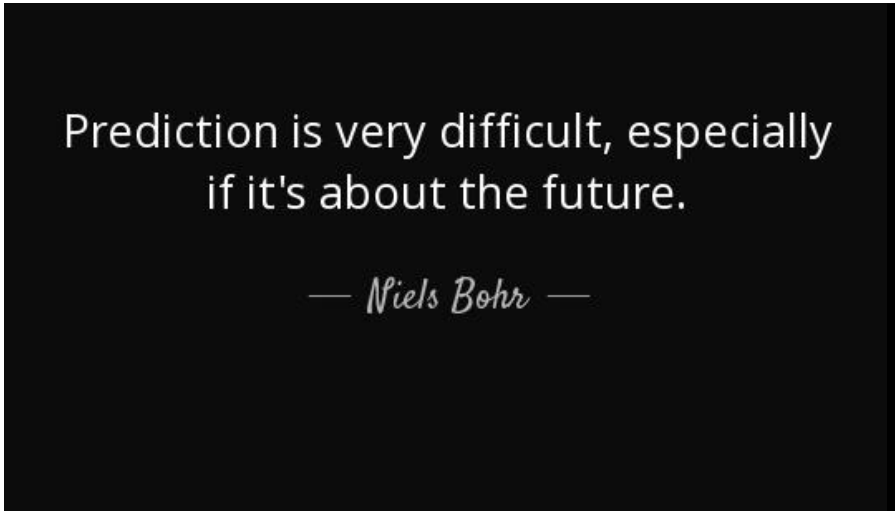
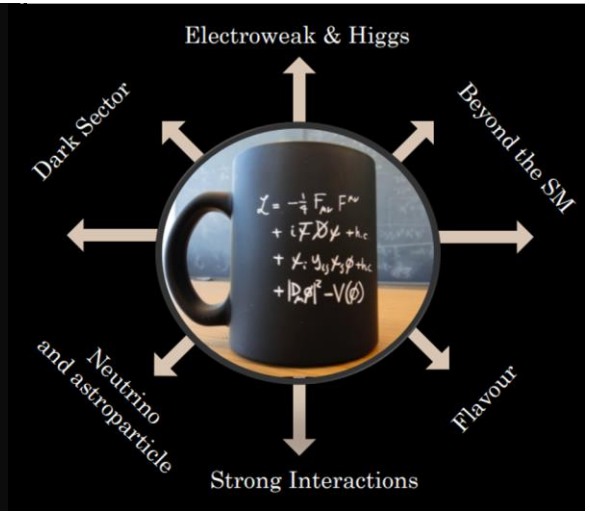
THE FUTURE OF PARTICLE ACCELERATORS

HST2026 Study Group 1





Key Ideas D

Possible Future Particle Accelerators

- *Hi-Lumi LHC*
- FCC
- Muon collider
- PWA

Purpose

We still have many unanswered questions which is why we keep searching.

Important Considerations

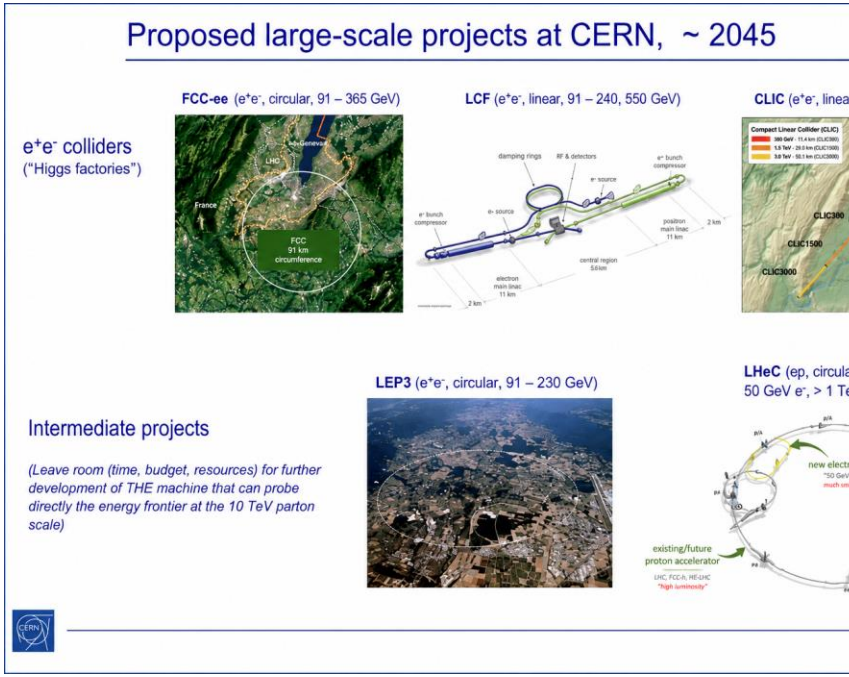
Long-term planning and investments must be made

