

# Neutrinos

Particles, Waves and The Birth of the  
Universe

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# Outline

What is a Neutrino?

Where can they be found?

How do you experiment with them?

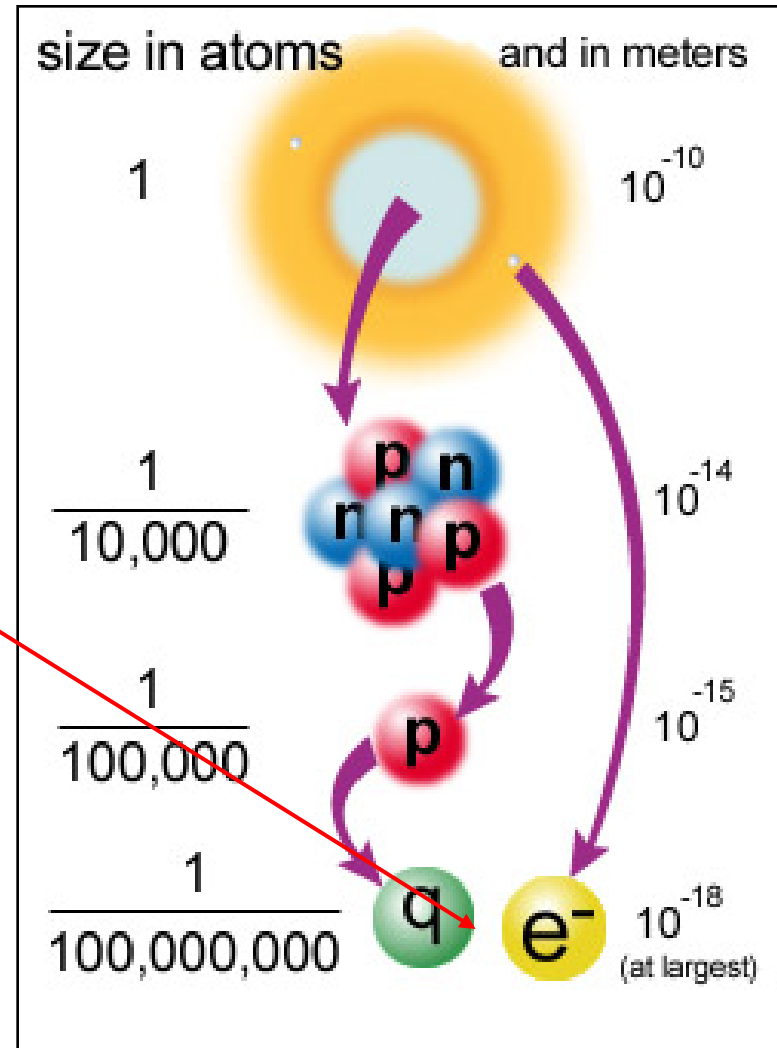
Why Experiment with Neutrinos?

