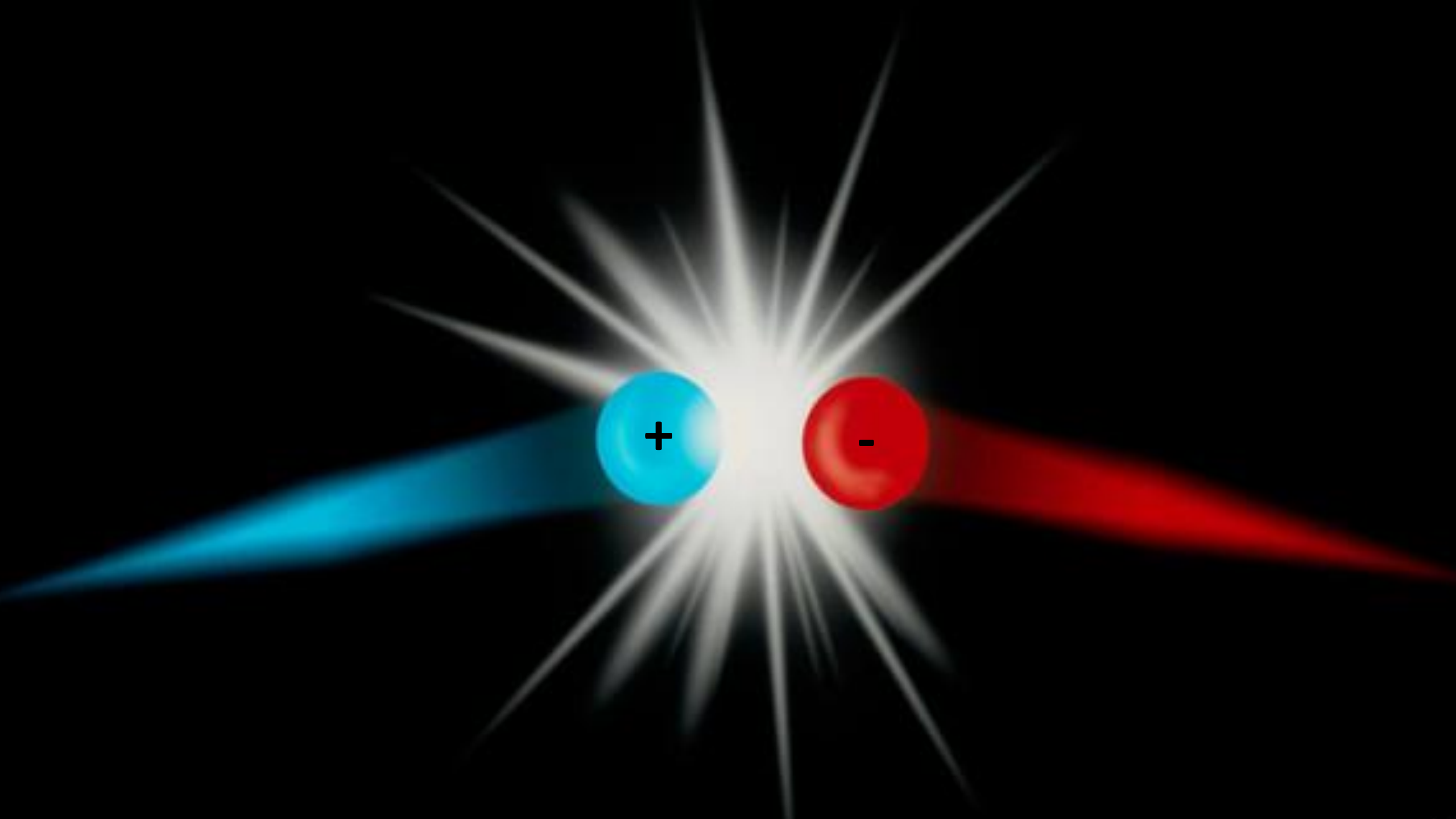
What is the dark matter?


0.5%
Stars, Planets, etc.
Interstellar Gas
4.5%
27%
Dark Matter
Dark Energy
68%

Where is the antimmater?