Future generation needs to continue on and build on the current knowledge.

Developing new magnet technology

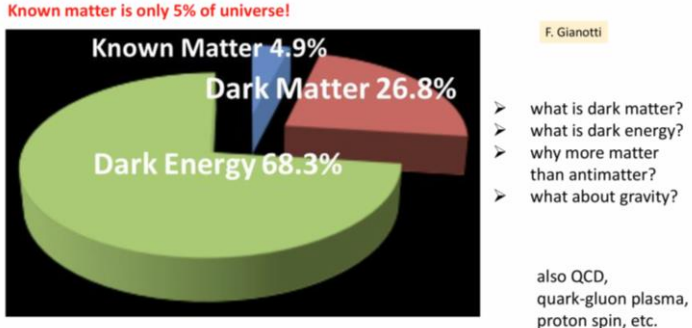
Other Applications

Medical applications of PWA

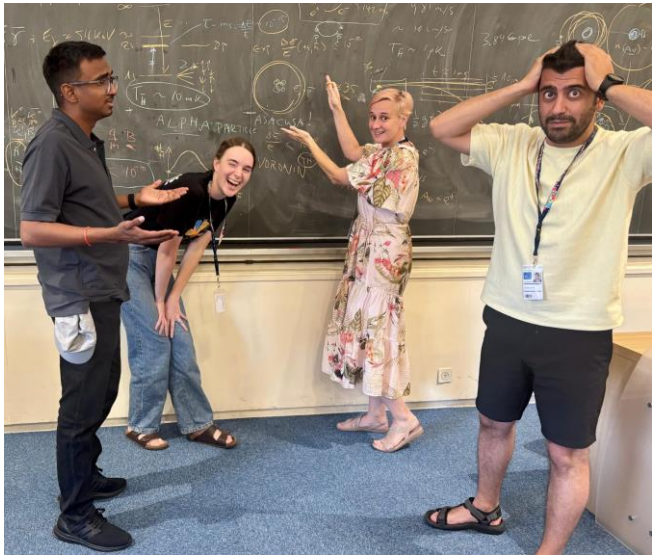


Curriculum & Classroom Connections A

Curriculum Link	Particle accelerators
Electric Fields	Linear acceleration
Magnetic Fields	Steering of beam
Standard Model (excluding experiments)	Some particle production/interactions
** Only 5% of the universe is covered in our curriculum!	Dark matter, energy still unknown



- It could be our students who are working on these future particle accelerators, so we have an opportunity now to equip and inspire them.
- We could do visits to science centres etc
- Hands-on activities



Potential Students' Conceptions & Challenges L

Questions of Why?

Why do we need to study this?

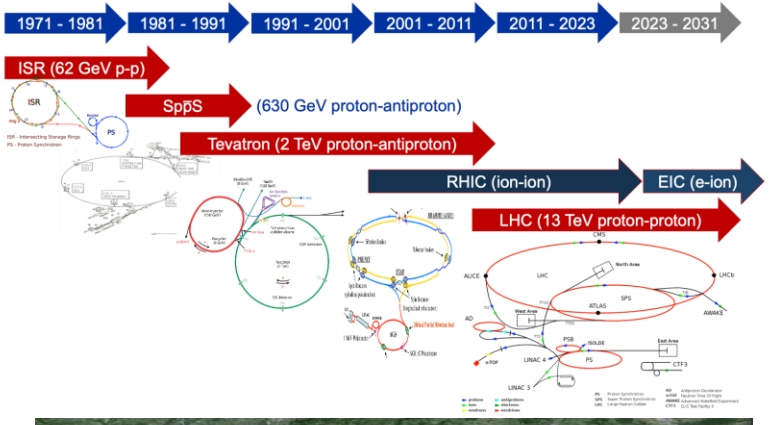
Why do we need a new accelerator?

