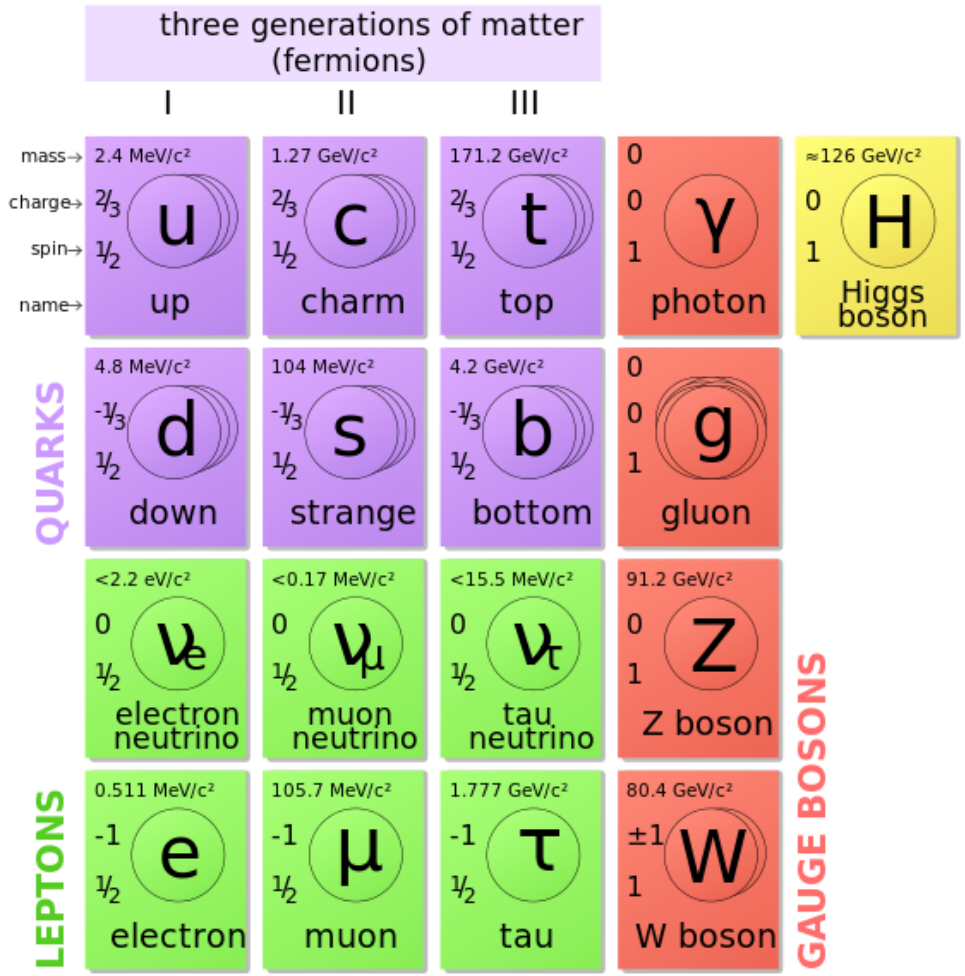
Fundamental Physics

⟹ **Study of physics at the most fundamental level**

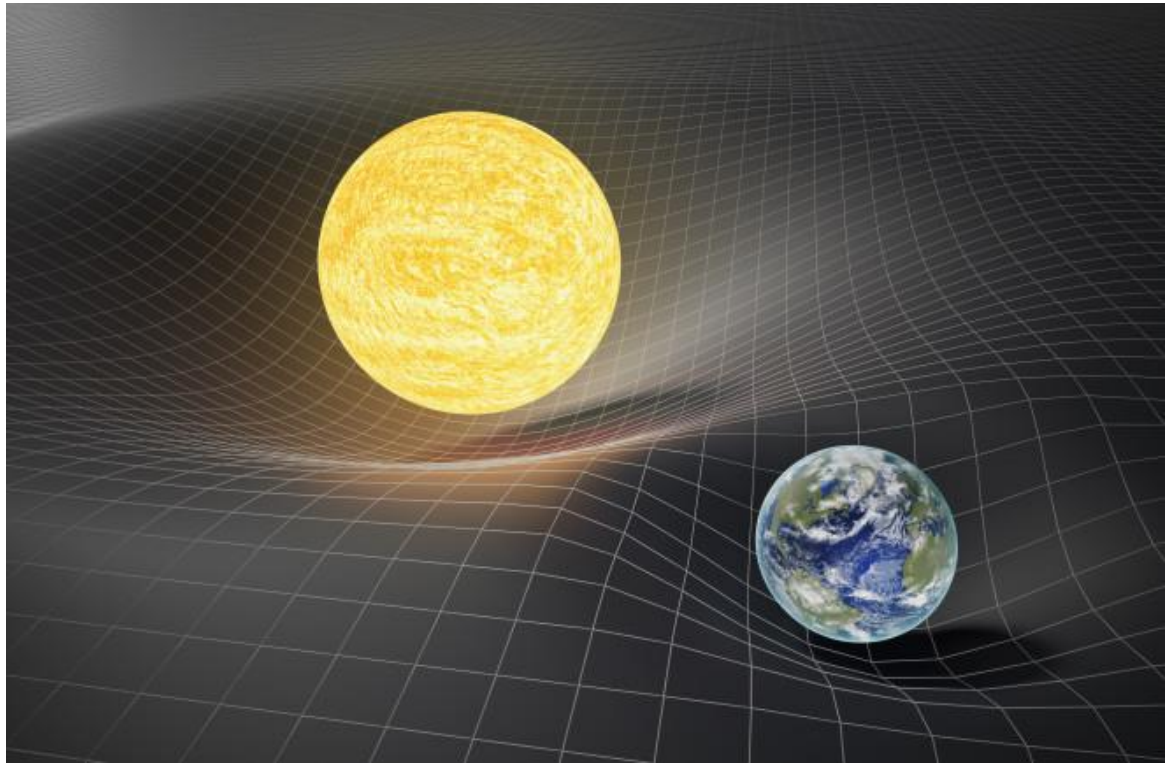
⟹ **Goal is towards a deep understanding of Space, Time and Matter itself.**