$E=mc^2$

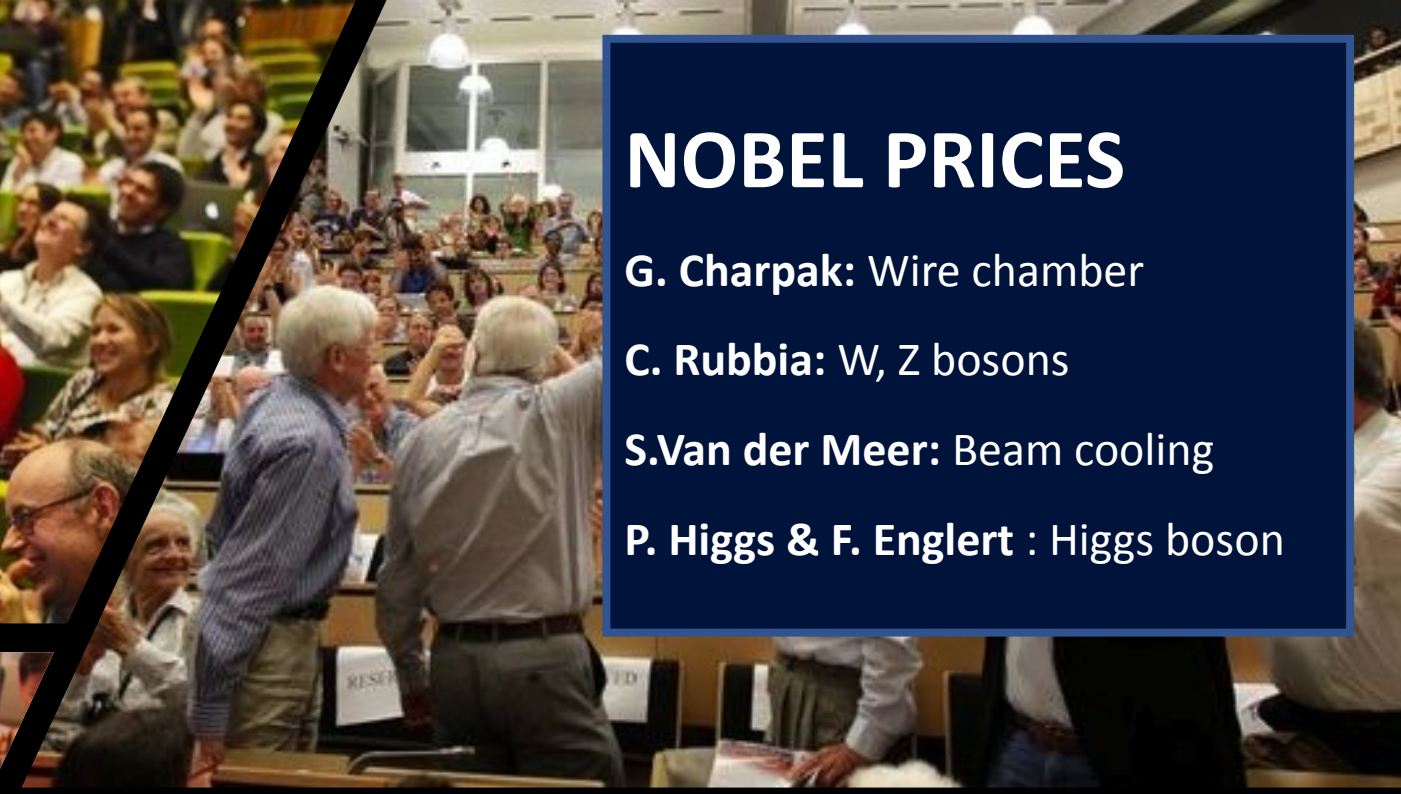




Higgs Boson?