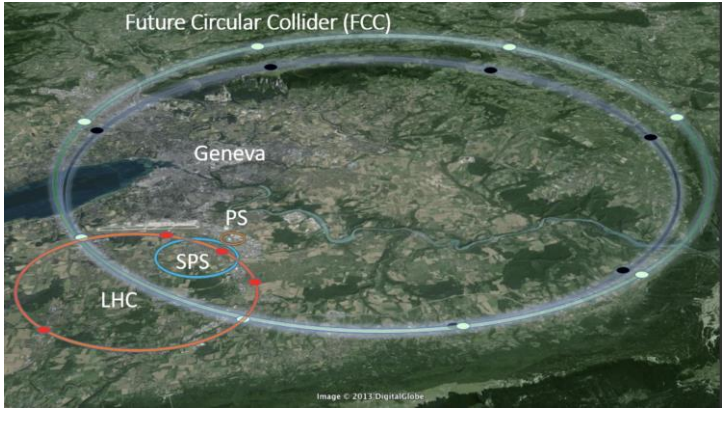
Why is it built in France?

May have little to no knowledge of Plasma.

May feel they are not good enough to pursue something in this area. This is where we need to encourage them.

School technological challenges - such as if the wifi is not available.





Useful Material & Resources

Scan the QR codes to take everything home

VIDEO

Video Tour of the FCC

CERN's official page on the Future Circular Collider

Scan me

VIDEO

FCC Video Library

Animations & fly-throughs ready for the classroom

Scan me

ACTIVITY

New Particles at CERN

Zooniverse citizen science: hunt for new particles with students

Scan me

SLIDES

Plasma Wakefield Lecture

Full HST2026 lecture slides
Indico · CERN

indico.cern.ch → HST2026

SLIDES

FCC Lecture Slides

“Future Circular Collider”
International Teacher Programmes 2026

indico.cern.ch → HST2026

ARTICLE

Plasma-Based Cancer Treatment

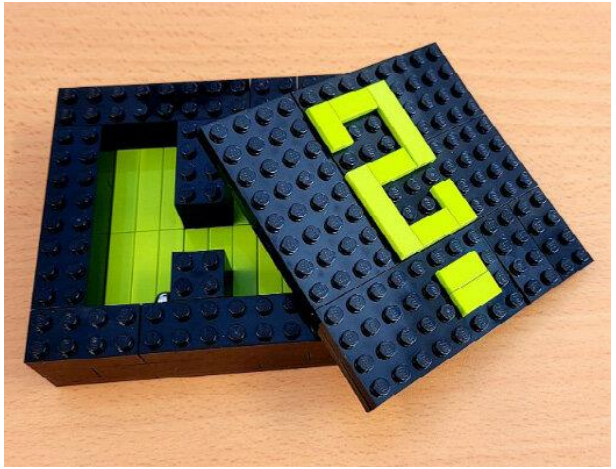
Medical applications of plasma wakefield technology

“New Hopes for Plasma-Based Cancer Treatment”

Best Practice Example B

Goal: Intrigue students to think about why we need these future accelerators.

Could use tools such as QR codes/ answer garden - “Why do we need future particle accelerators?” This gets the students current understanding.

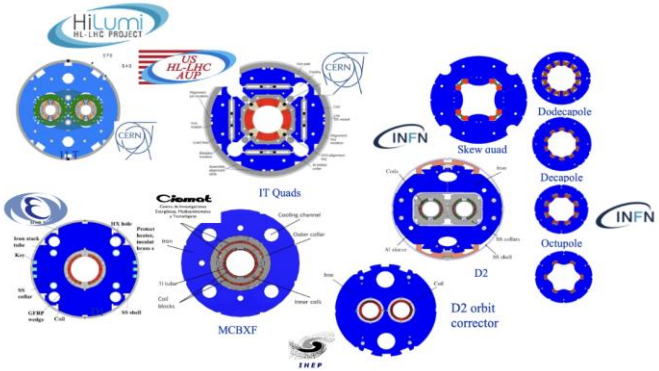


Our current understanding of the Universe is like shaking the mystery box. We can make some observations but are limited in our technology.

