My path into Particle physics: Hunting muons!

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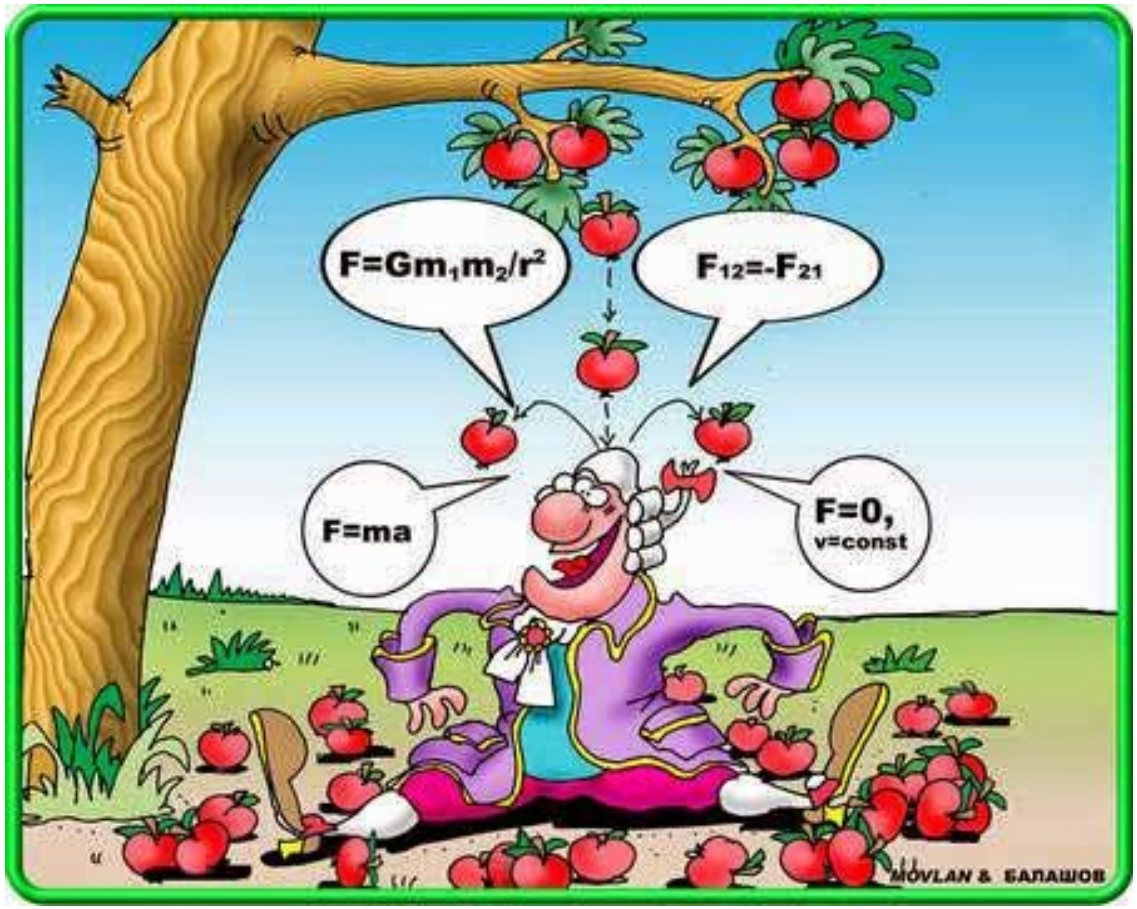
LNF-INFN

INSPYRE 2019 *- INternational School on modern PhYsics and Research*
April 2nd, 2019

AFTER THE HIGH SCHOOL?

- *2010: Science high school diploma*
- *What's next???*



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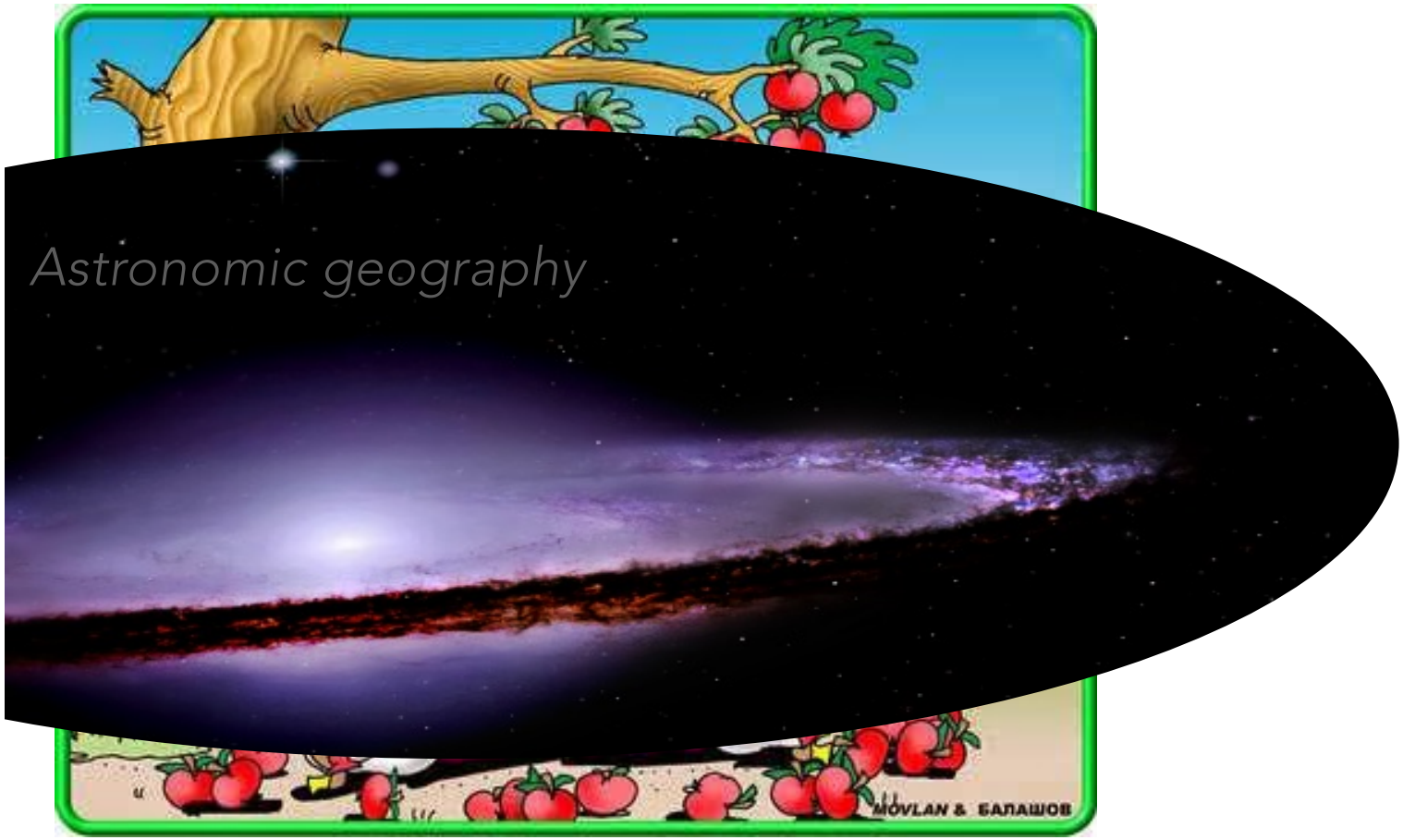
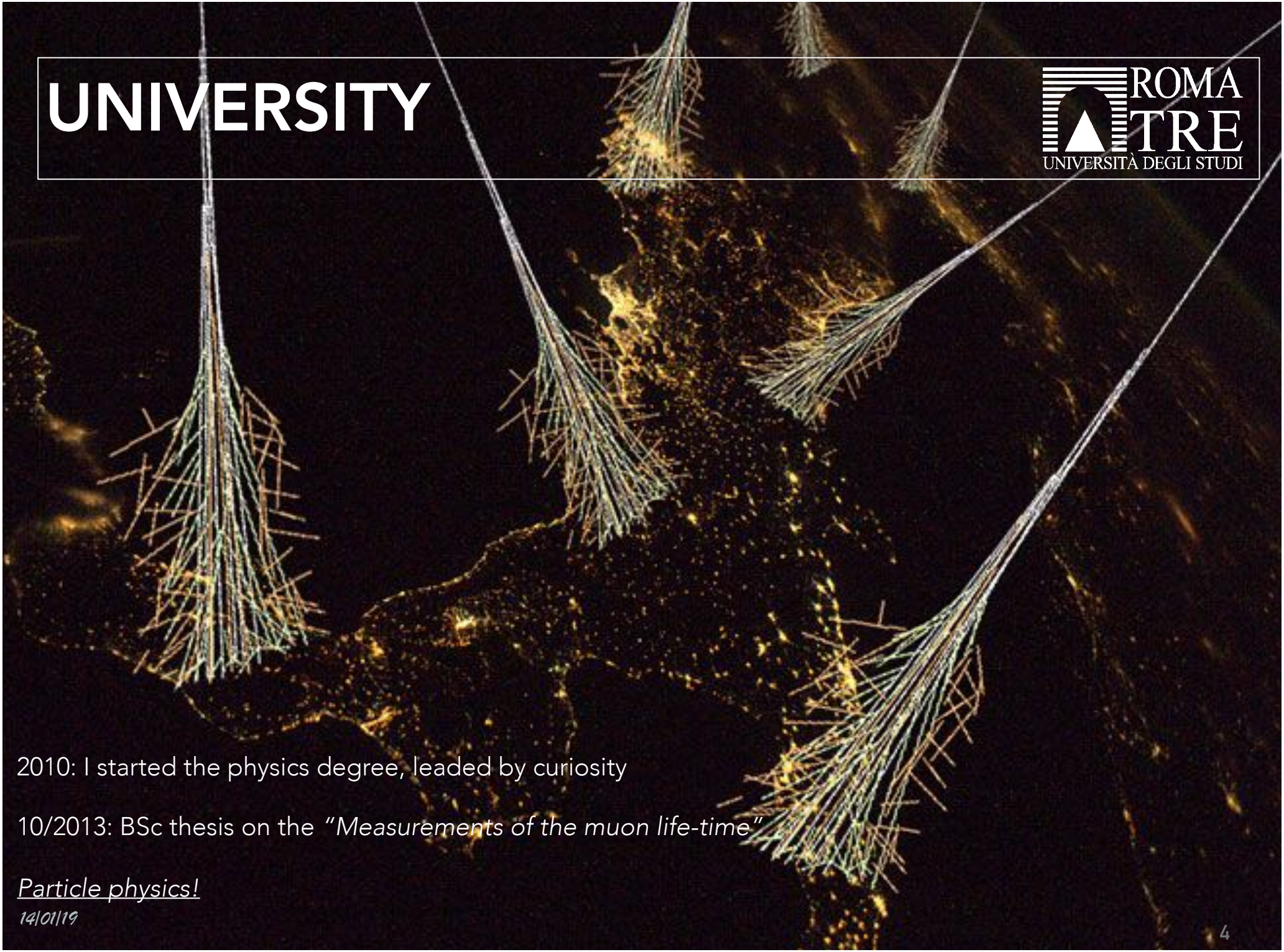