4. July 2012

Peter Higgs



NOBEL PRICES

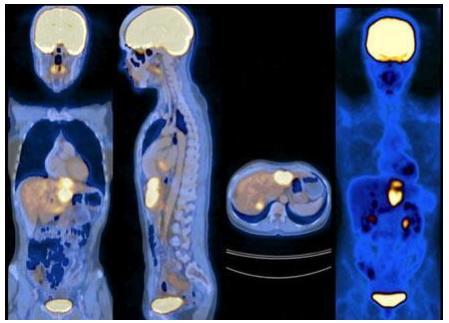
G. Charpak: Wire chamber

C. Rubbia: W, Z bosons

S.Van der Meer: Beam cooling

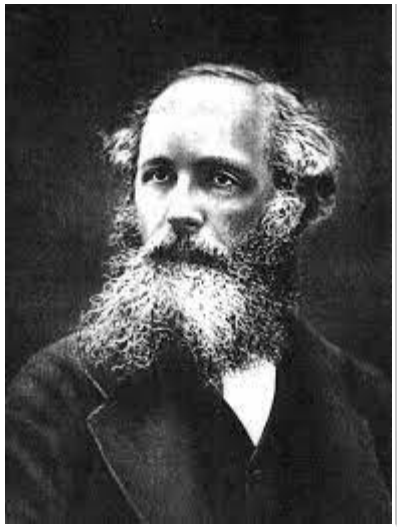
P. Higgs & F. Englert : Higgs boson

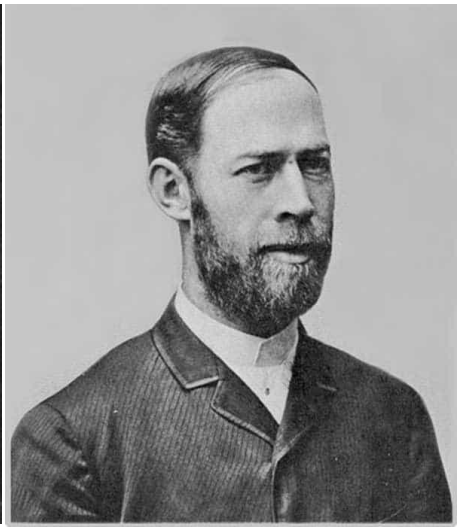
Why should I care?

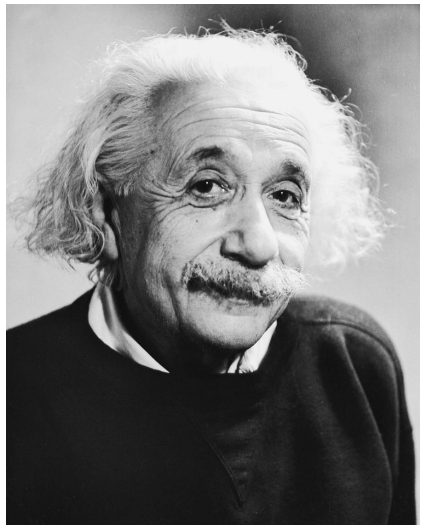


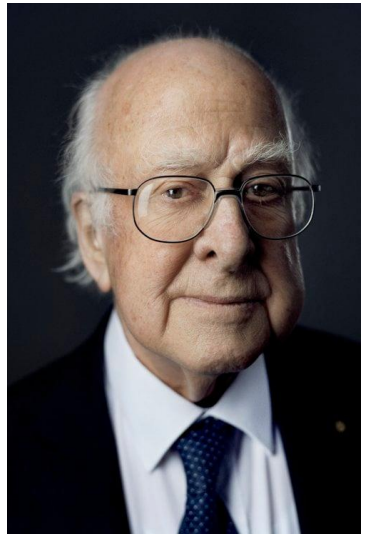

750m
US-50W/Arlington Blvd
Arlington Blvd
G W Parkway
72
Stop
speed
72km/h
Remaining distance
4587km


EDF

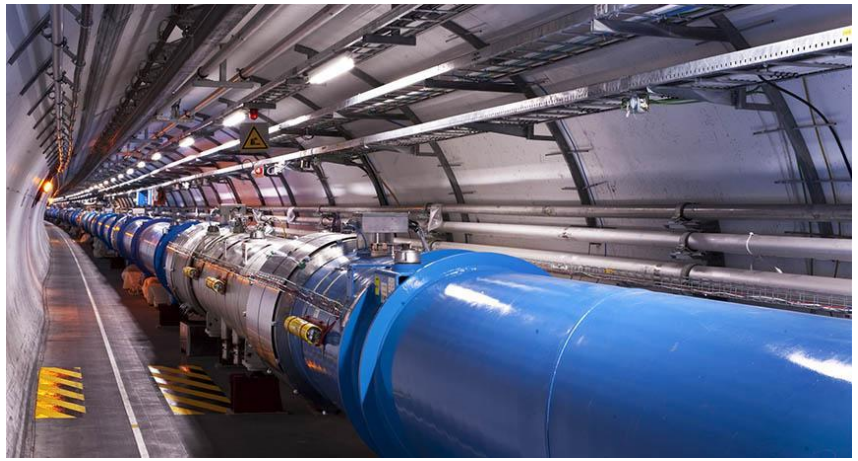








UNIQUE WORLD-CLASS SCIENCE INSTRUMENTS



ACCELERATORS

DETECTORS

COMPUTING
BIG DATA

Technologies & Innovations

Particle Physics in Industry

Many tens of thousands of particle accelerators and detectors operating in industry worldwide