Hi-lumi LHC is like getting a magnet. Now we can manipulate it and learn more.

FCC or Plasma Wakefield technology is like getting a torch.

New generation of Magnets (~130)



HST2026 Study Group 1

Amber Custance (Australia), Burak Çakar (Turkiye), Doran Dipayan Mondal (India, Indonesia), Lucija Mihelak (Slovenia)

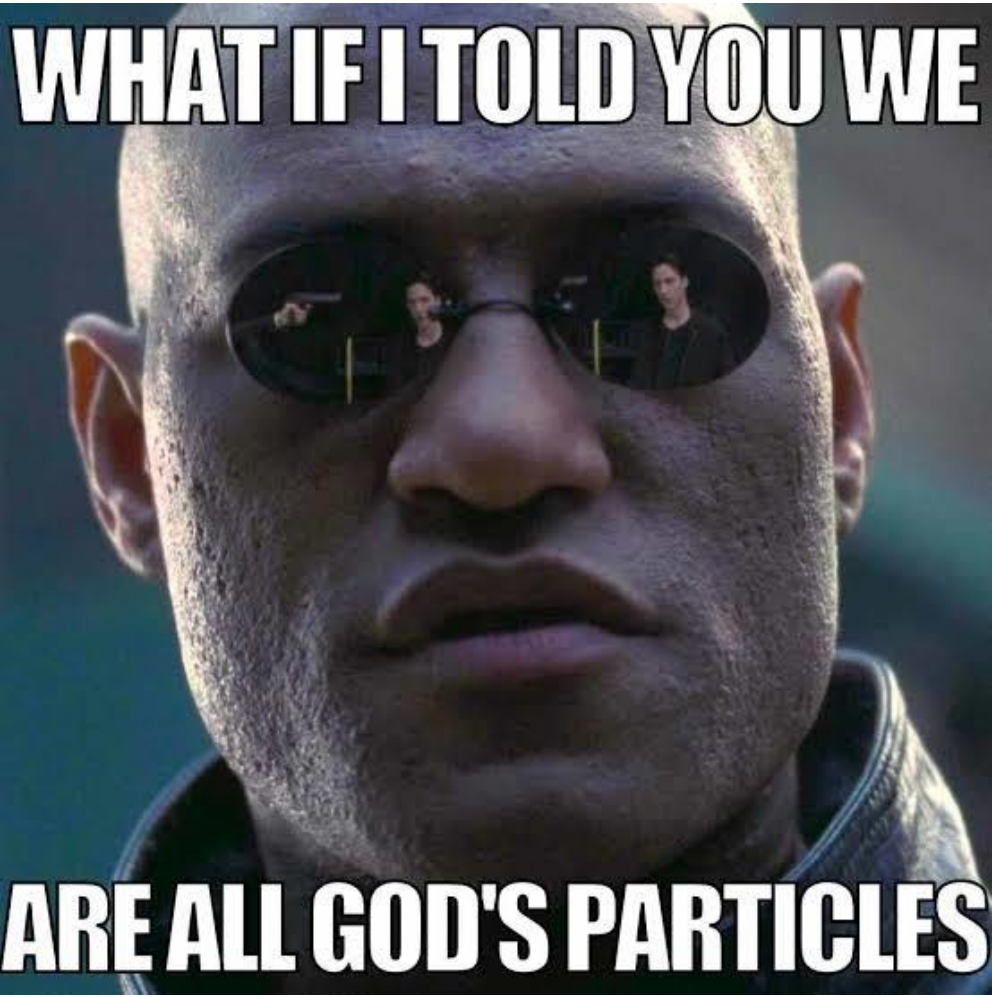
One way in which our thinking has changed…