# Breaking Down Nature

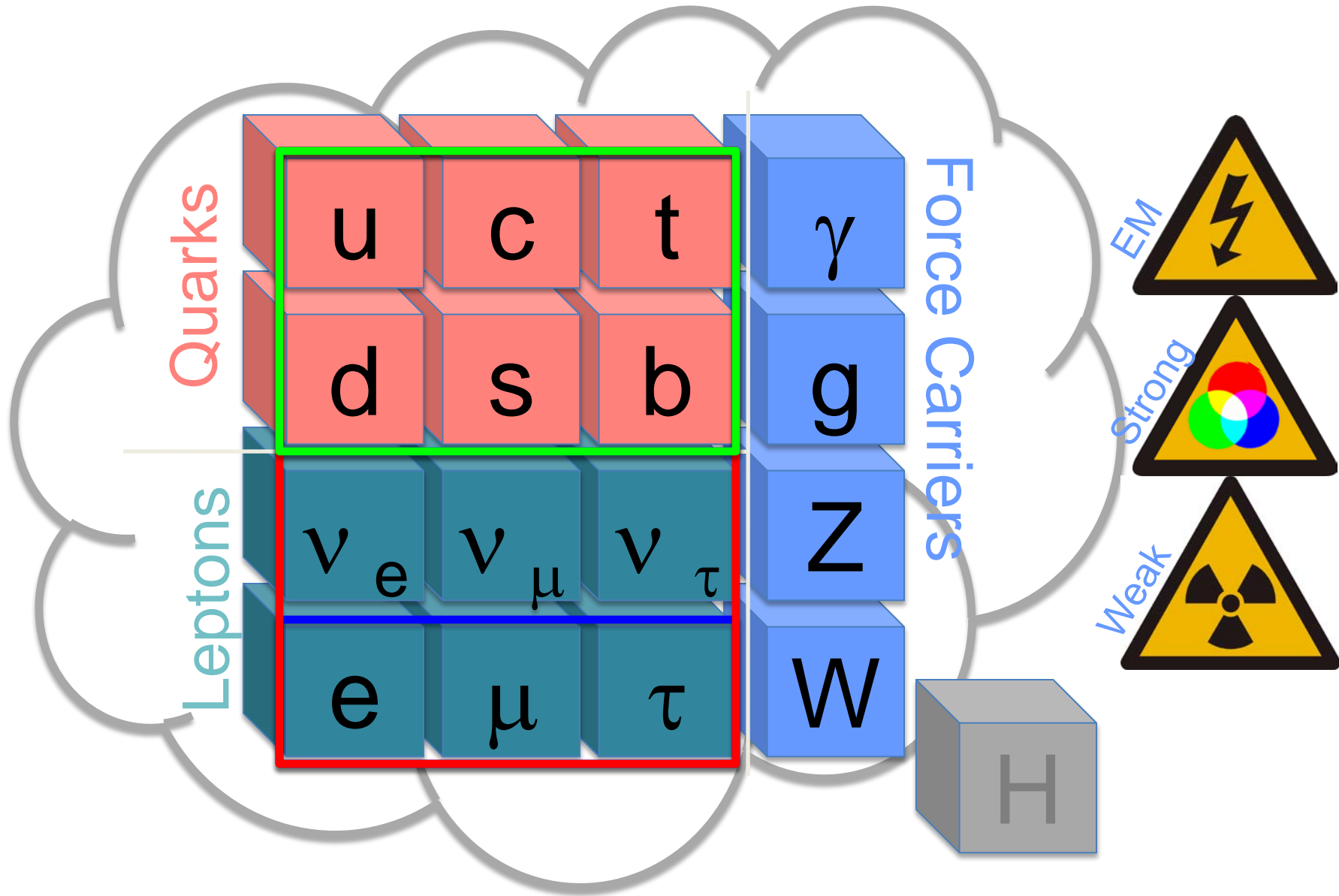
**Particle Physicists** try to discover the fundamental "**Elementary Particles**" that everything is made of – and what **forces** bind these together.

