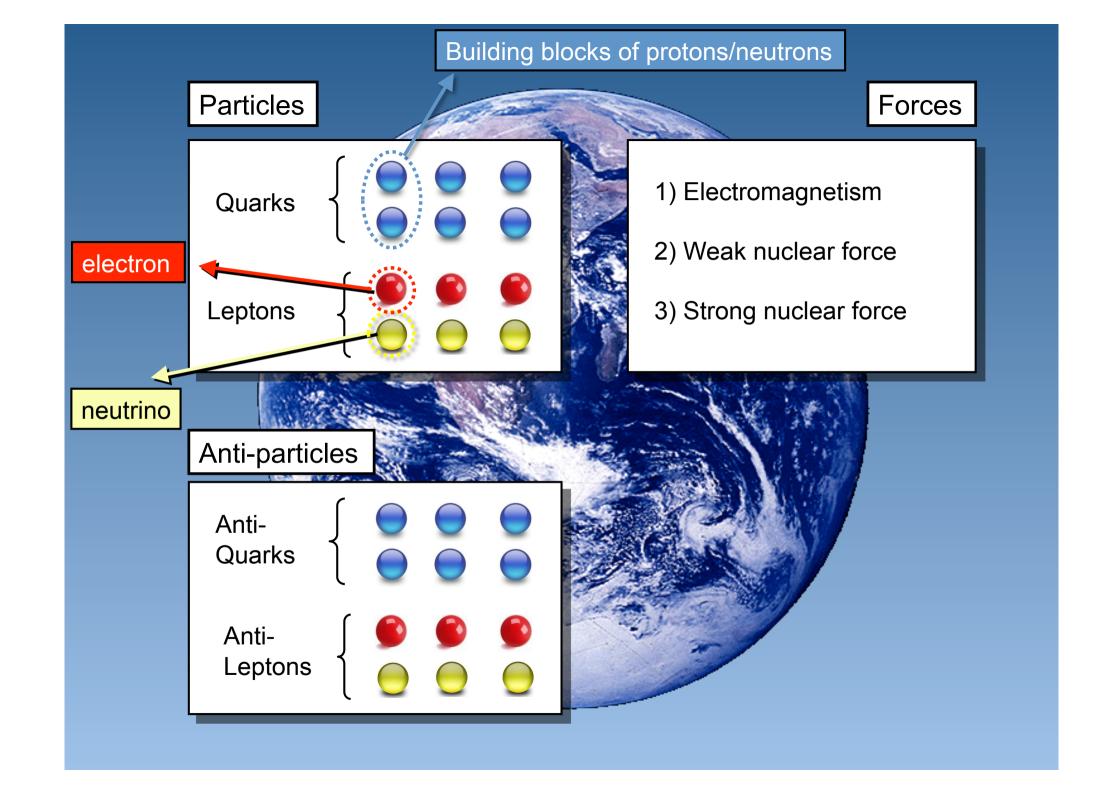




Maurice 'Sherlock' Aalbers



Christa 'Darwin' Testerink



Theory

Reality

The Standard Model

 $SU(2)_L \otimes U(1)_Y \otimes SU(3)_C$

Describes all phenomena and measurement to high precision

Massless (force-)particles





Massive (force-)particles

Theory

Reality

The Standard Model

 $SU(2)_L \otimes U(1)_Y \otimes SU(3)_C$

Massive (force-)particles



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 A. Colderina, Rosew Clempin 18 (1982), 114.
 A. Colderina, A. Johns and S. Westberg, Phys. Rev. Letters 10 (1982), 115.
 A. Software S. W. Lee, Phys. Rev. Letters 10 (1984), 116.
 A. Colders, Phys. Rev. Letters 10 (1984), 116.
 A. Software, Phys. Rev. Letters 10 (1984), 116.
 A. Software, Phys. Rev. 117 (1984), 118.

The Higgs mechanism

Higgs field in the vacuum

"If I'm right there has to be a new scalar particle: **the Higgs boson**"

"It's properties depend on it's mass, ... a mass that I cannot predict. Go find it!"