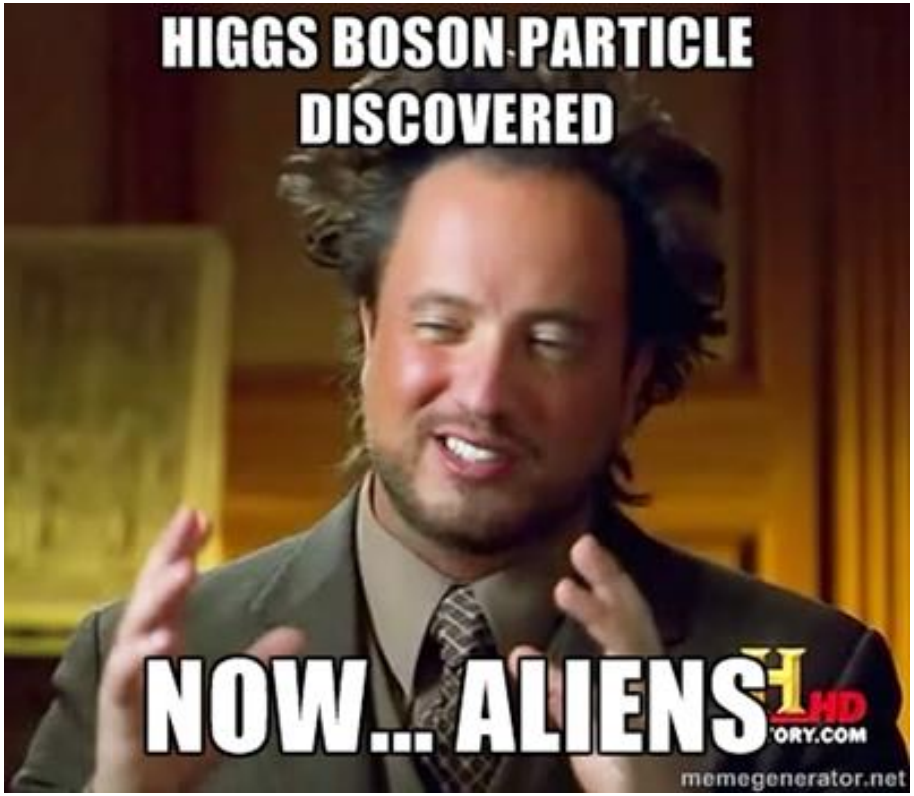
International Collaboration - great minds don’t need to compete/collide but to collaborate.

We can bring modern physics into the classroom, through simple, but engaging activities.

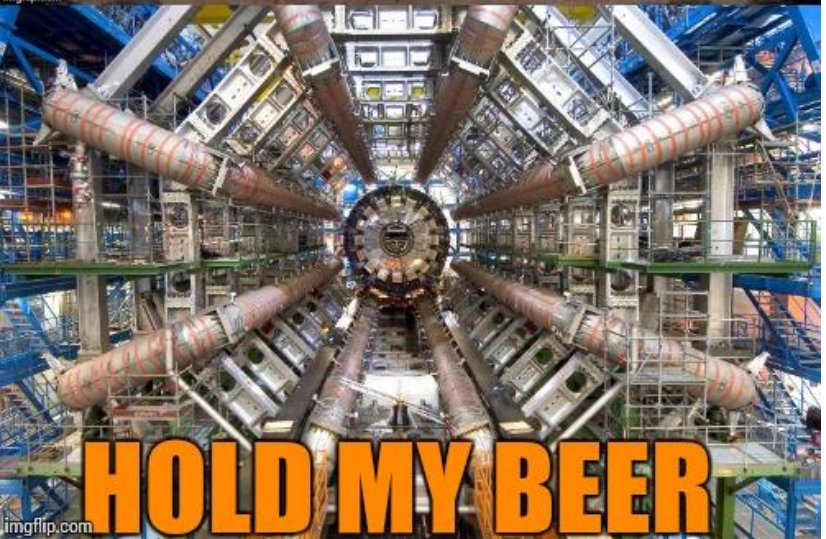
Keep questioning, keep learning, it’s not the end it's only the beginning.