Particle detector is used to:
- restore partial sight to the blind
- visualize the brain activity
- validate new drugs in preclinical trials
- confirm the efficacy of cancer treatment
- spot the location and content of suspicious cargo
- detect contraband radioactive materials

Accelerator is used to:
- treat a tumour
- provide sustainable and cleaner source of energy
- burn nuclear waste
- harden materials (better tyres, resistant plastic foils)
- implant ions in semi-conductors
- map proteins
- design new drugs
- date archaeological findings…

CERN: Driver of Innovation

CERN | Knowledge Transfer

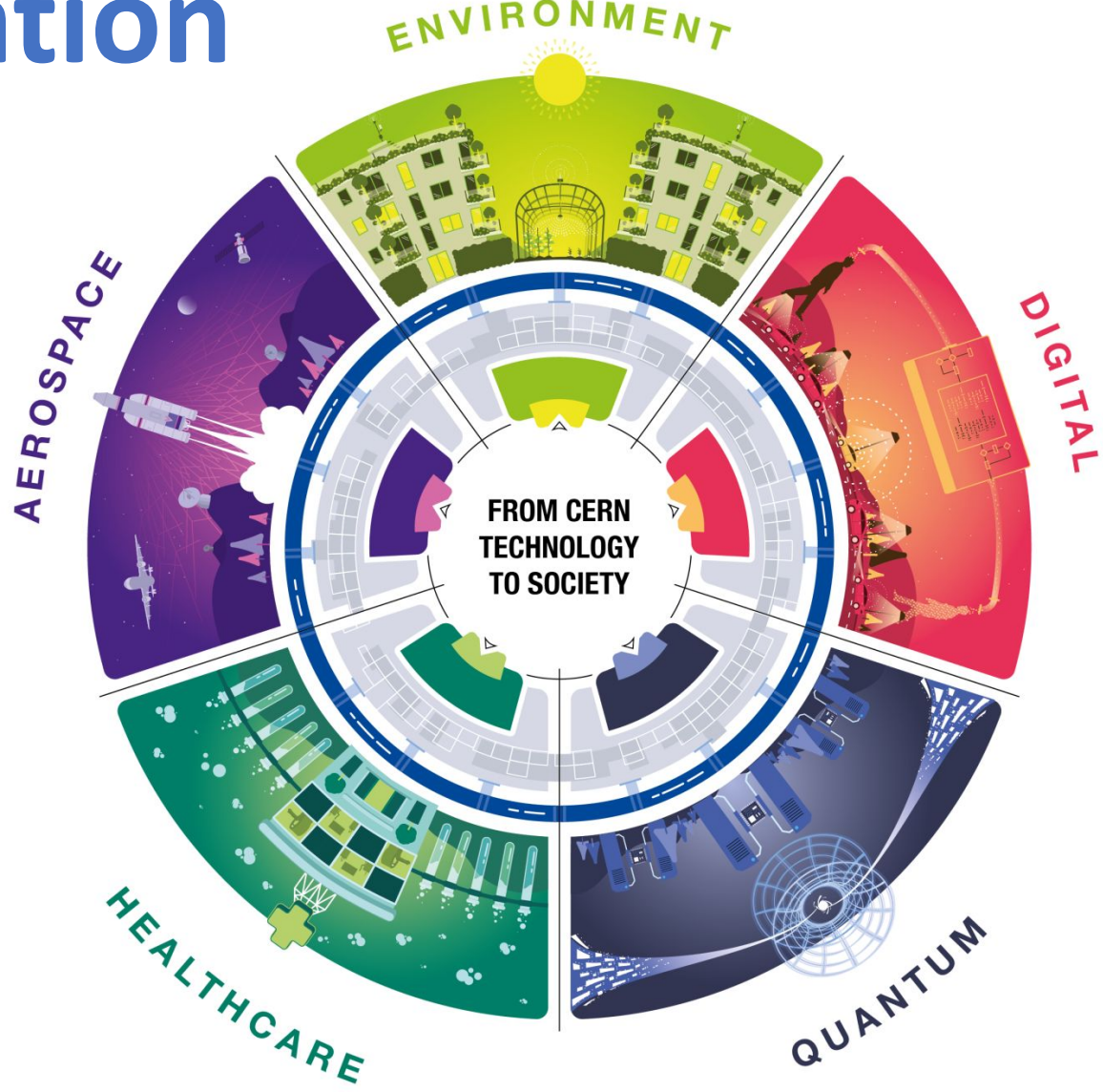
30 start-ups and spin-offs using CERN technologies