- September 1964 -

(In)famous Higgs boson

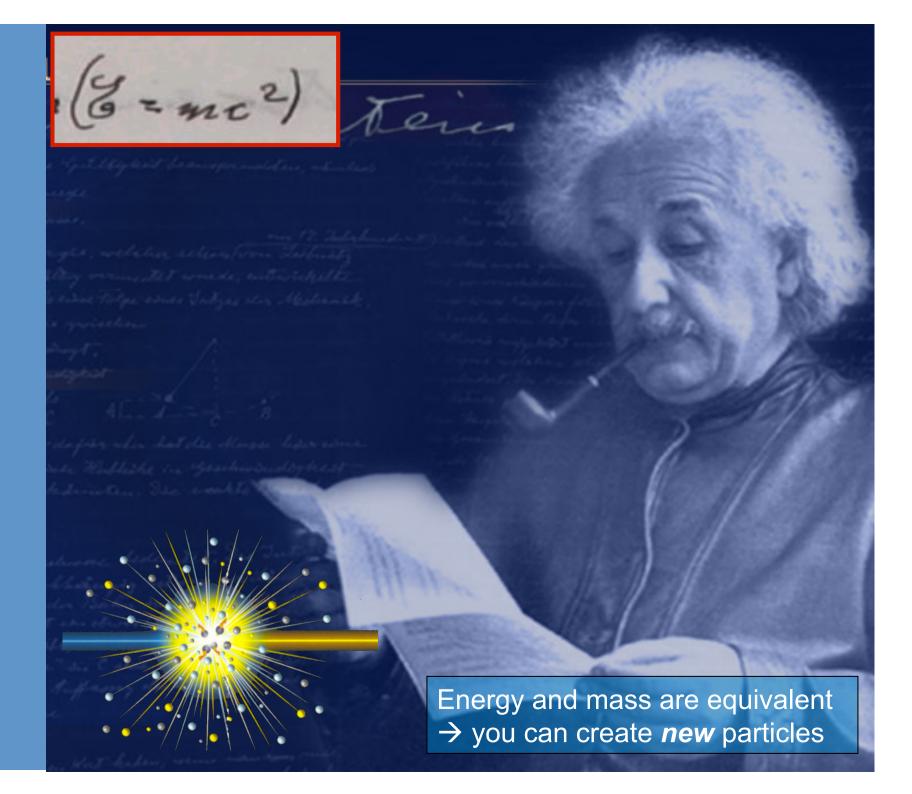


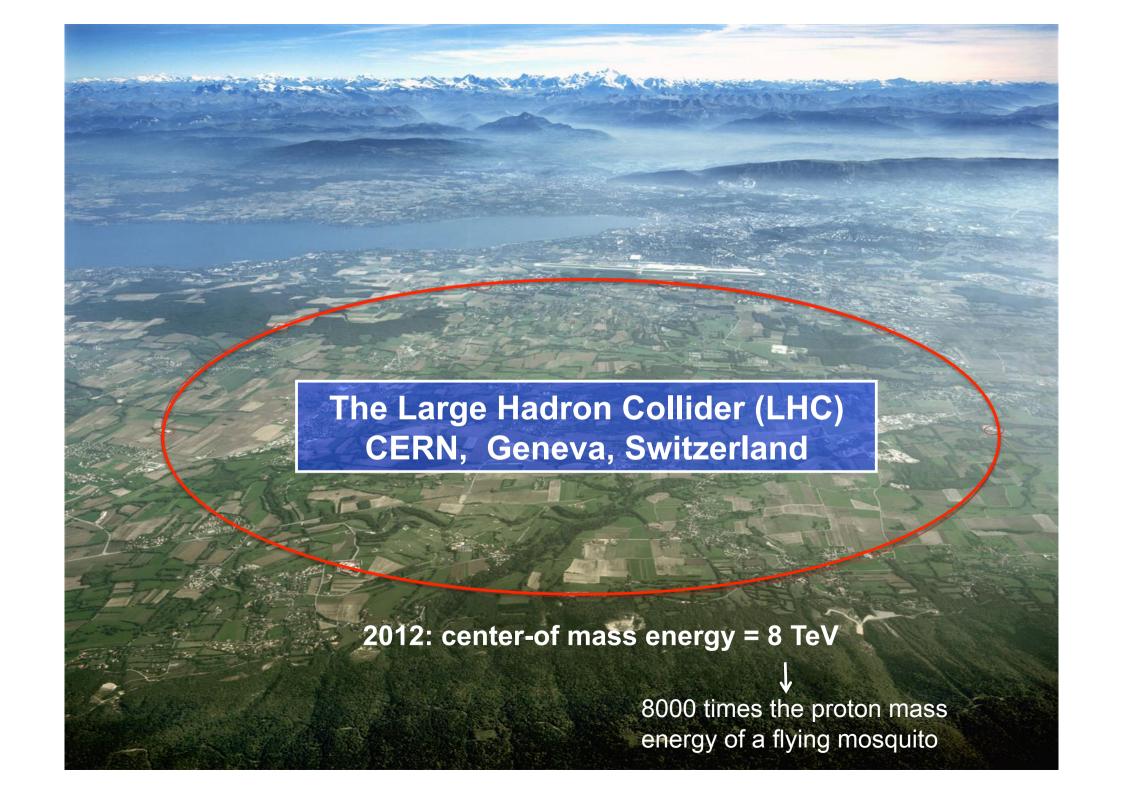
The Higgs boson

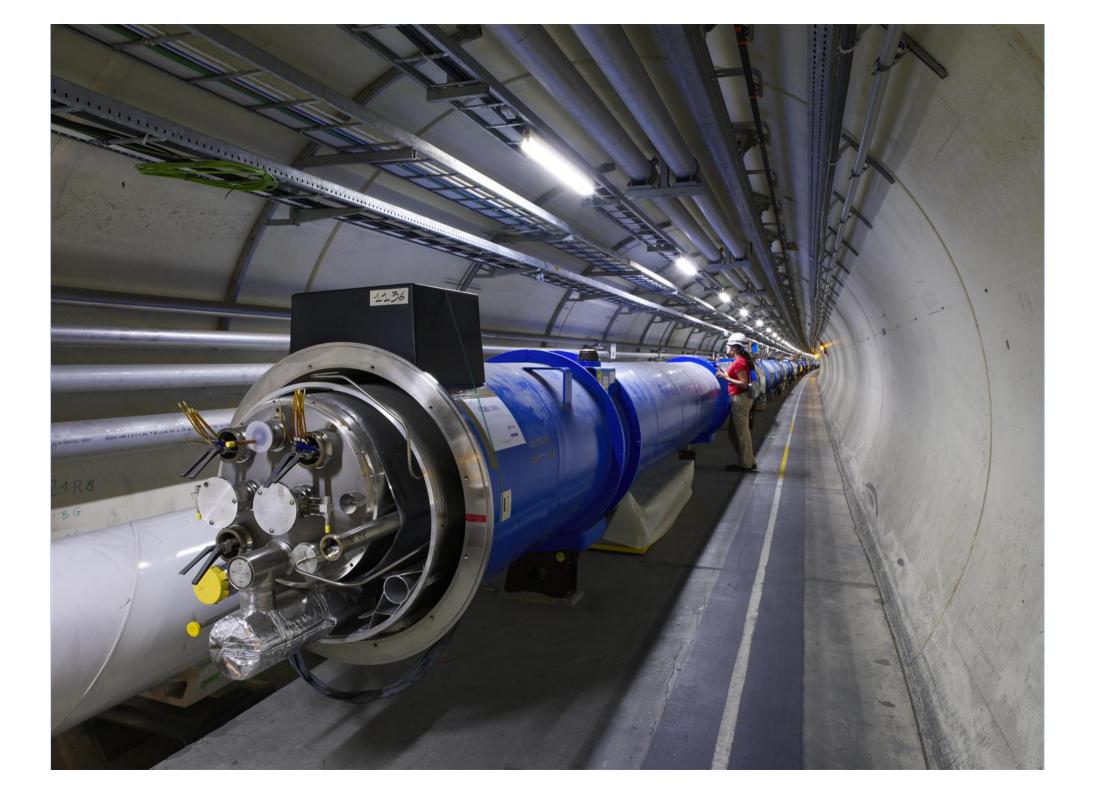