UNIVERSITY

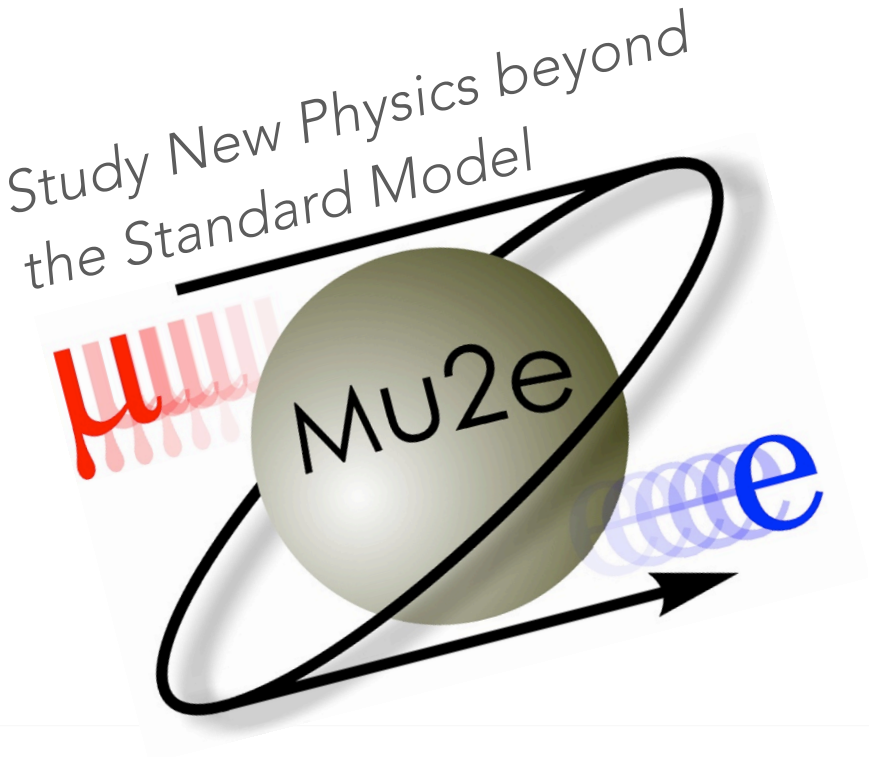


- 2010: I started the physics degree, leaded by curiosity
- 10/2013: BSc thesis on the *"Measurements of the muon life-time"*
- *Particle physics!*

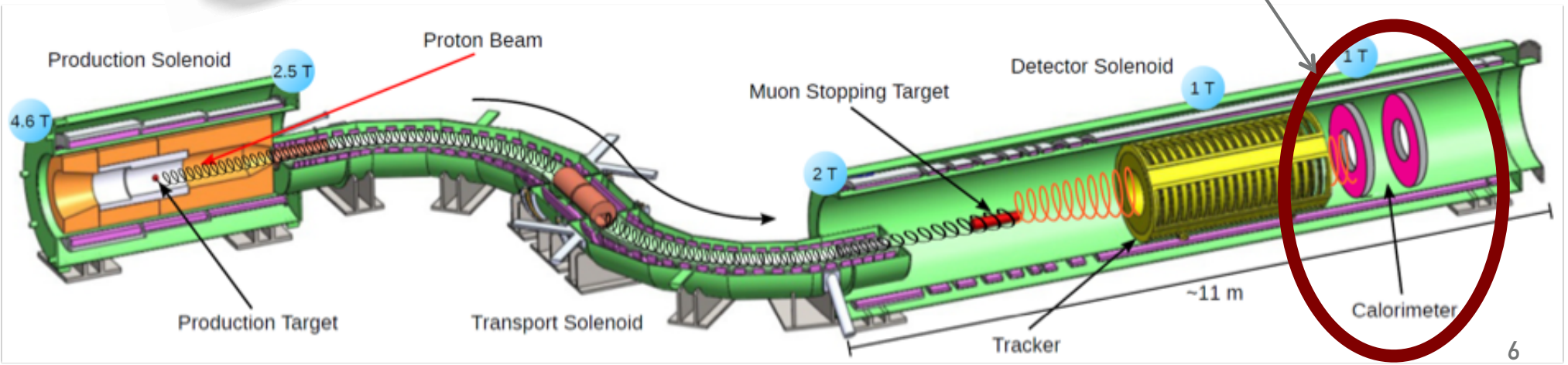
TROUGH PP IN US

- Summer School @ FNAL (Chicago, US)
- 10/2015: MSc degree and start of the PhD

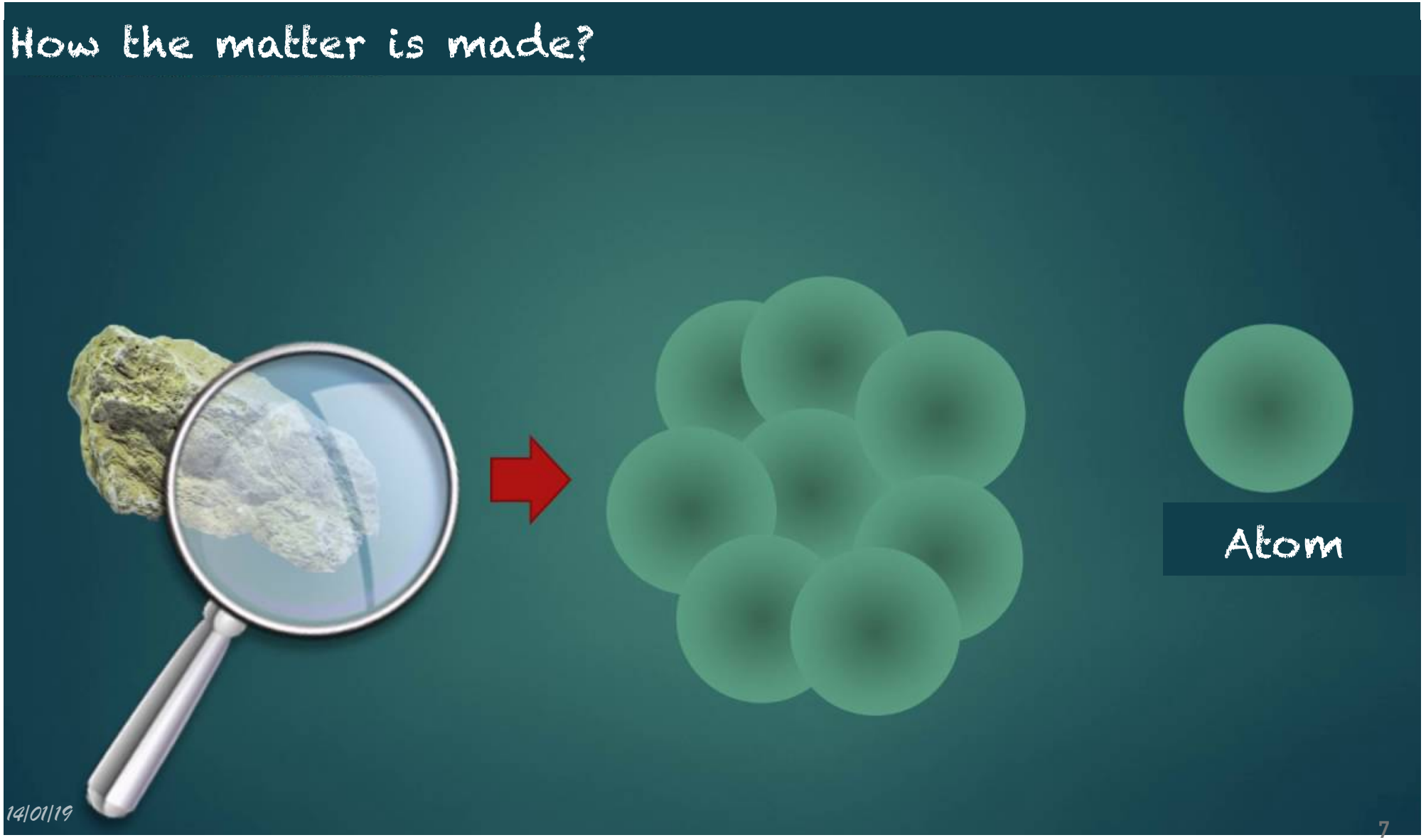
MU2E EXPERIMENT



Electromagnetic calorimeter:
Detector needed to measure particles energy
(electrons, photons)



WHAT IS A PARTICLE?



