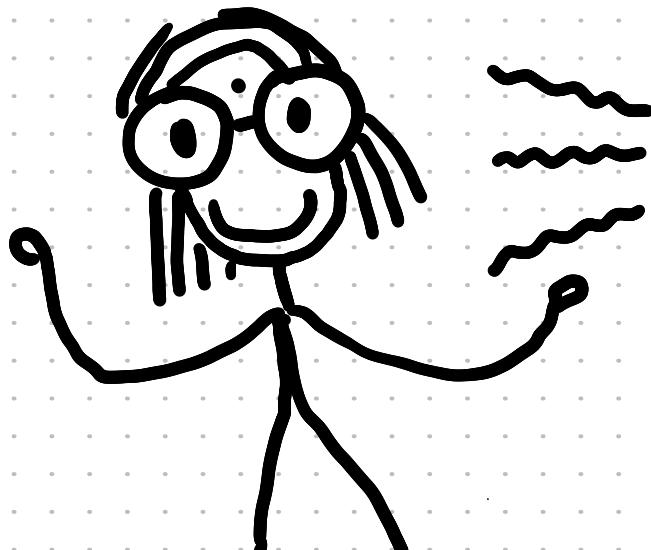


introduction to particle physics :)

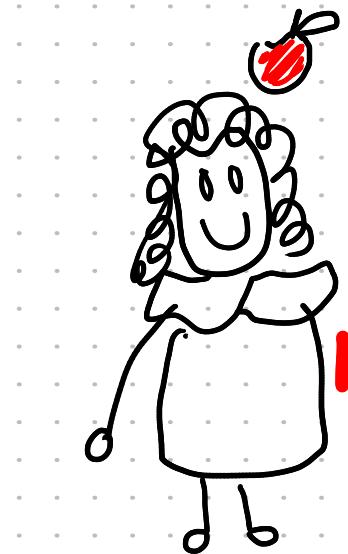


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What do particle physicists study?

What is particle physics about?



CLASSICAL
MECHANICS

'SLOW'
($\ll 3 \times 10^8$ m/s)



QUANTUM
MECHANICS



'BIG'
($\gg 10^{-9}$ m)

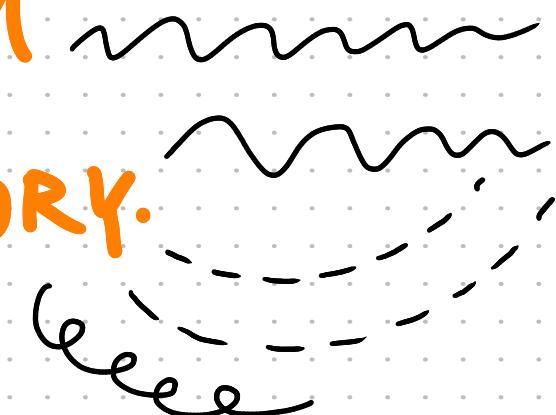
RELATIVISTIC
MECHANICS



FAST
($\sim 3 \times 10^8$ m/s)

QUANTUM

FIELD THEORY.



ENERGY + MASS IN PARTICLE PHYSICS



DEALING
W/ V. SMALL
LENGTHS

$$\hbar = c = 1$$

→ TRAVELLING @
V. HIGH SPEEDS.

$$\cancel{E=mc^2}$$

$$E^2 = p^2c^2 + m^2c^4$$

→ E, m, p HAVE SAME UNIT

→ E, m, p MEASURED
IN eV.

What is our universe made up of?

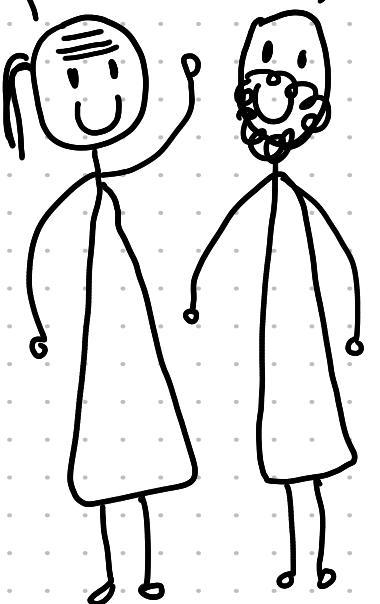
What is the most fundamental particle?