Paris Hilton

Being famous is not the same as being important

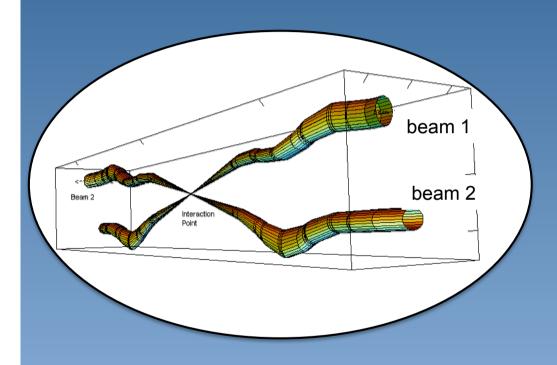






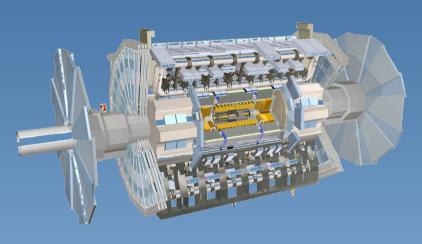
Colliding beams of protons

ATLAS detector



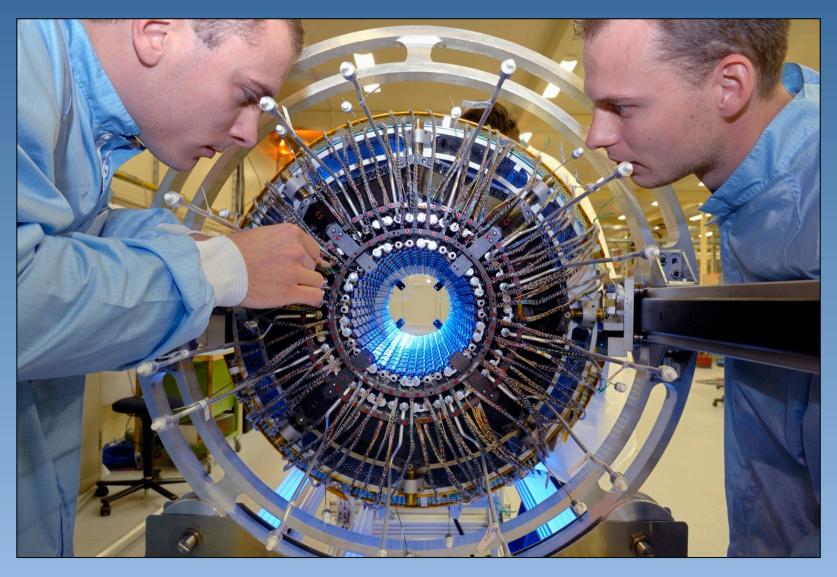
40 million collisions per second

Was an (unstable) Higgs boson produced?