**Quarks and Electrons** are "**Elementary Particles**"

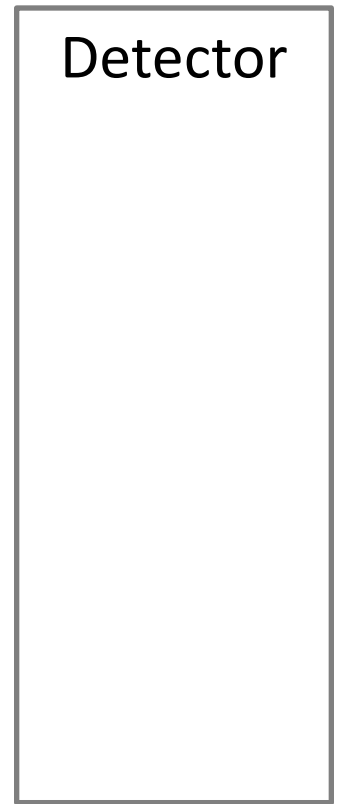
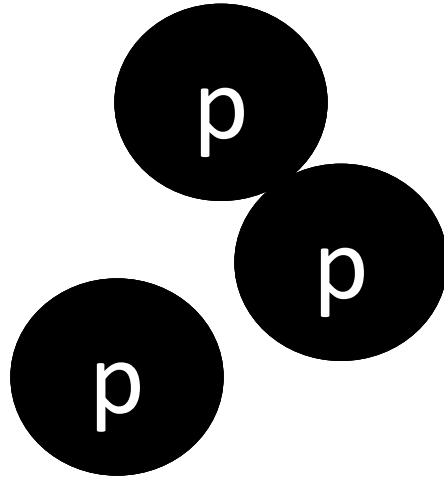
These **Elementary Particles** are the raw building material for our Universe and were created in just seconds after the **Big Bang**.



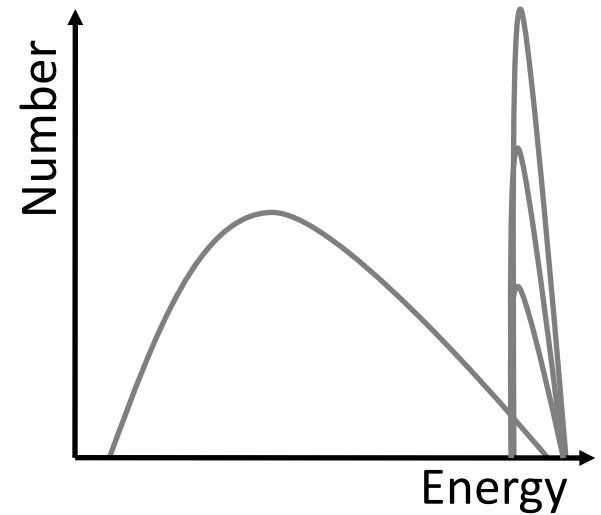
# The Standard Model Building Blocks



# $\beta$ Decay: The Weak Force at Work

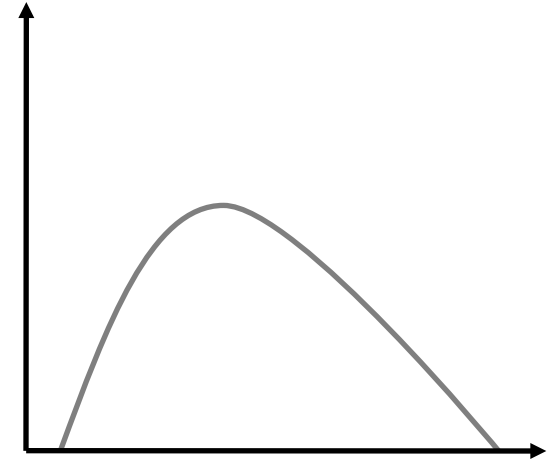
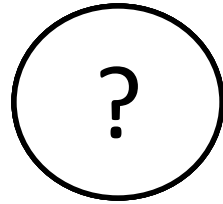


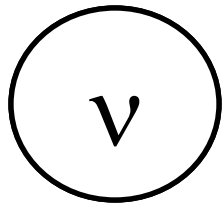
~~$E = \Delta mc^2$~~



# $\beta$ Decay: The Weak Force at Work

Detector





1930: Neutrino  $\nu$  (Wolfgang Pauli)

“little neutral one”

1934: Neutrino interactions (Enrico Fermi)