> 100 external partners with CERN know-how
(industry, labs, universities)

10 CERN Business Incubation Centres (BICs)

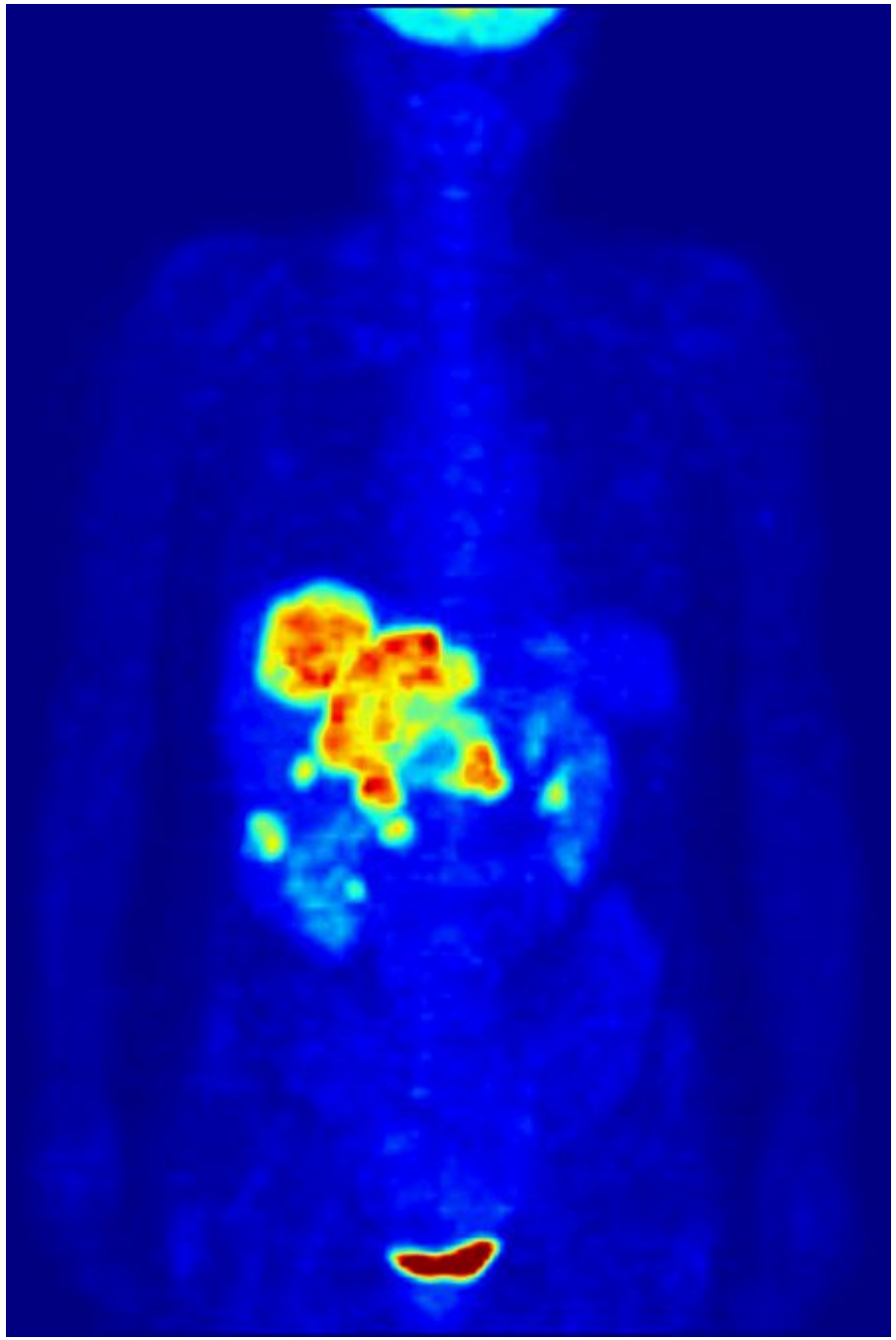
Big Data partnership **with leading ICT**
(Huawei, Intel, Oracle, Siemens)