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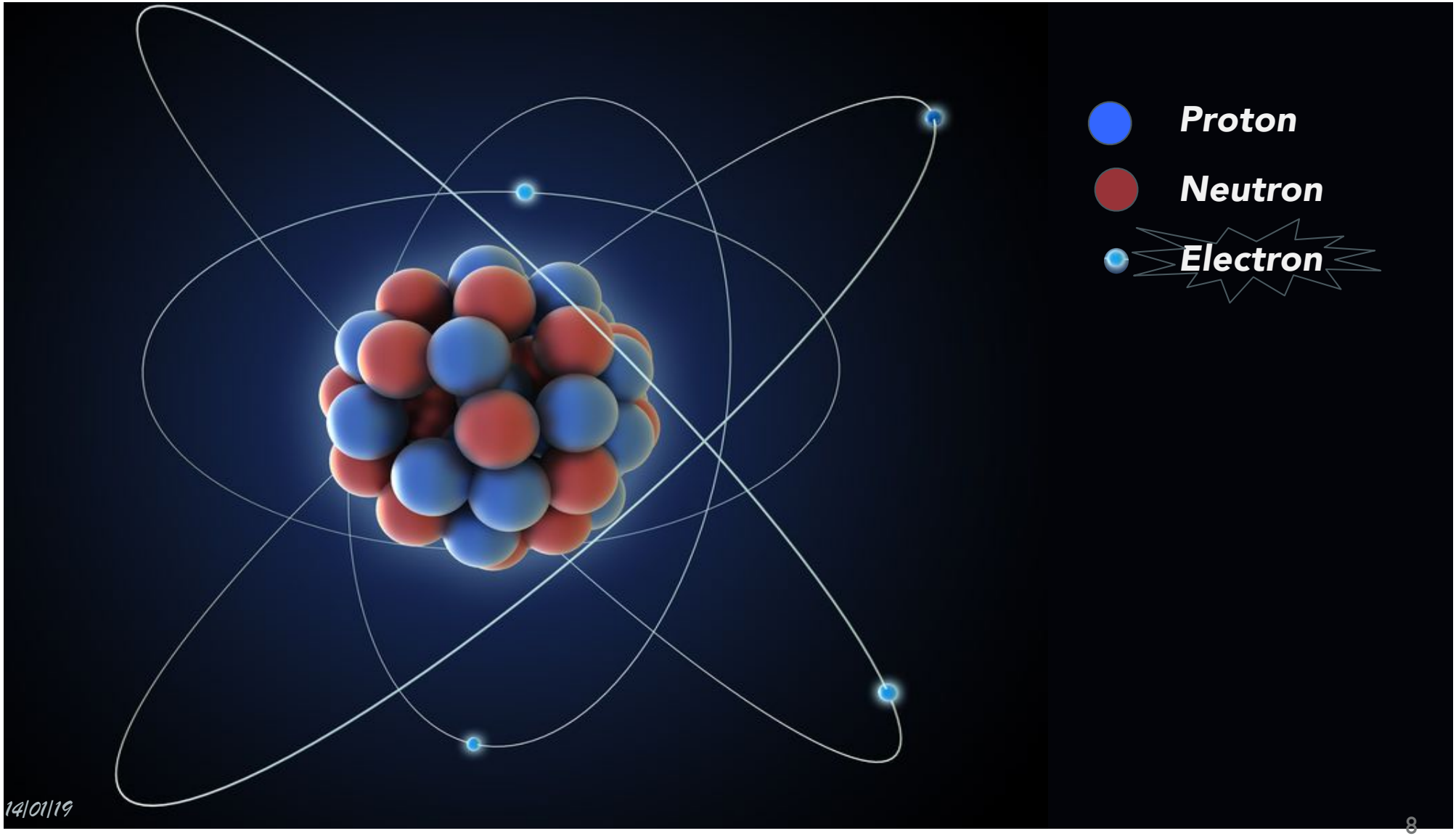
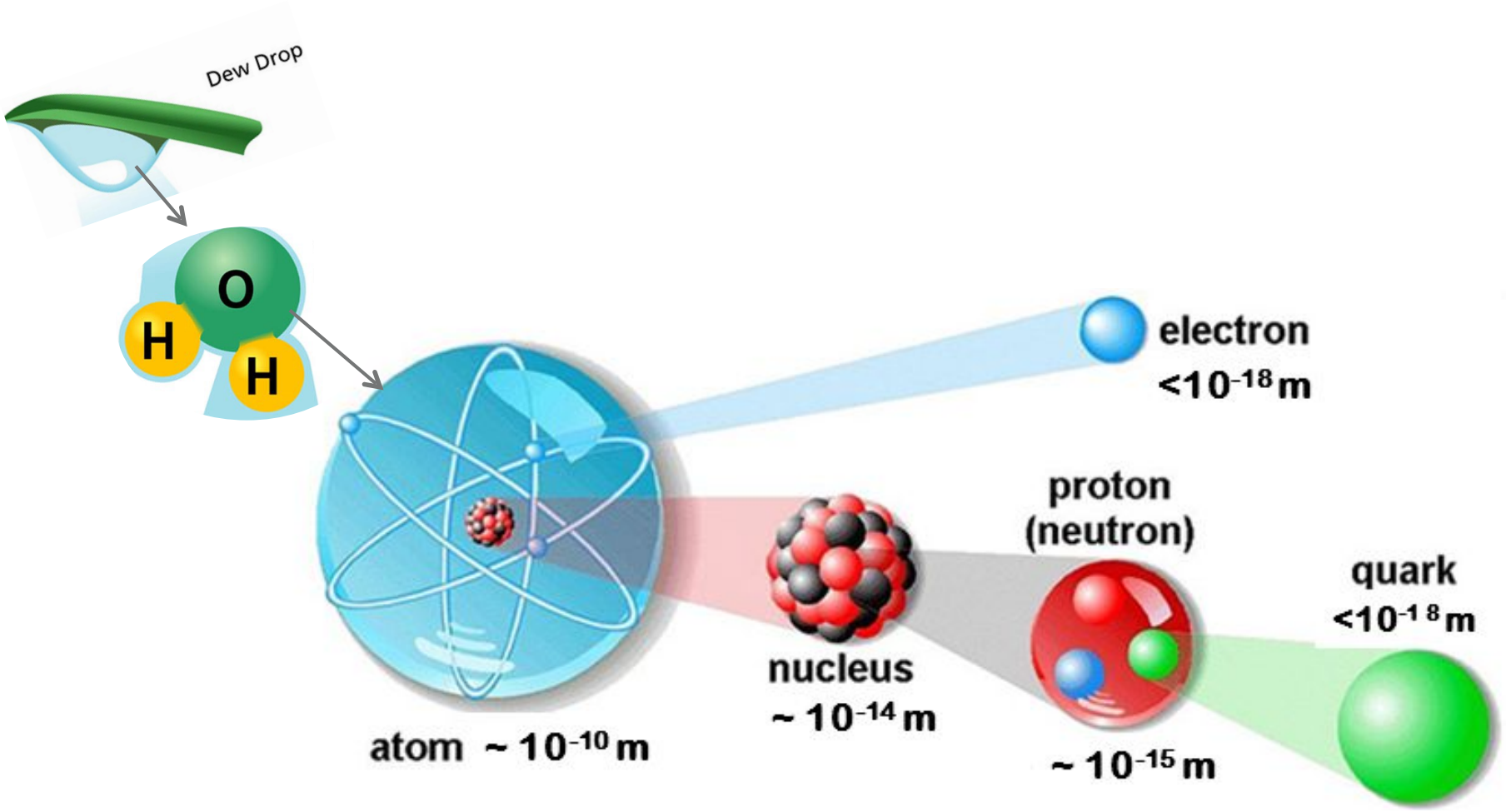
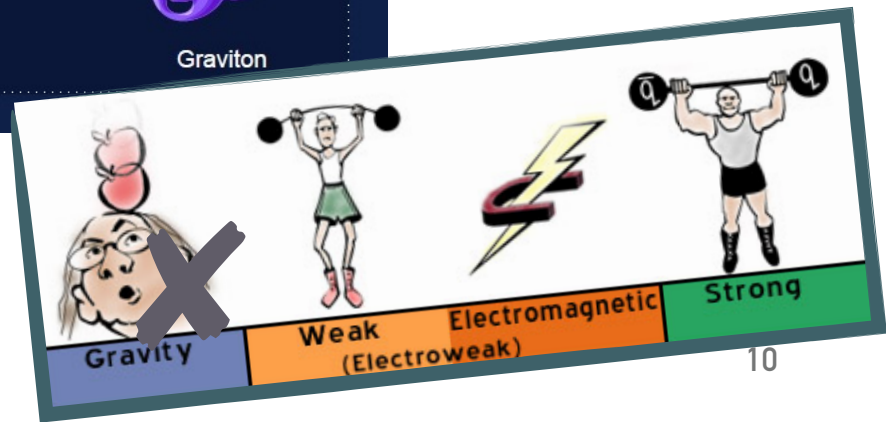


ELEMENTARY PARTICLES



HOW MANY?


Quarks
Leptons
Bosons
Up
Down
Electron
Neutrino
Photon
Gluon
Charm
Strange
Muon
Neutrino Muon
Z⁰
W⁻
W⁺
Top
Beauty
Tau
Neutrino Tau
Higgs
Graviton


Gravity
Weak
(Electroweak)
Electromagnetic
Strong
q
q

STANDARD MODEL

- *12 "fermions": matter building blocks*
- *5 "bosons": forces carriers*
- *Higgs boson gives everything else in the universe mass*

Receipt: Standard Model

HOW DO WE KNOW THE PARTICLES?

Particles cannot be seen by human eyes!