What is the most fundamental particle?

'INDIVISIBLE'
PARTICLES!

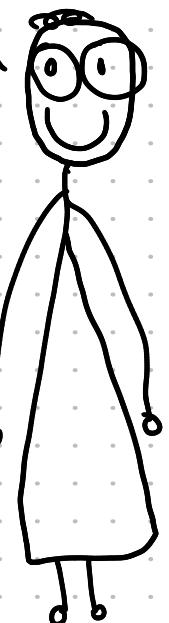
5 NATURAL
ELEMENTS!

ATOMS!



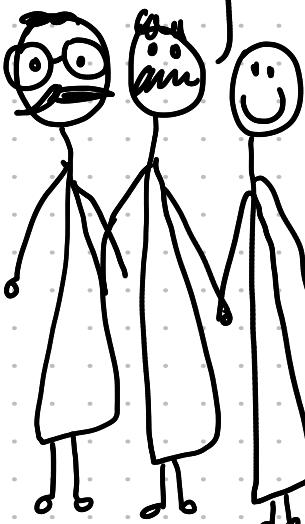
ANCIENT INDIA/GREECE

PROTONS, NEUTRONS
& ELECTRONS!



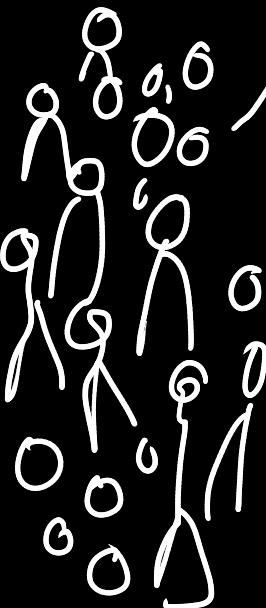
1800s - DALTON

1900s - THOMSON,
RUTHERFORD, CHADWICK.



1950s - 2012
MODERN
PHYSICISTS.

WELL
ACTUALLY...



so far

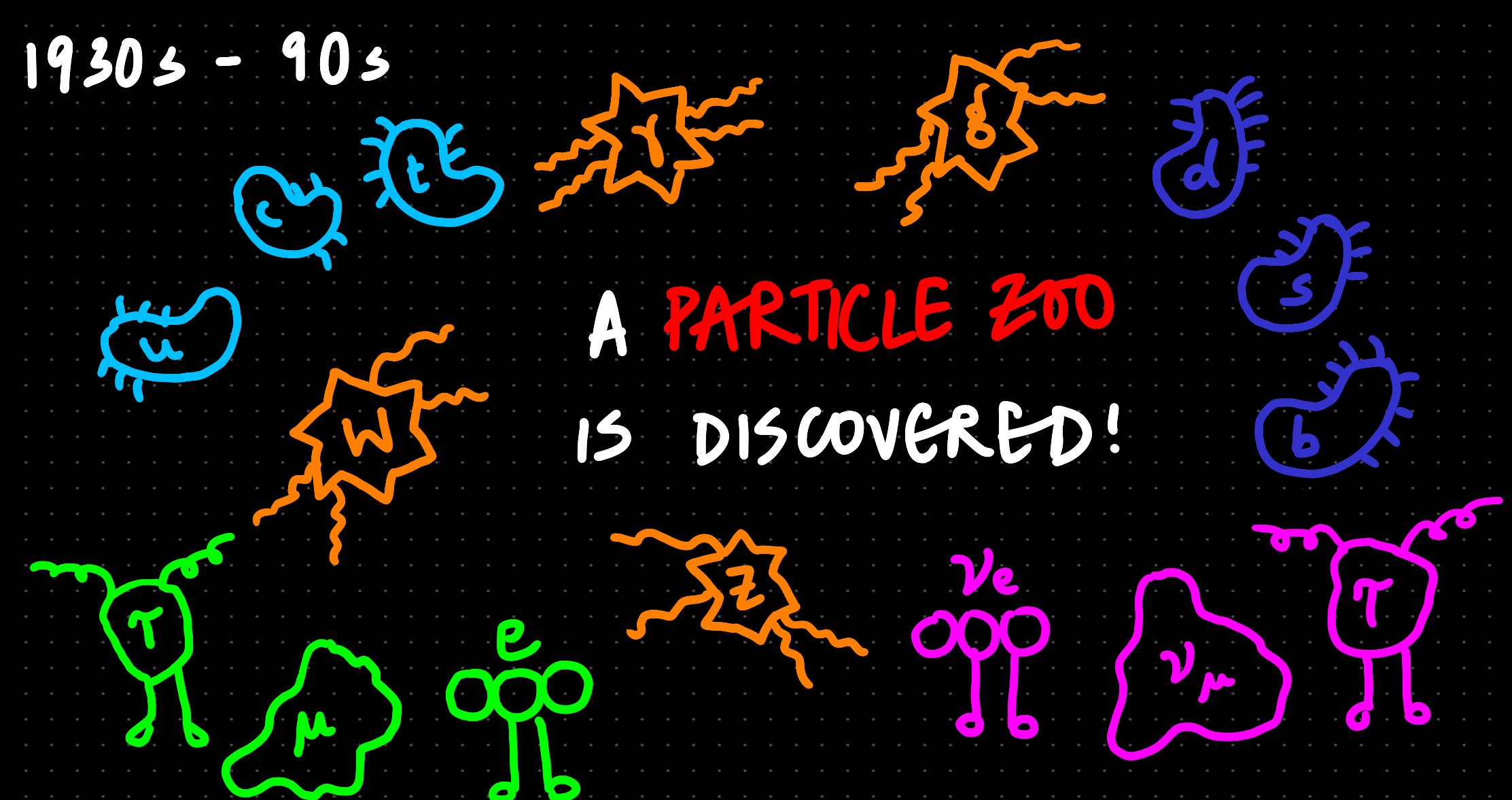
What is the most fundamental particle?