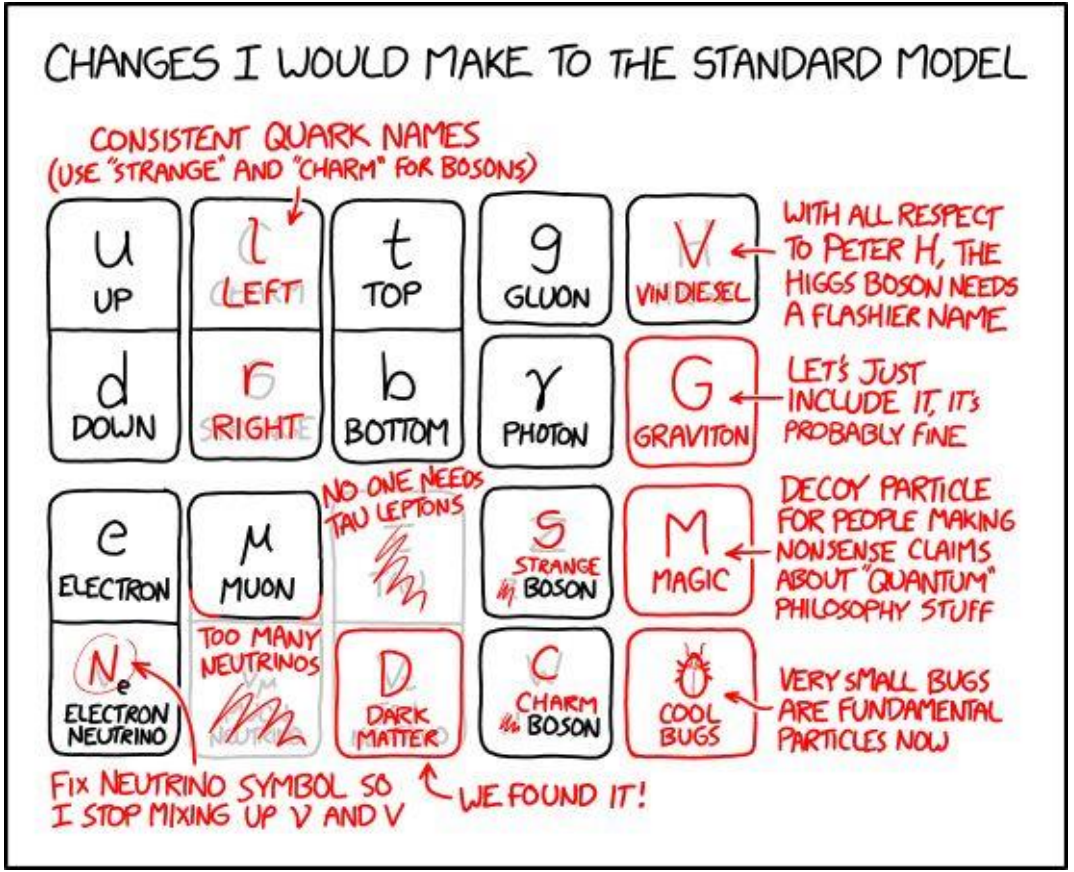
Highlights, snapshots, farewell messages…


WHAT IF I TOLD YOU WE
ARE ALL GOD'S PARTICLES


HIGGS BOSON PARTICLE DISCOVERED
NOW... ALIENS
memegenerator.net

THIS DEVICE
YES
NO
MYSTIFYING ORACLE
ABCDEFGHIJKLM
NOPQ
IVWXYZ
1234
7890
OUIJA
CAN SUMMON DEMONS
PARKER BROTHERS INC., SALEM, MASS. U.S.A.
imgflip.com


HOLD MY BEER
imgflip.com


CHANGES I WOULD MAKE TO THE STANDARD MODEL
CONSISTENT QUARK NAMES
(USE "STRANGE" AND "CHARM" FOR BOSONS)
u UP
l LEFT
t TOP
g GLUON
V VIN DIESEL
WITH ALL RESPECT TO PETER H, THE HIGGS BOSON NEEDS A FLASHIER NAME
d DOWN
r RIGHT
b BOTTOM
γ PHOTON
G GRAVITON
LET'S JUST INCLUDE IT, IT'S PROBABLY FINE
e ELECTRON
μ MUON
NO ONE NEEDS TAU LEPTONS
S STRANGE BOSON
M MAGIC
DECOY PARTICLE FOR PEOPLE MAKING NONSENSE CLAIMS ABOUT "QUANTUM" PHILOSOPHY STUFF
Ne ELECTRON NEUTRINO
TOO MANY NEUTRINOS
D DARK MATTER
C CHARM BOSON
COOL BUGS
VERY SMALL BUGS ARE FUNDAMENTAL PARTICLES NOW
FIX NEUTRINO SYMBOL SO I STOP MIXING UP V AND V
WE FOUND IT!