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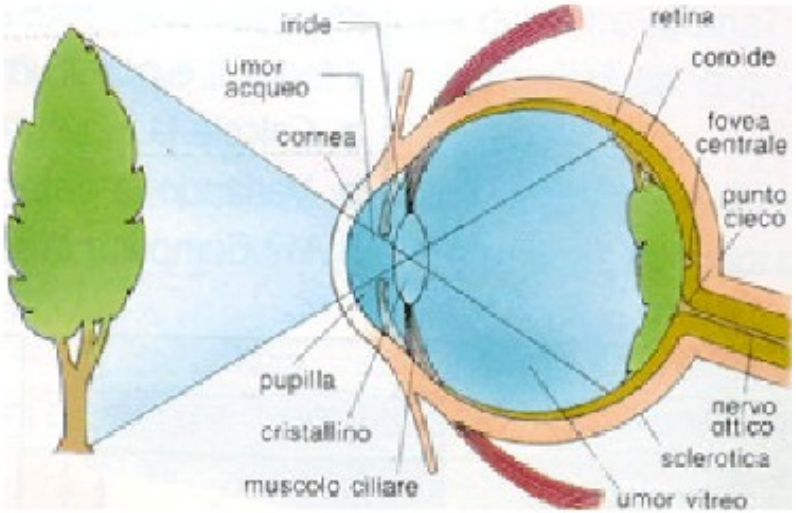
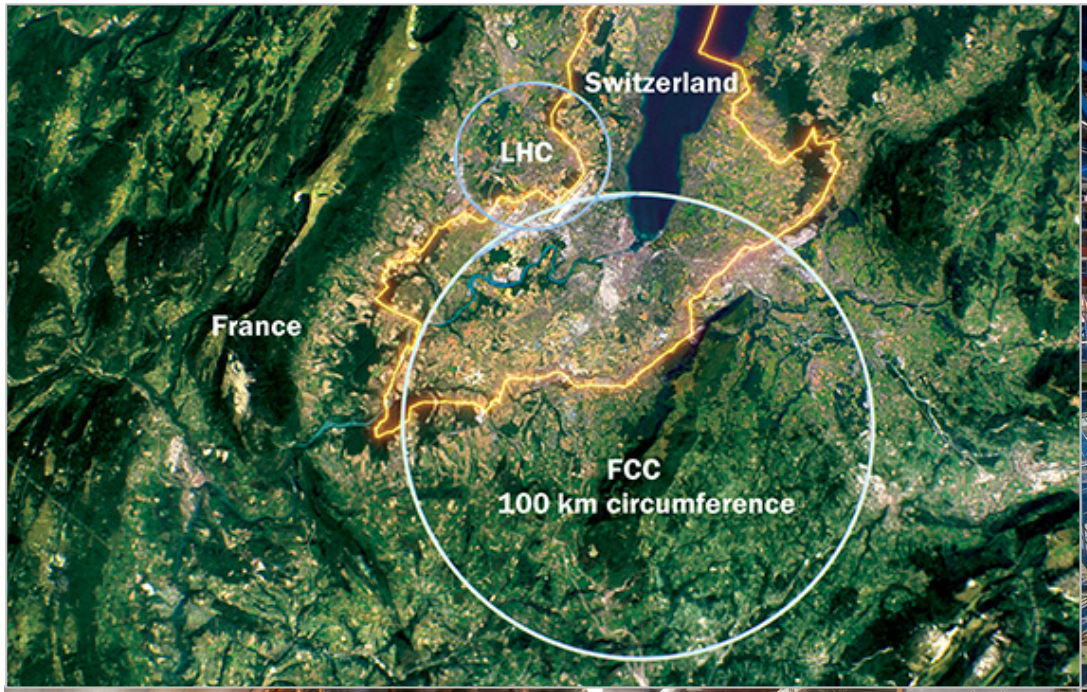


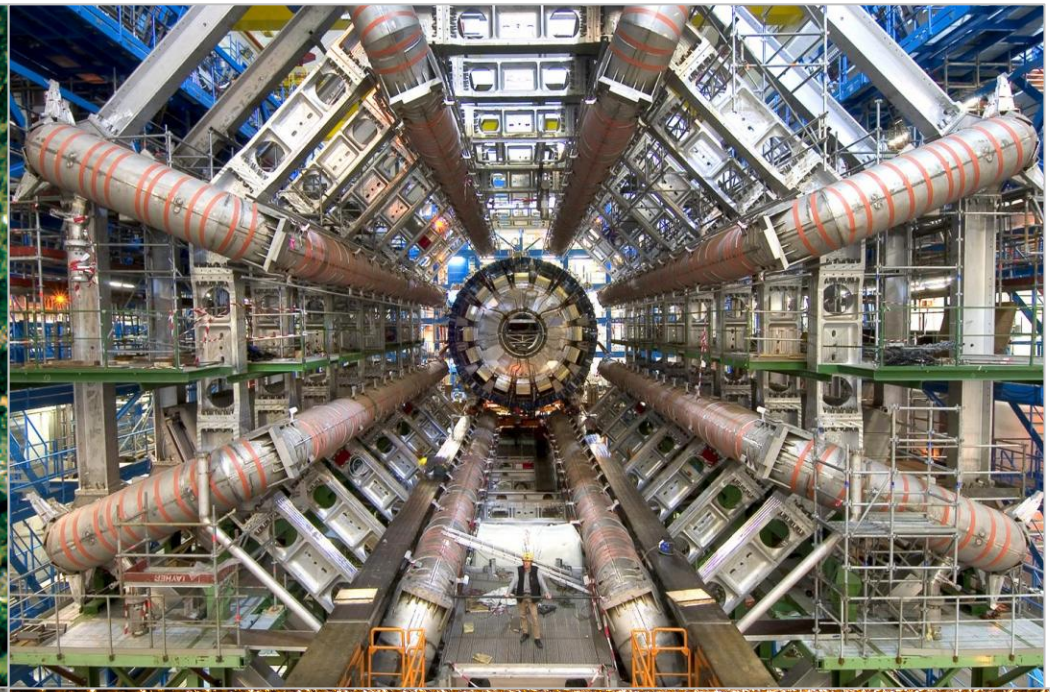
HOW DO WE KNOW THE PARTICLES?

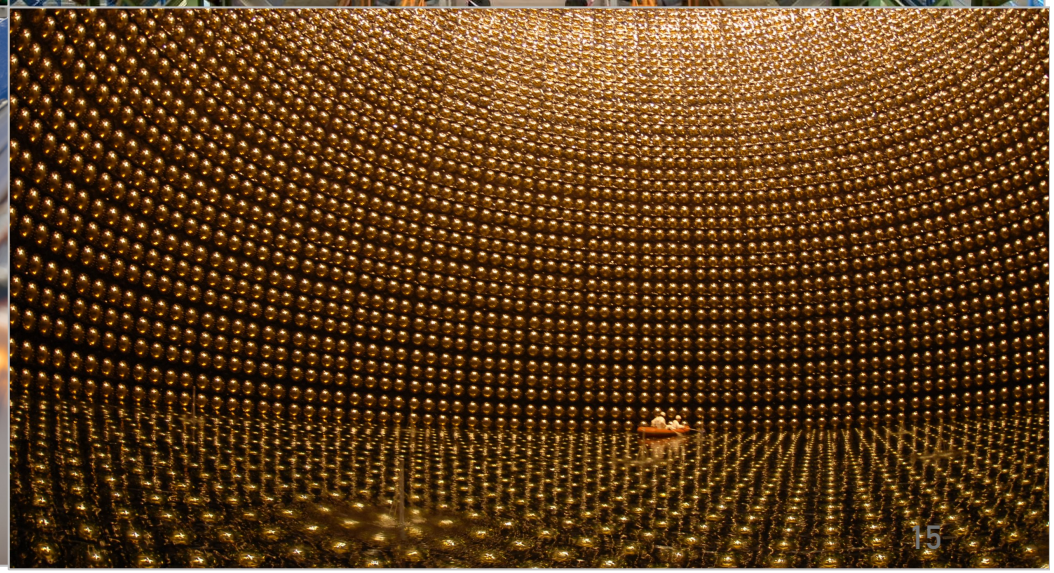
Particles cannot be seen by human eyes!

We can study their traces/interactions with matter

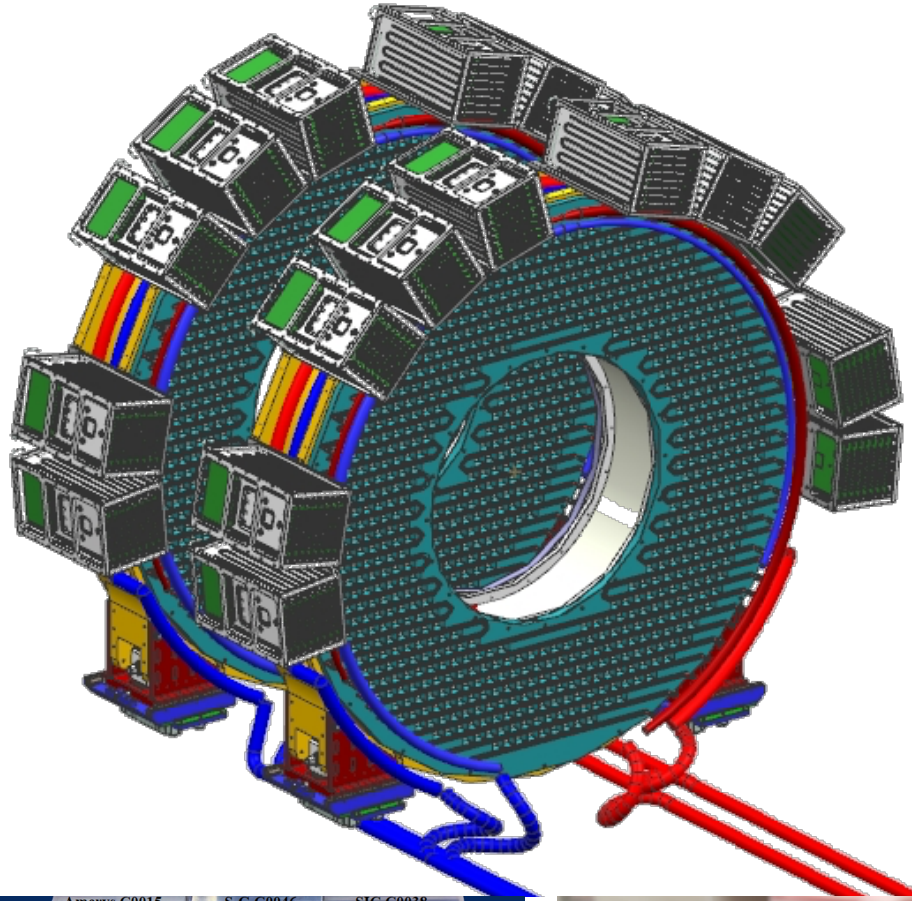
SOME EXPERIMENTS - OUR EYES ON PARTICLES

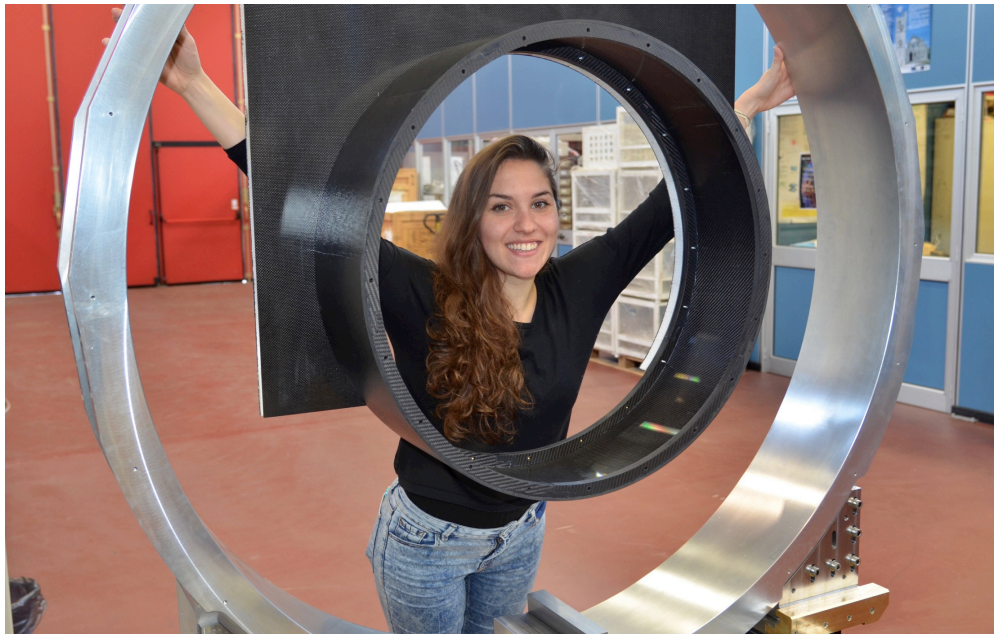






WHAT DO I DO?