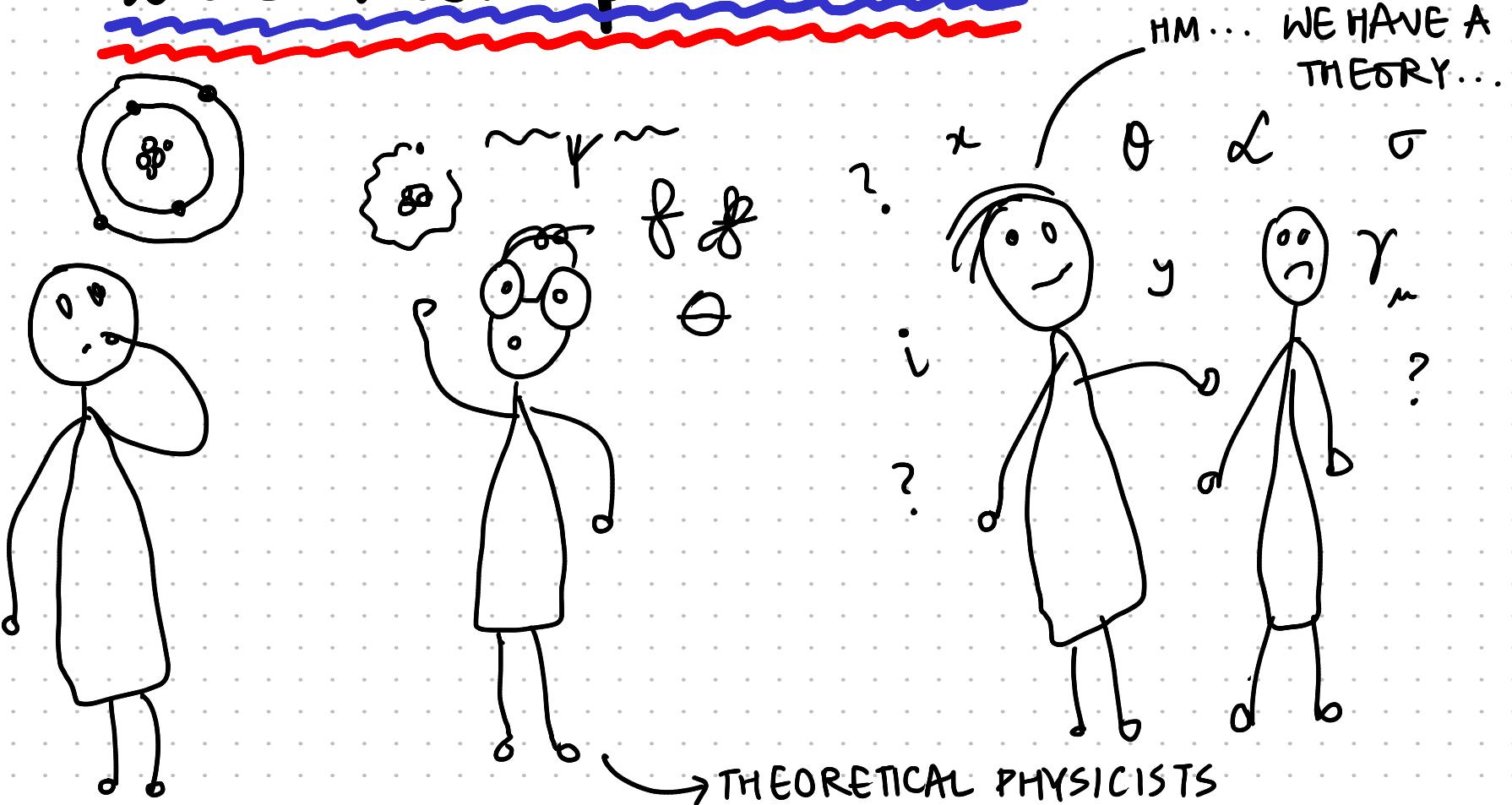
MOST FUNDAMENTAL
IS A MOVING
TARGET.