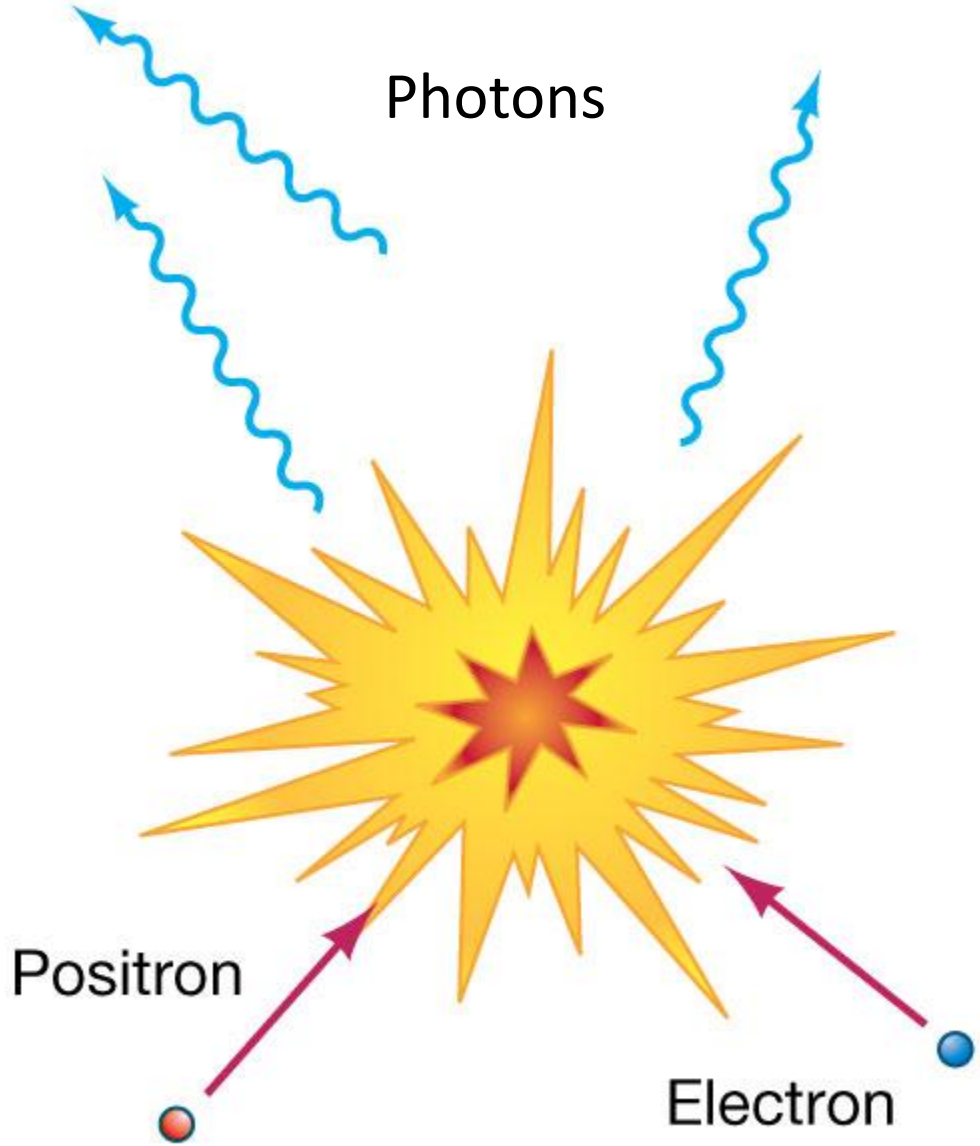
CERN openlab

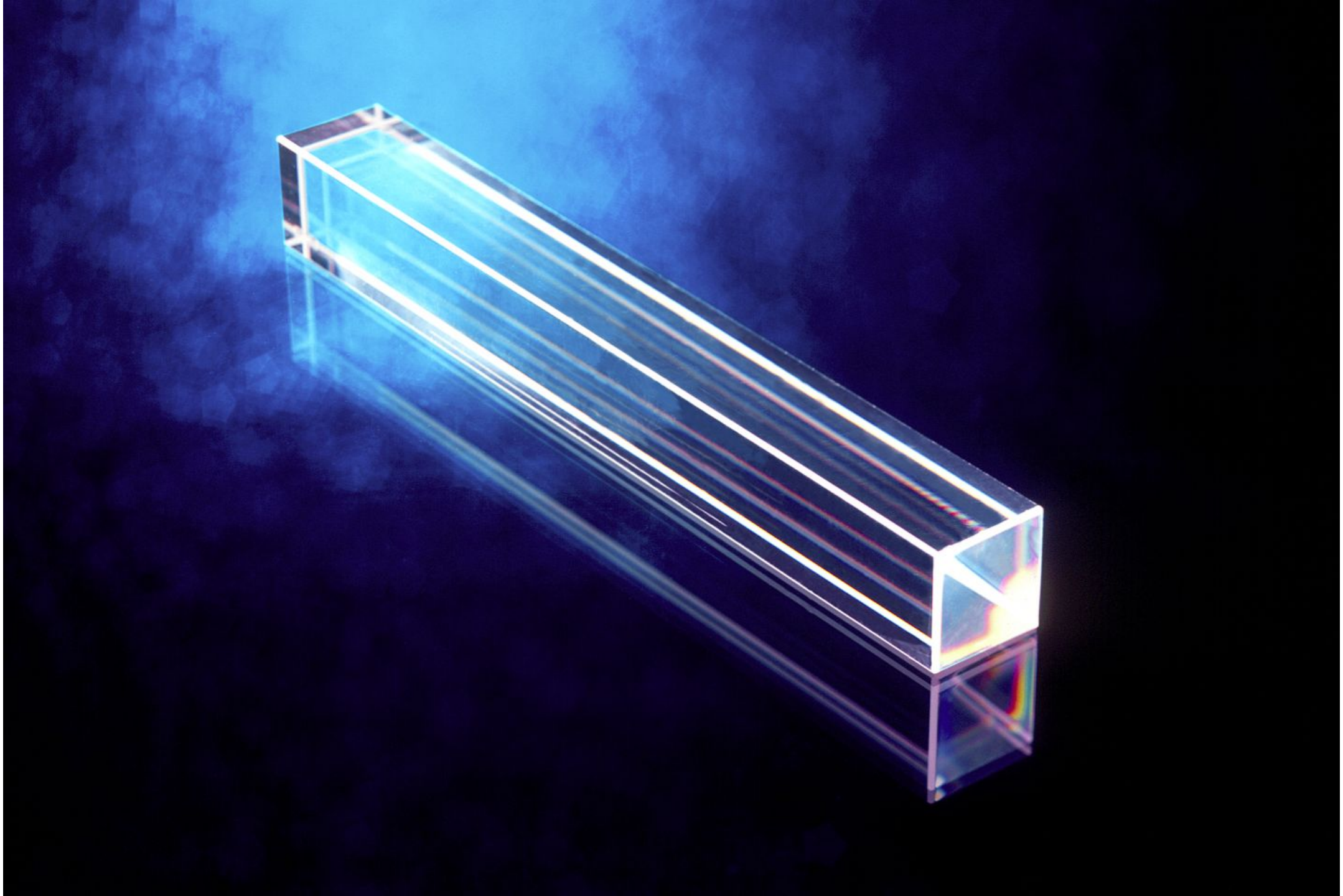


Medical imaging
PET, IRM

Positron emission thomography (PET)