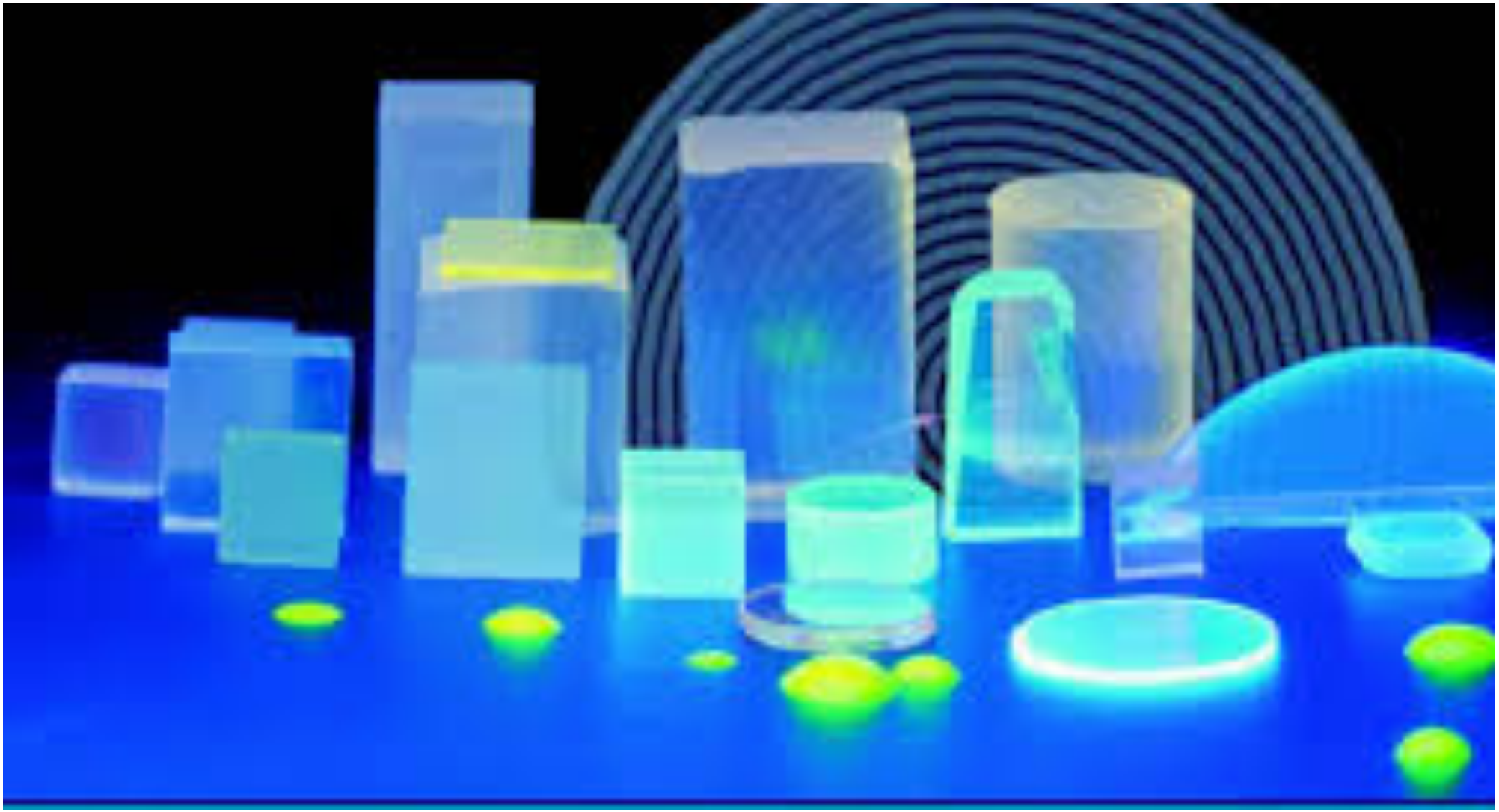
Amcrys C0015	S-G C0046	SIC C0038
Amcrys C0016	S-G C0048	SIC C0039
Amcrys C0019	S-G C0049	SIC C0040
Amcrys C0023	S-G C0051	SIC C0041
Amcrys C0025	S-G C0057	SIC C0042
Amcrys C0026	S-G C0058	SIC C0043
Amcrys C0027	S-G C0060	SIC C0068
Amcrys C0030	S-G C0062	SIC C0070
Amcrys C0032	S-G C0063	SIC C0071
Amcrys C0034	S-G C0065	SIC C0072
Amcrys C0036	S-G C0066	SIC C0073