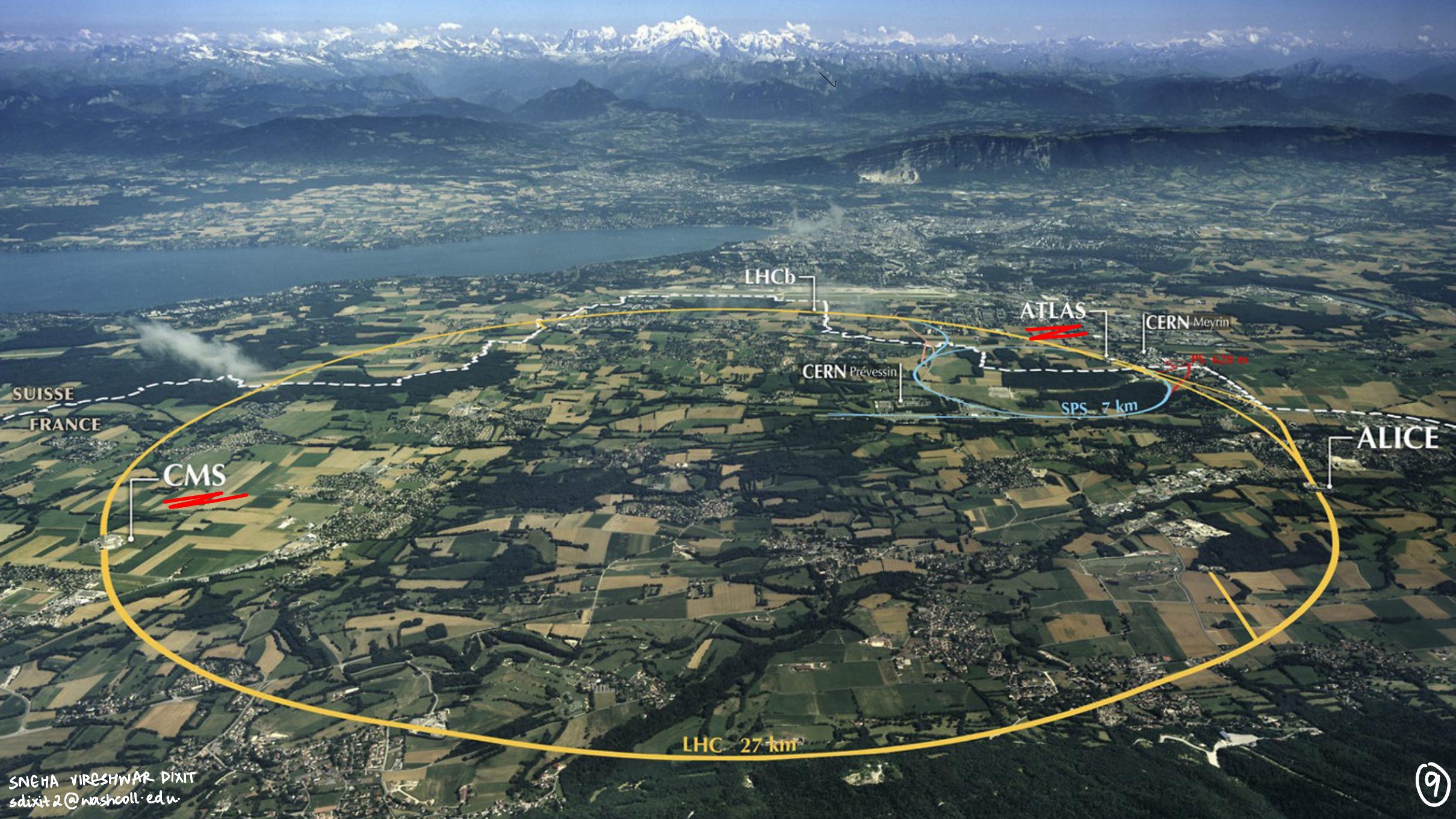
1930s - 90s

A PARTICLE ZOO
IS DISCOVERED!