“There is no practically possible way  
of

observing the

1953: Project Polter



Wolfgang Pauli



Enrico Fermi



FredERIC REINES

Clyde Cowan

10's /s





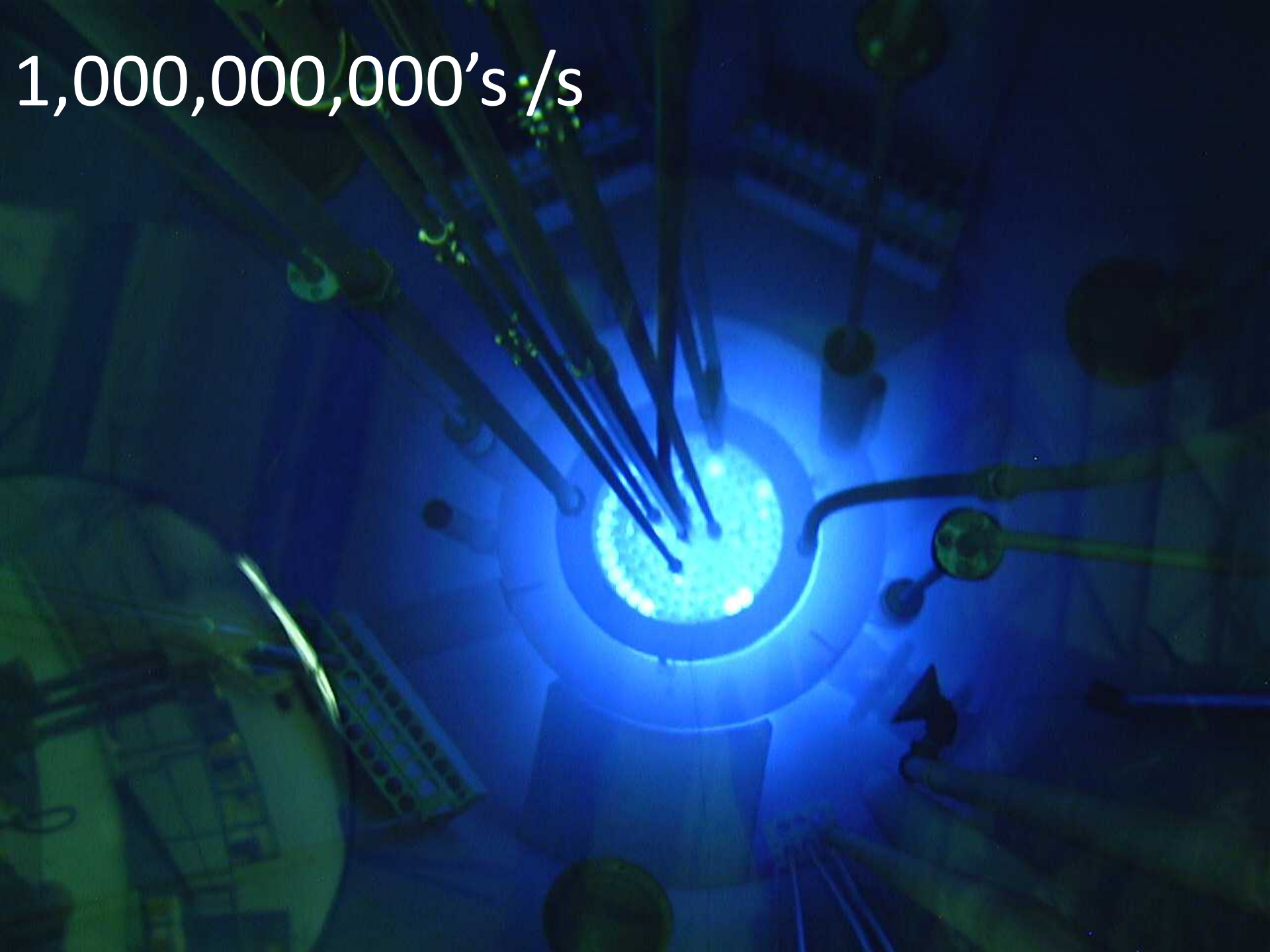
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