Research and development of detectors

INFN Istituto Nazionale di Fisica Nucleare Laboratori Nazionali di Frascati

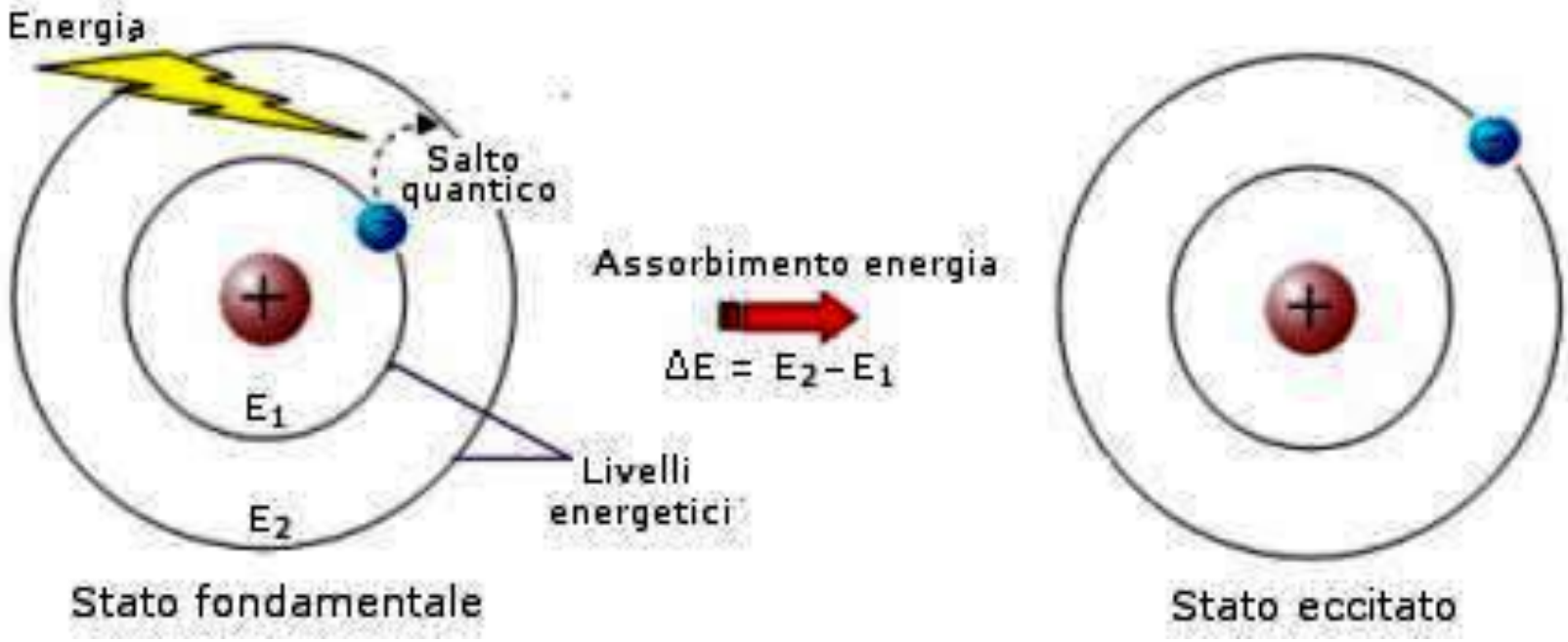
ROMA TRE UNIVERSITÀ DEGLI STUDI

CRYSTALS



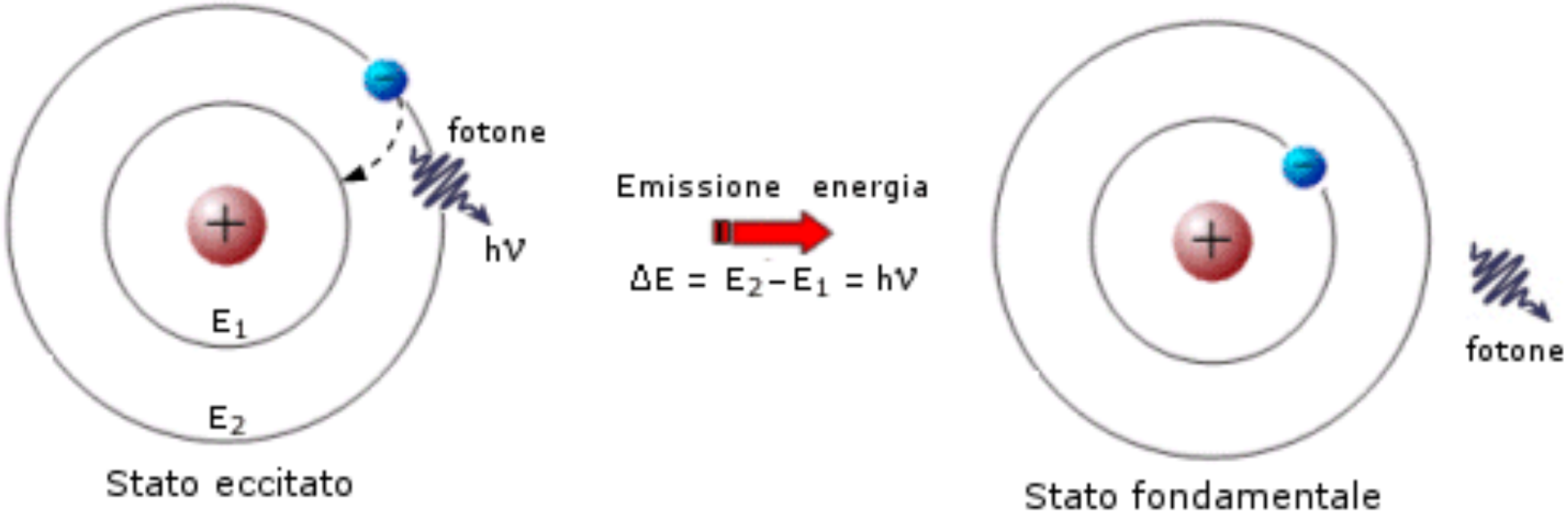
SCINTILLATION

De-excitation of single atoms excited by the passage of an incoming particle

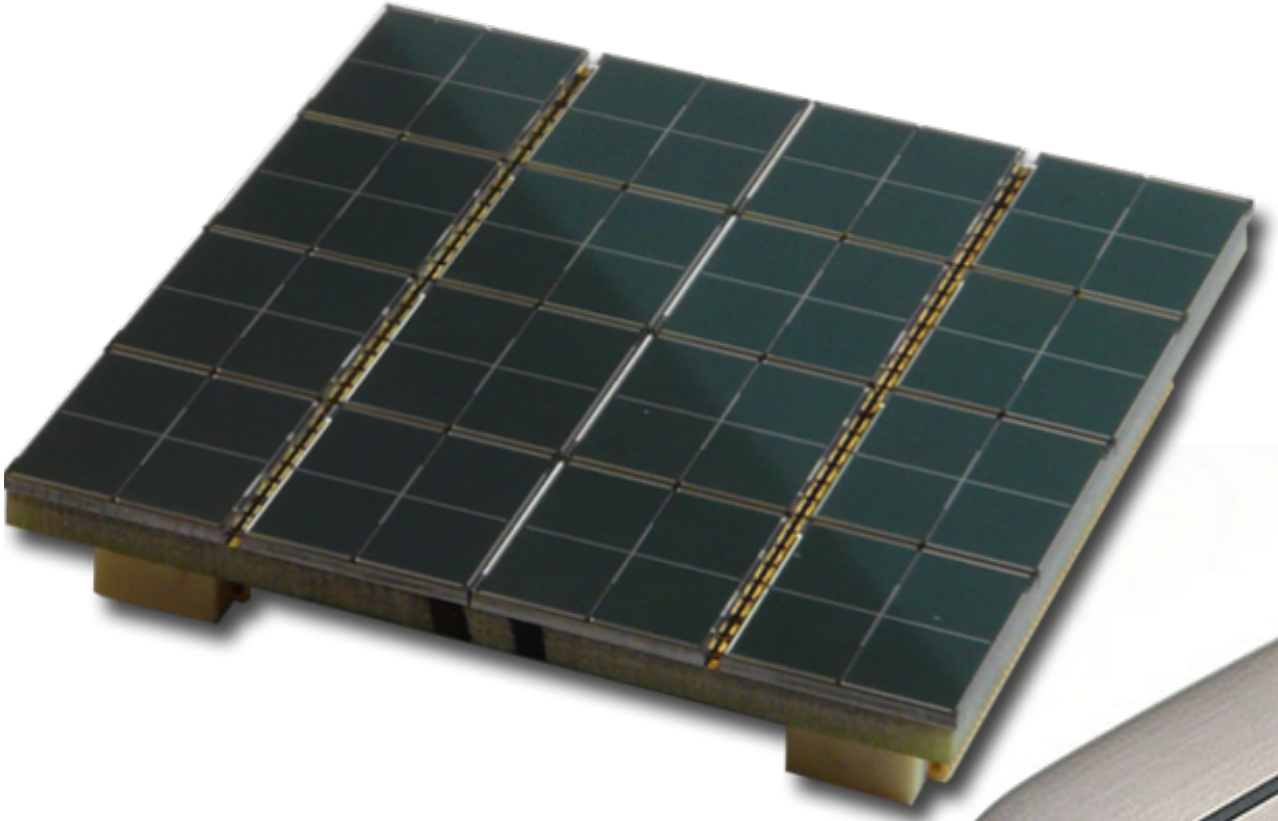


SCINTILLATION

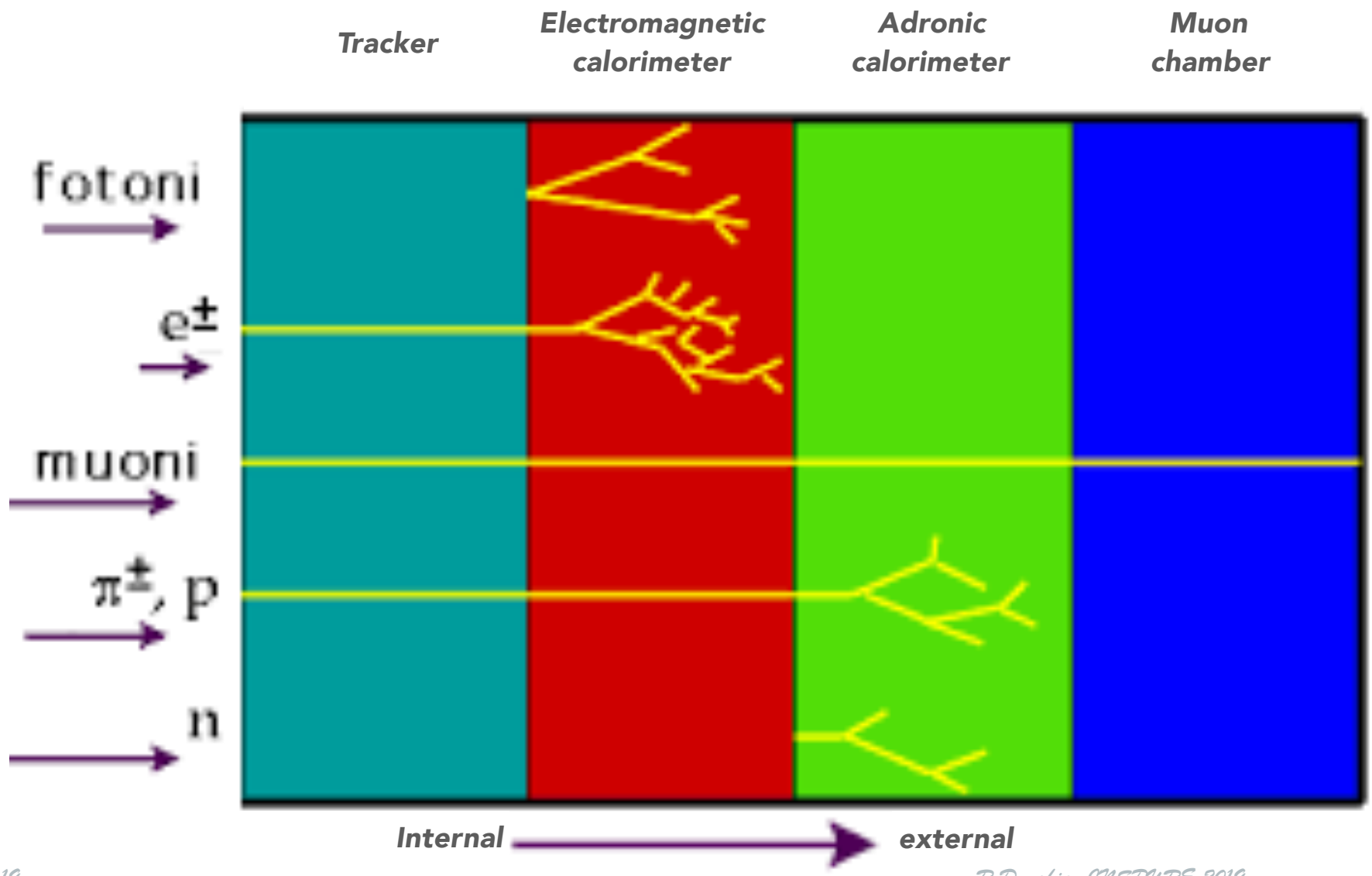
De-excitation causes light emission



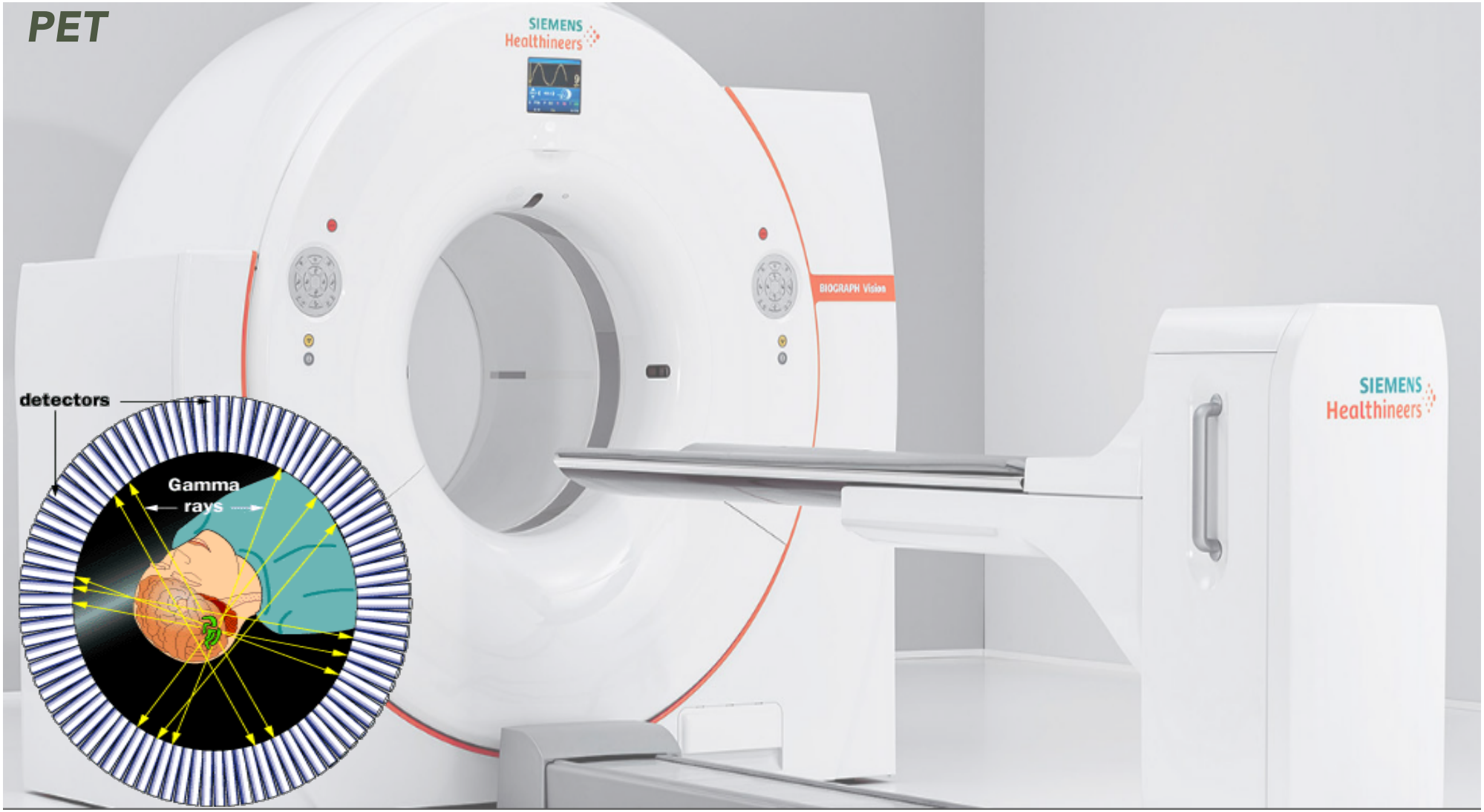
PHOTOSENSORS



TRACES


Tracker
Electromagnetic calorimeter