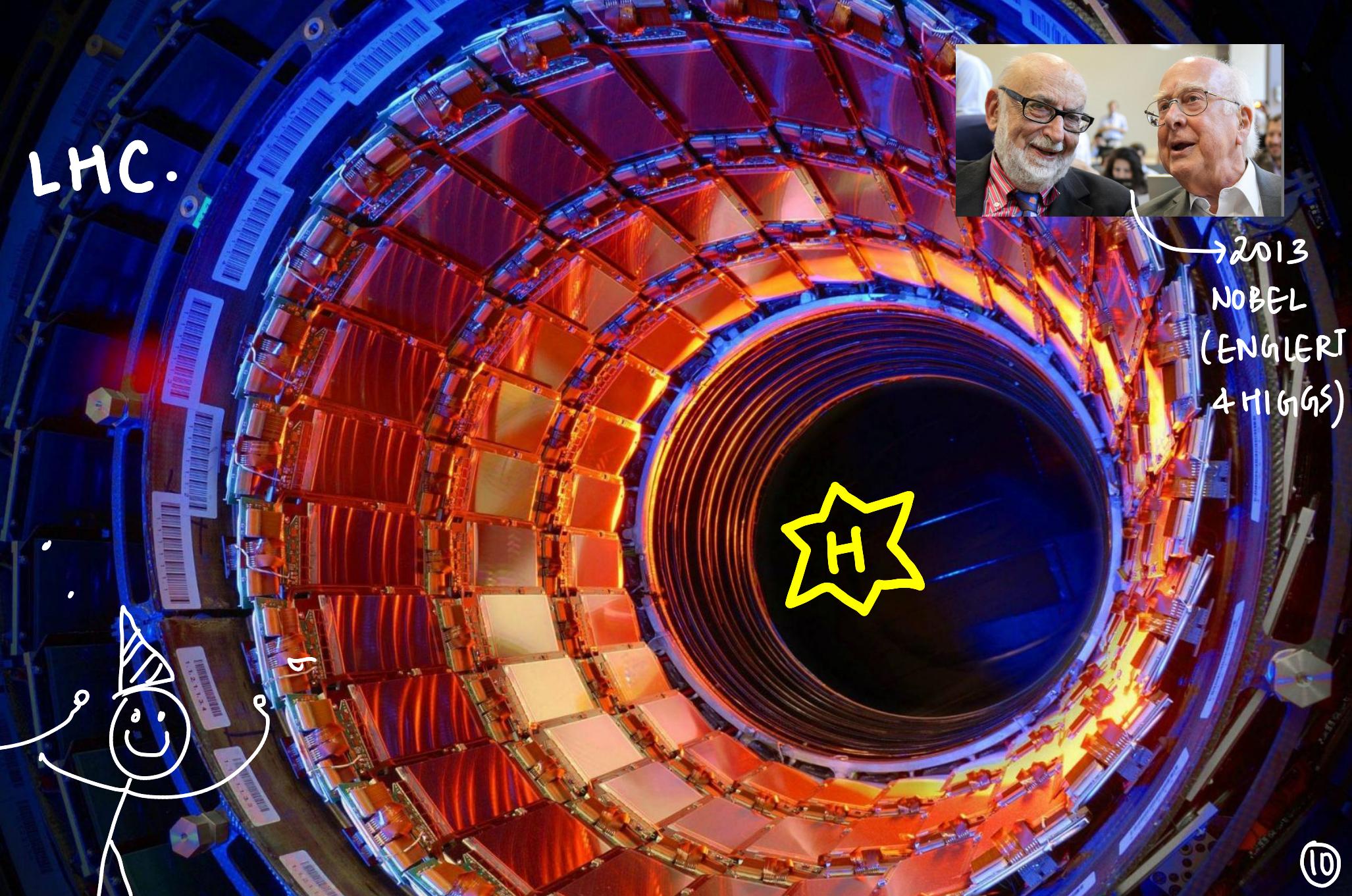


How do we make sense of all these new particles?