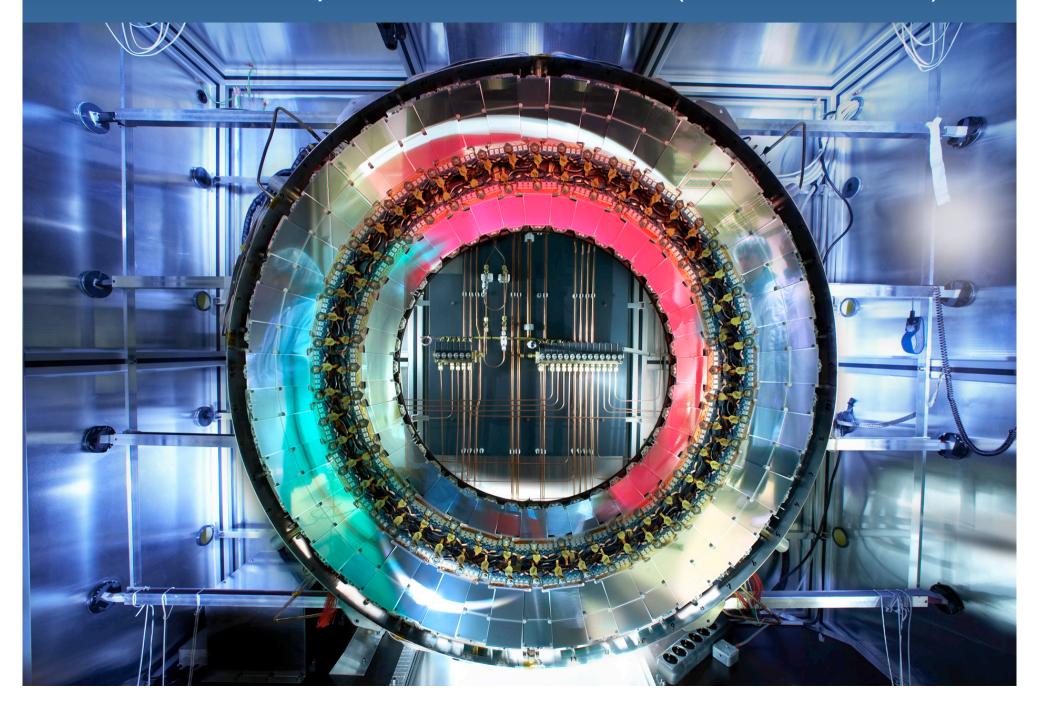


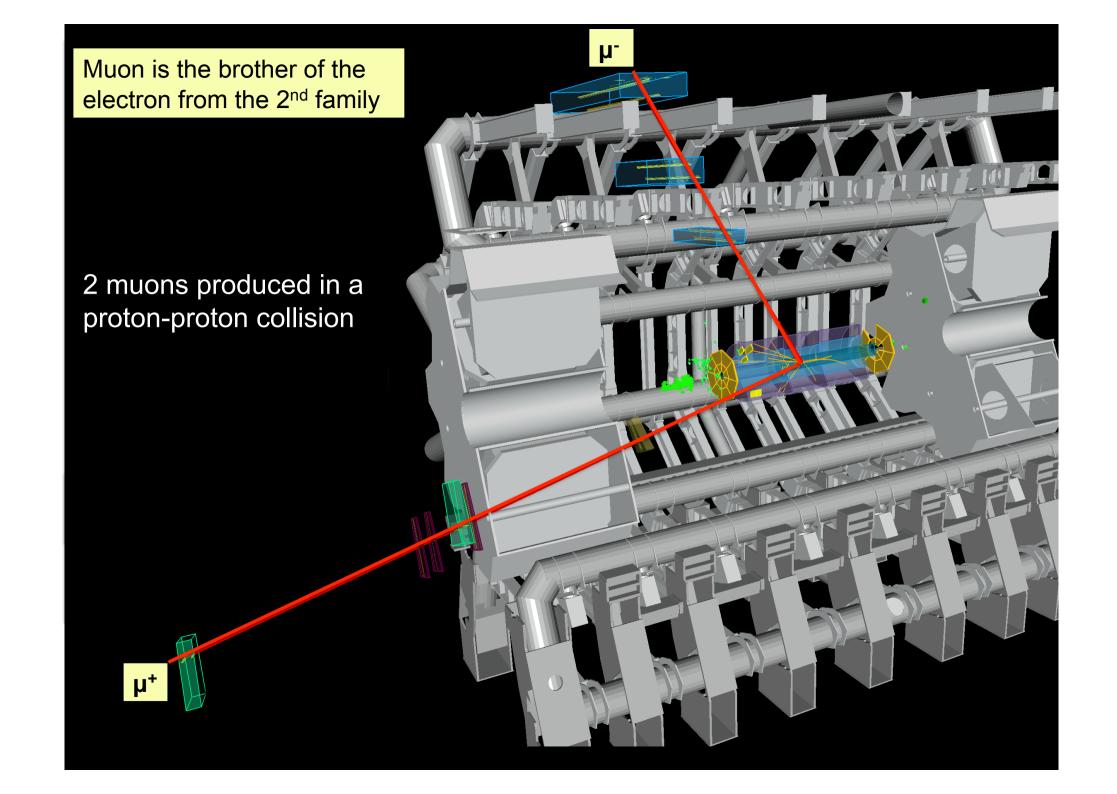
De Atlas pixel detector

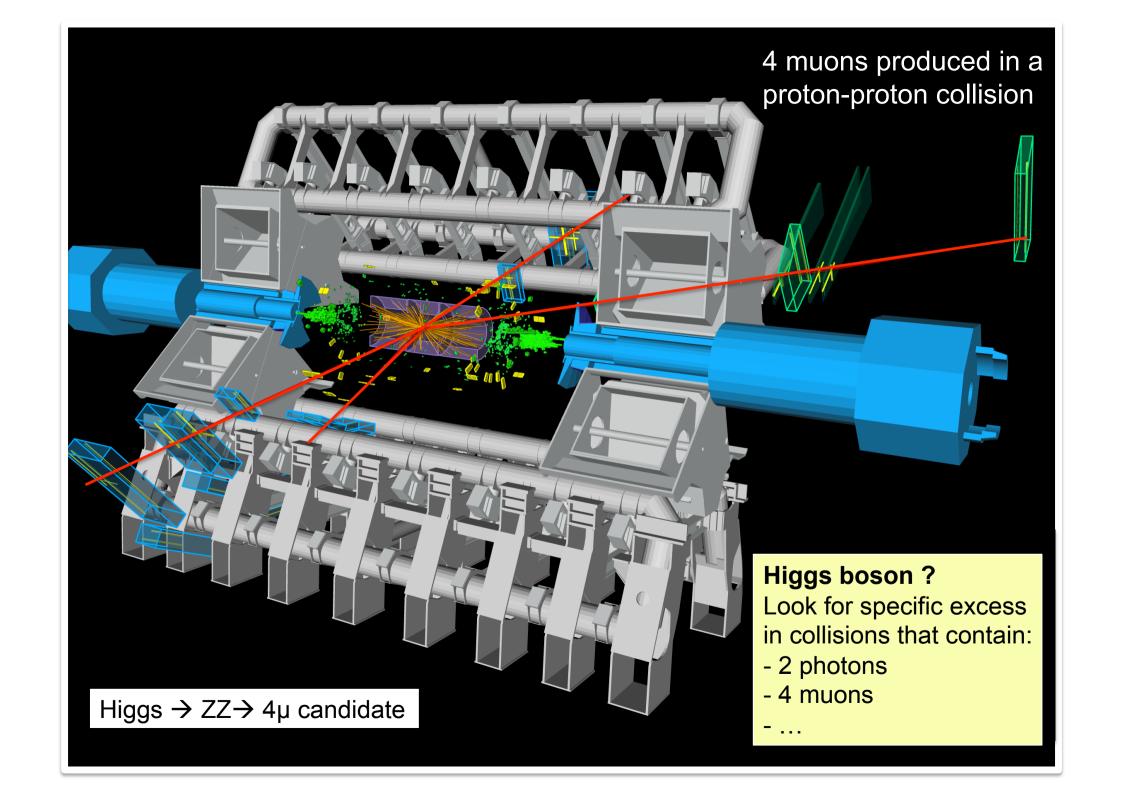


Nikhef technicians at work

The SCT end-cap: constructed at Nikhef (across the street)

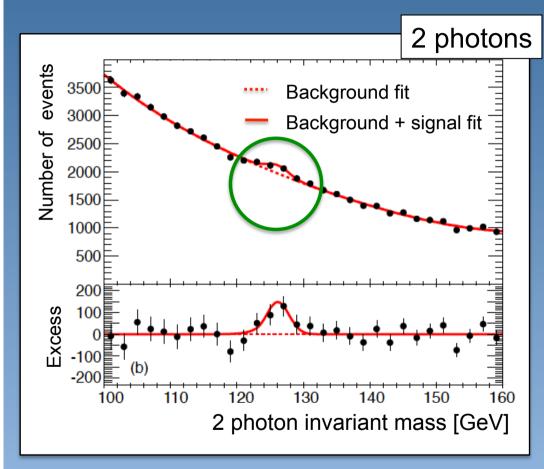


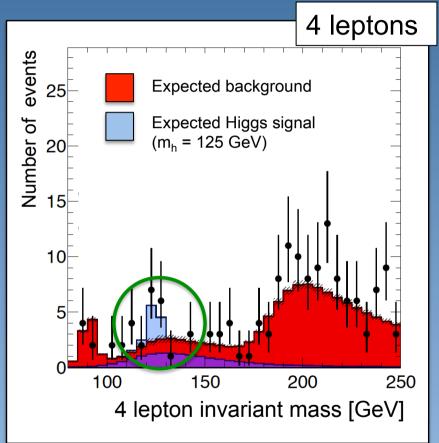




Result of the ATLAS experiment (juli 2012)

Excess (peak) in the collisions where 2-photons or 4-leptons were produced





Probability to observe such an excess given the Standard Model without the Higgs boson $\sim 10^{-9}$ \rightarrow We discovered something new!

Discovery of a new particle

- The Large Hadron Collider works
- Discovered the Higgs* boson, so we think we understand how particles acquire mass

*well ok, a Higgs-boson like particle

Few 'tiny' unresolved issues

- why the large spread in masses?
- Nature of dark matter?
- Where did all the anti-matter go?

- ...

Standard Model of elementary particles

Hope to discover new phenomena

Supersymmetry?