Adronic calorimeter
Muon chamber
fotoni
e±
muoni
π±, p
n
Internal
external

DETECTORS APPLICATIONS



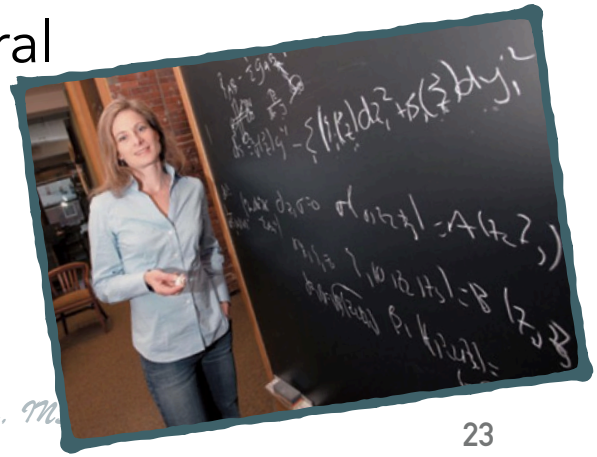
THE *PHYSICIST JOB*

Observing the behavior and properties of matter:
how it moves, its behavior through space and time…

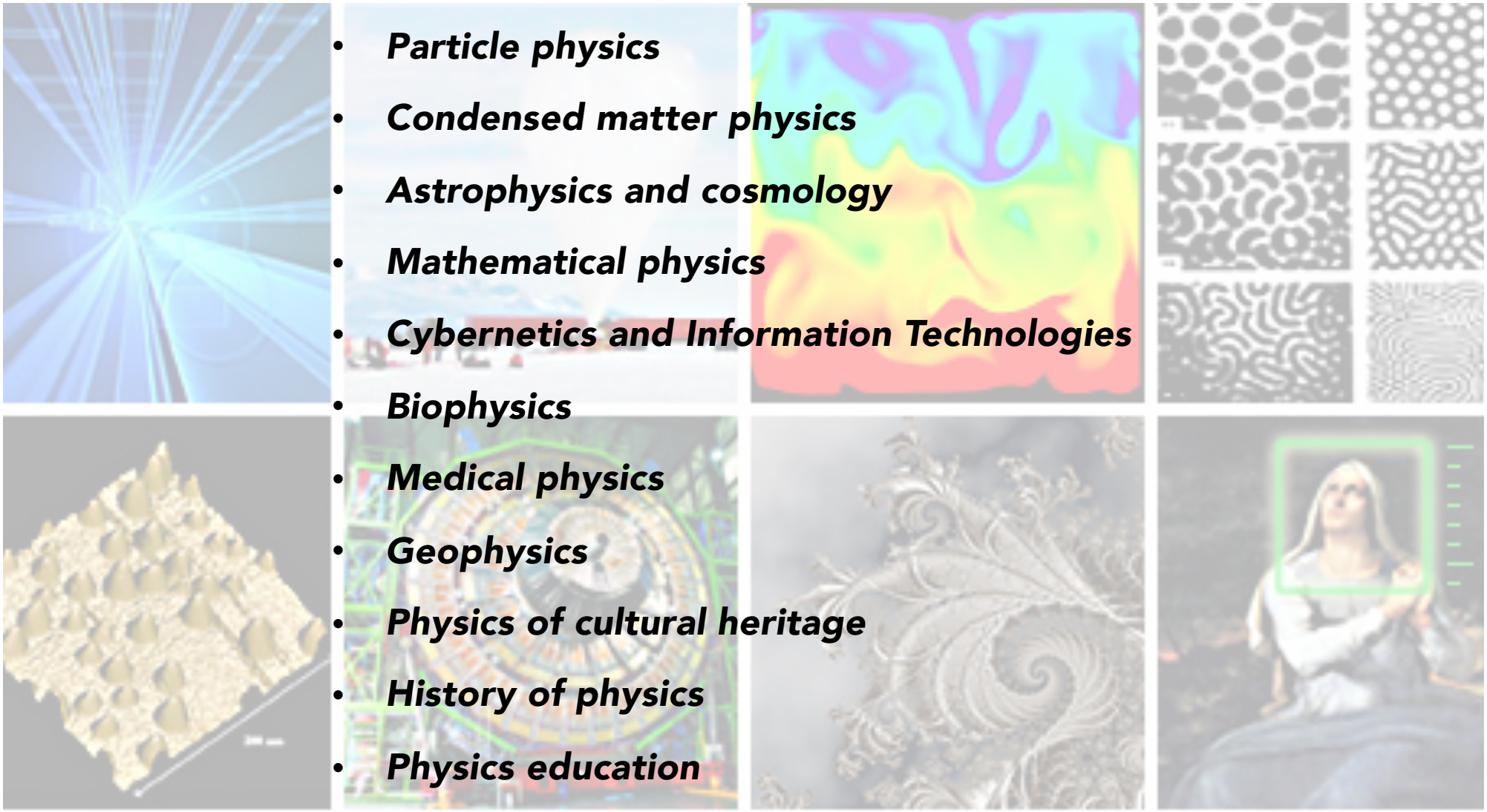
<u>Two main disciplines:</u>

1) **Experimental Physics**, concerned with the observation and study of physical phenomena and conducting experiments;

2) **Theoretical Physics**, which uses mathematical models and simulations to understand, explain, and predict natural phenomena.