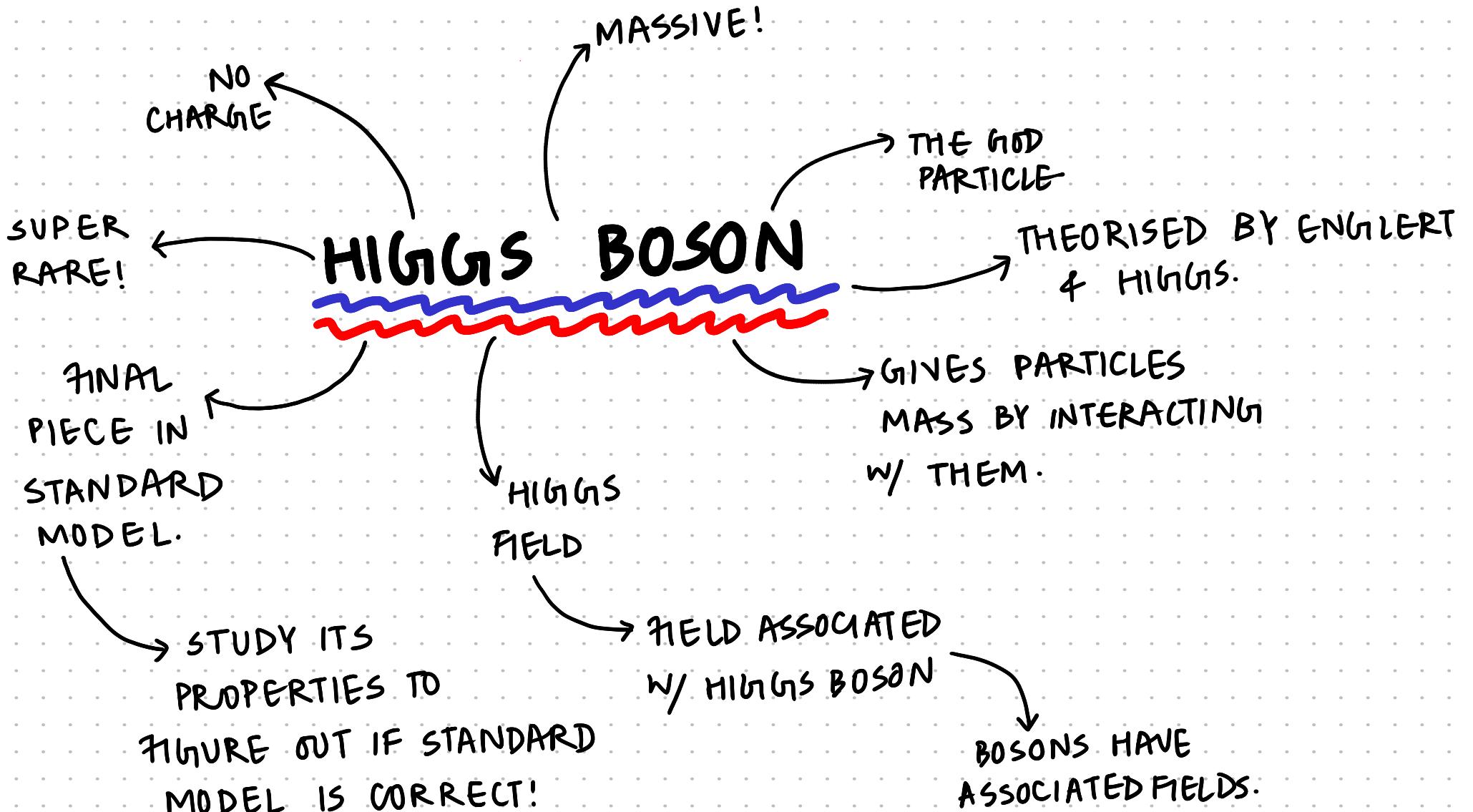




2012
CERN LHC.

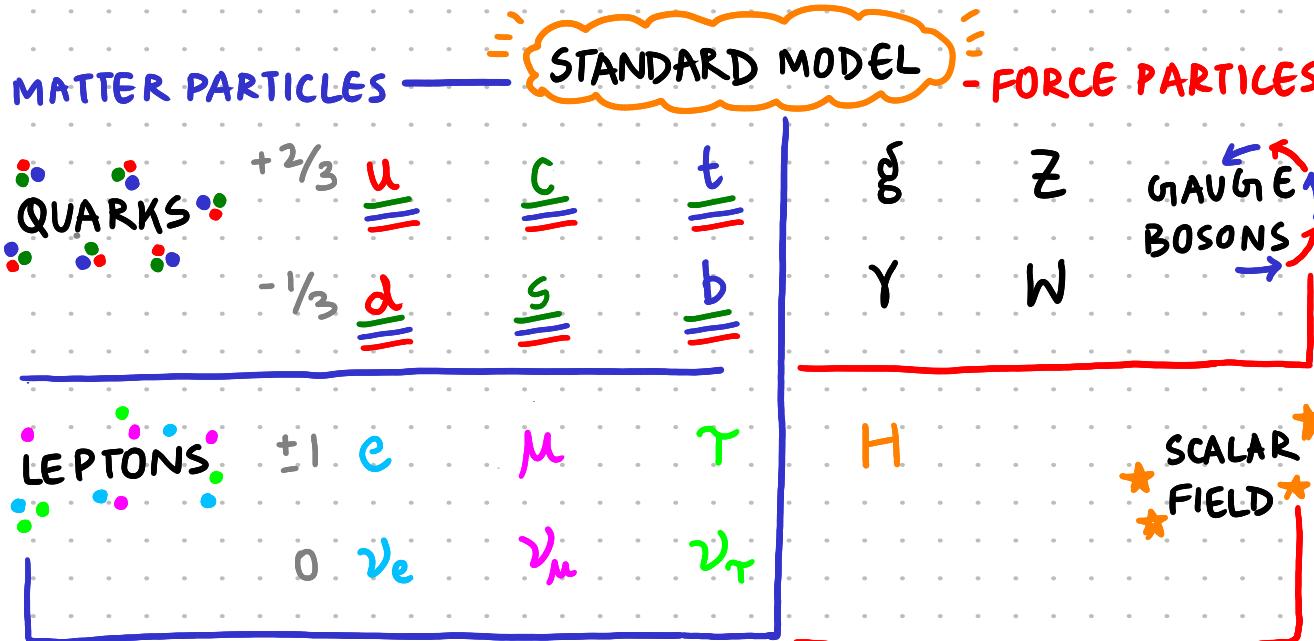


→ 2013
NOBEL
(ENGLERT
& HIGGS)



STANDARD MODEL OF PARTICLE PHYSICS

UNIVERSE = made up of MATTER/ENERGY that interacts via FORCES



gravity?

dark energy?

?

?

!BEYOND STANDARD MODEL!