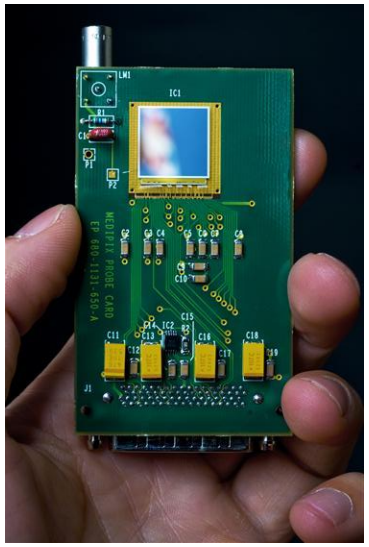



Photons
Positron
Electron

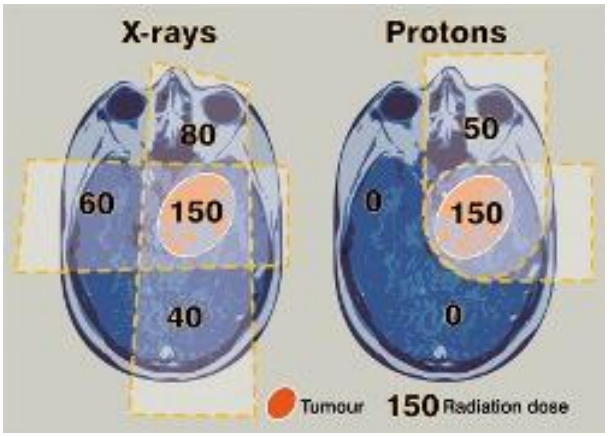


Medical imaging
PET, IRM

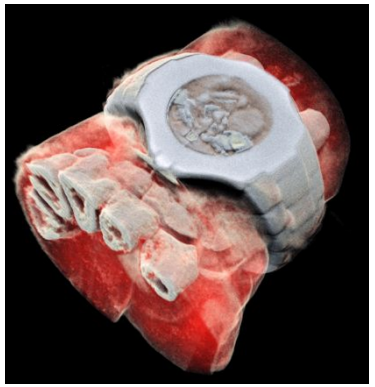
Medipix



Cancer proton therapy

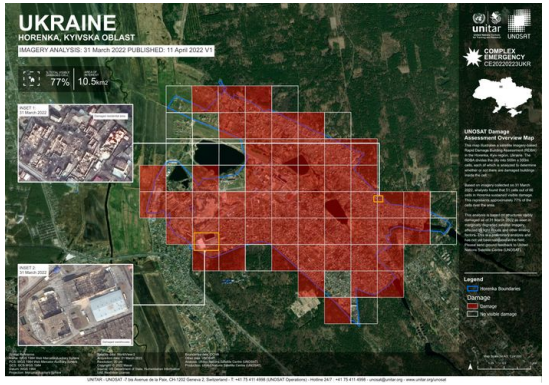


3D colour X-ray

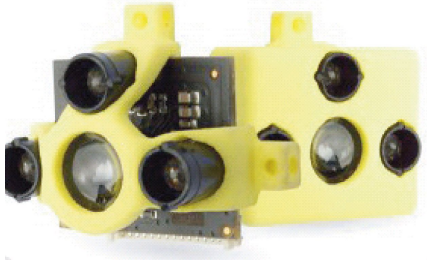


Touchscreen

UN digital library



Terabee Drones



Virus detection

Science & research

- Innovations & new technologies to solve all challenges

2022 2023 IYBSSD

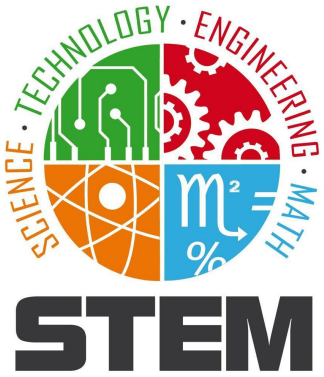
International Year of Basic Sciences for Sustainable Development

In partnership with

unesco

- Economic progress
  - physics-based industry is 2nd largest contributor to Swiss economy after finance

Contra-productive reality



Interest of youth, especially girls to study basic sciences / especially physics & engineering **is falling**!

- Jobs in STEM are growing at rate 3 times faster than in any other sector
- Current projections: 7 million of new STEM jobs in Europe in 2025 and not enough skilled people to fill them
- Lack of engineers to be recruited by Swiss high-tech companies already today!
- No connection of sustainability and science / STEM in school curricula

It is crucial to inspire and motivate new generation of technically skilled / STEM specialists!