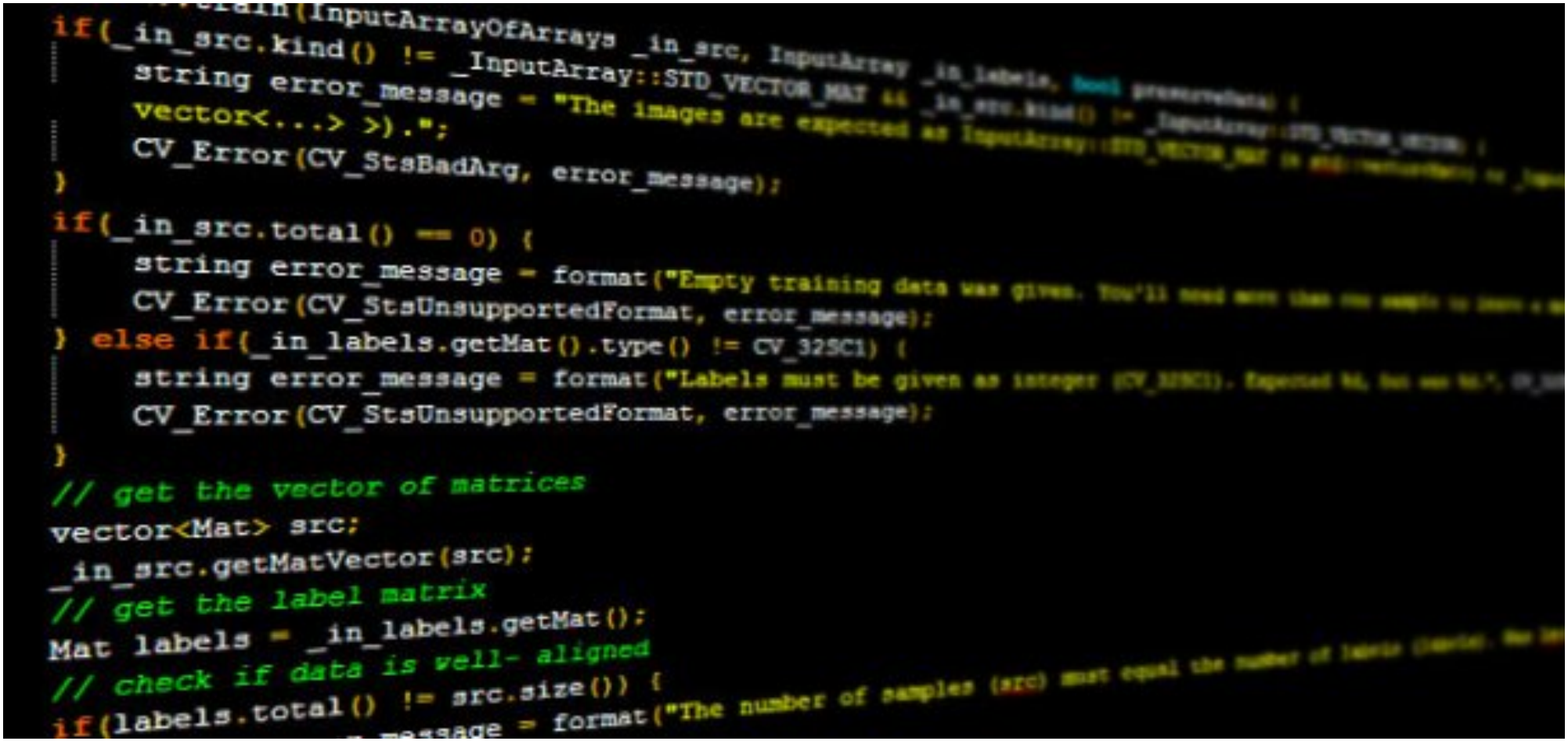
RESEARCH FIELDS



- ***Particle physics***
- ***Condensed matter physics***
- ***Astrophysics and cosmology***
- ***Mathematical physics***
- ***Cybernetics and Information Technologies***
- ***Biophysics***
- ***Medical physics***
- ***Geophysics***
- ***Physics of cultural heritage***
- ***History of physics***
- ***Physics education***

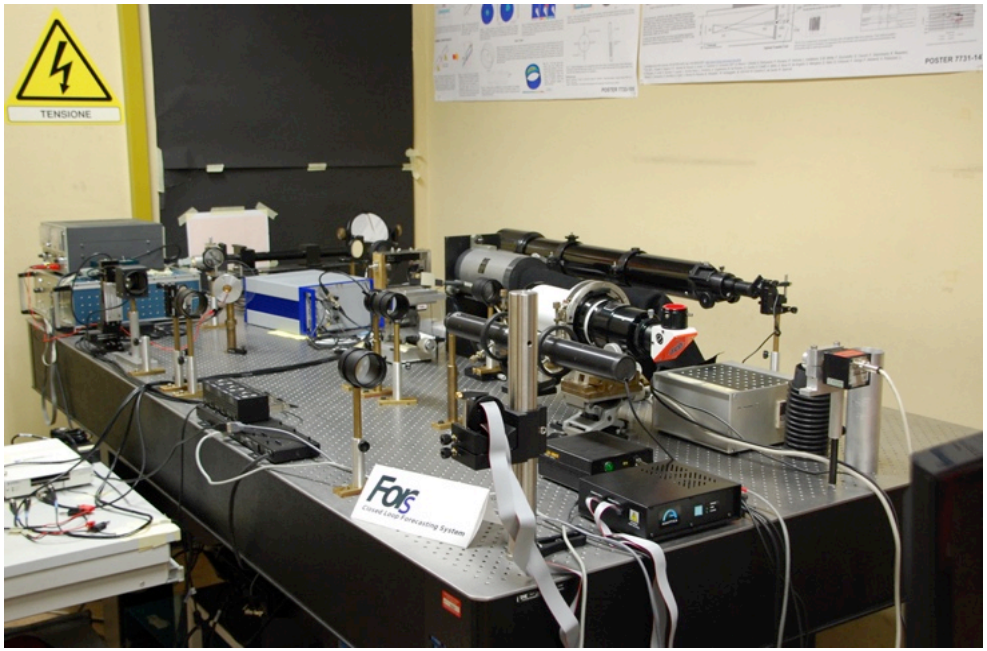
A TYPICAL DAY

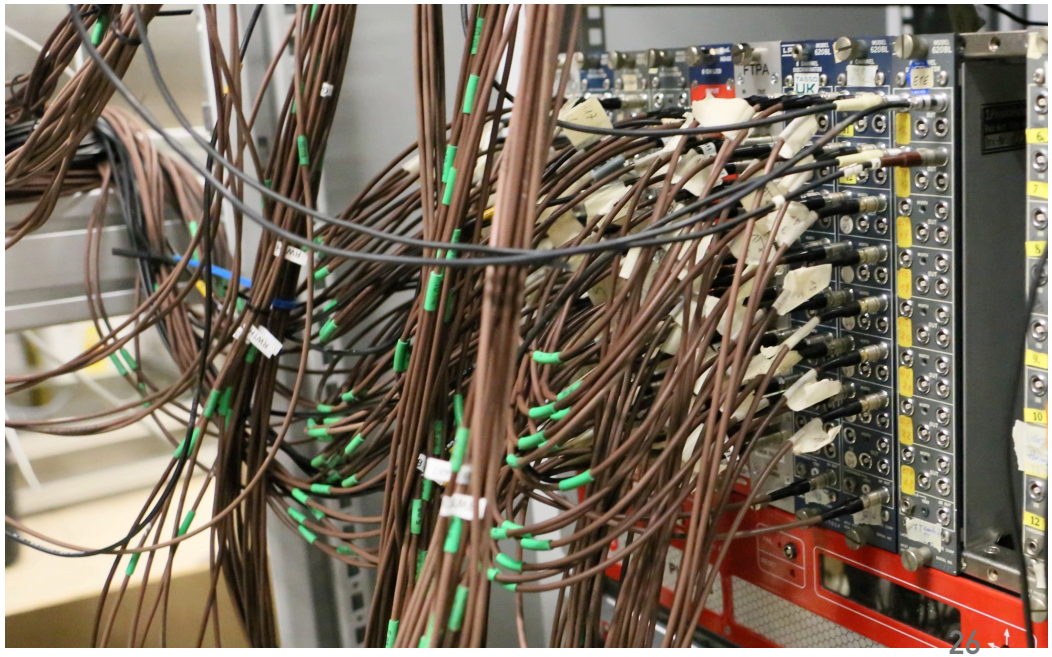
Coding, coding, coding



A TYPICAL DAY

- *Laboratory test*
- *Electronics*
- …



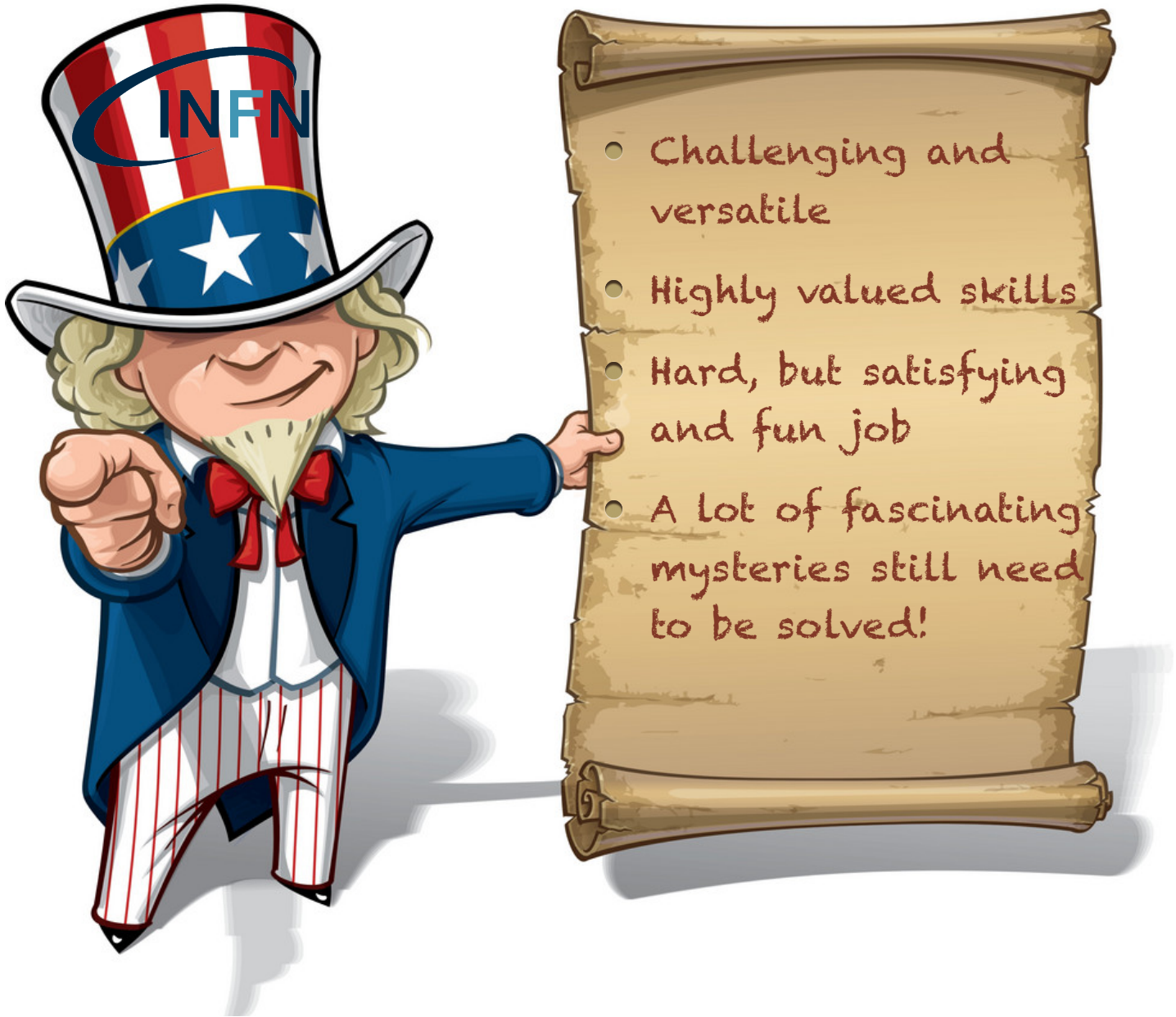


A TYPICAL DAY

- Presentations, emails, meetings, discussions
- Study, popular events, travel

OUTSIDE RESEARCH WORLD

IS BECOMING A PHYSICIST DIFFICULT?



Thanks for listening!

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