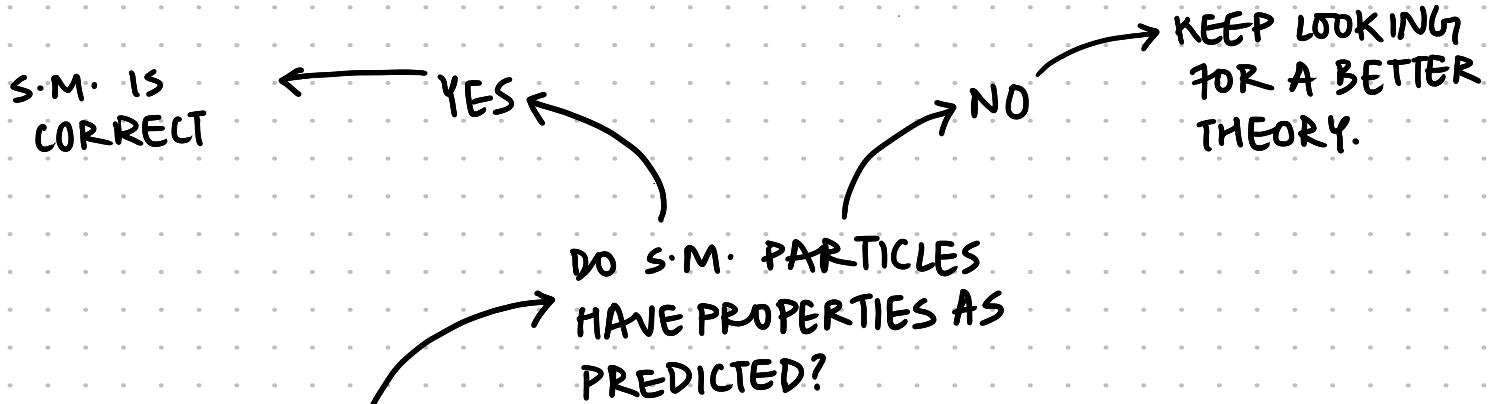
?

dark matter?
new physics?

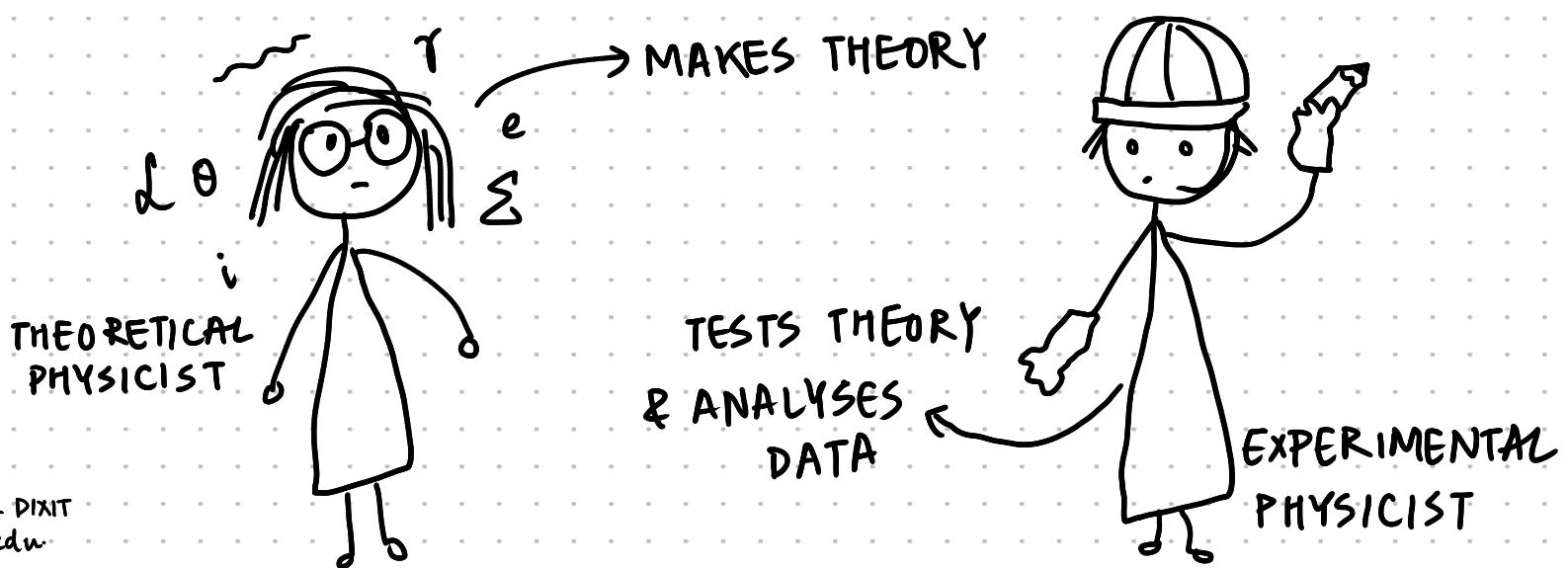
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What happens next?

Is the standard model the best we have?



We can test the standard model!



What do we not know yet?