⟹ **‘Standard Model’ of Particle Physics**

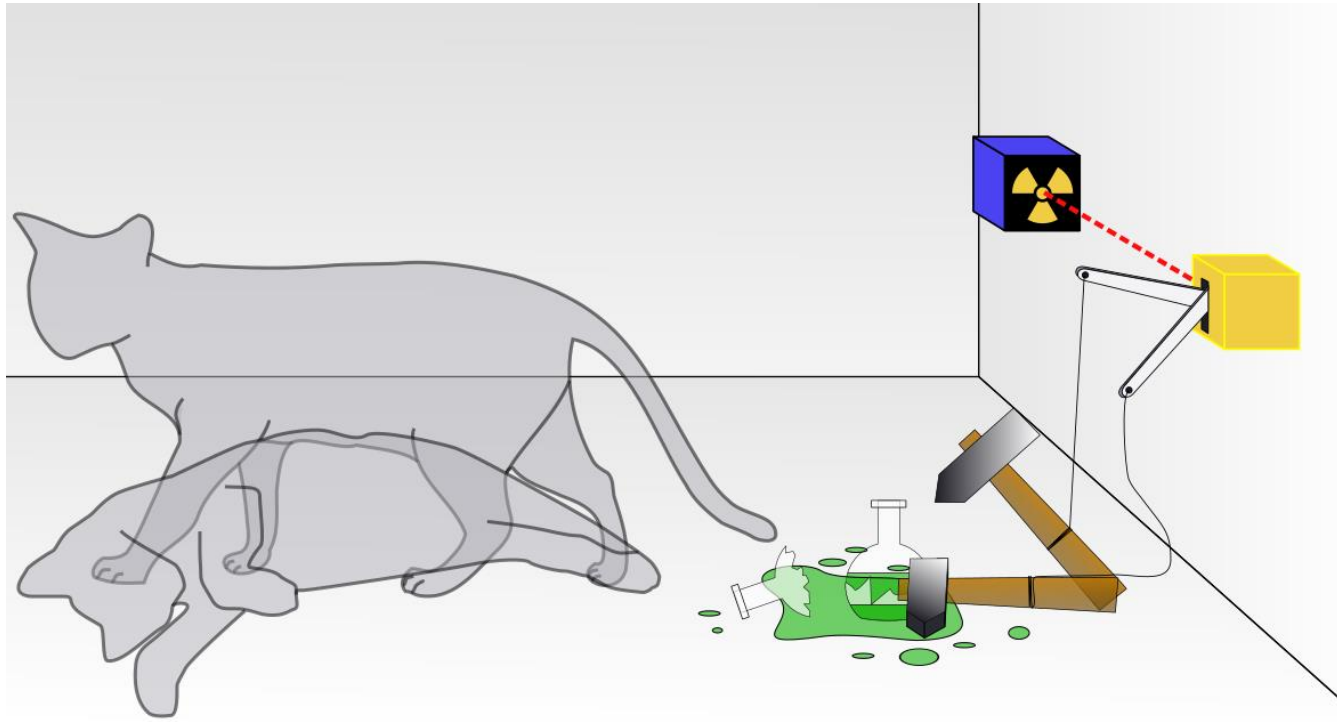


Founding Pillars !

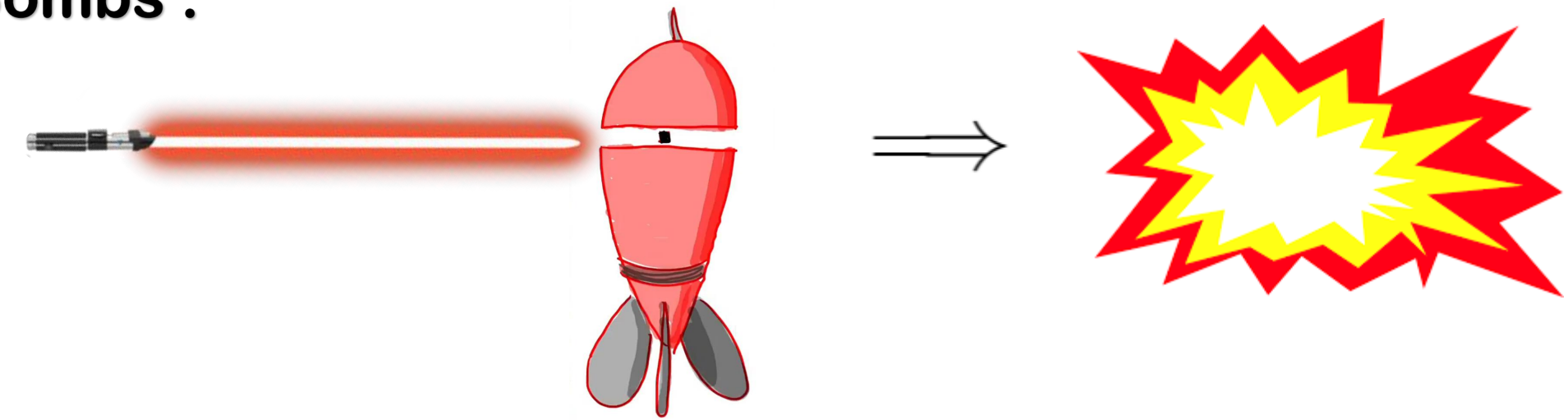
Theory of Relativity



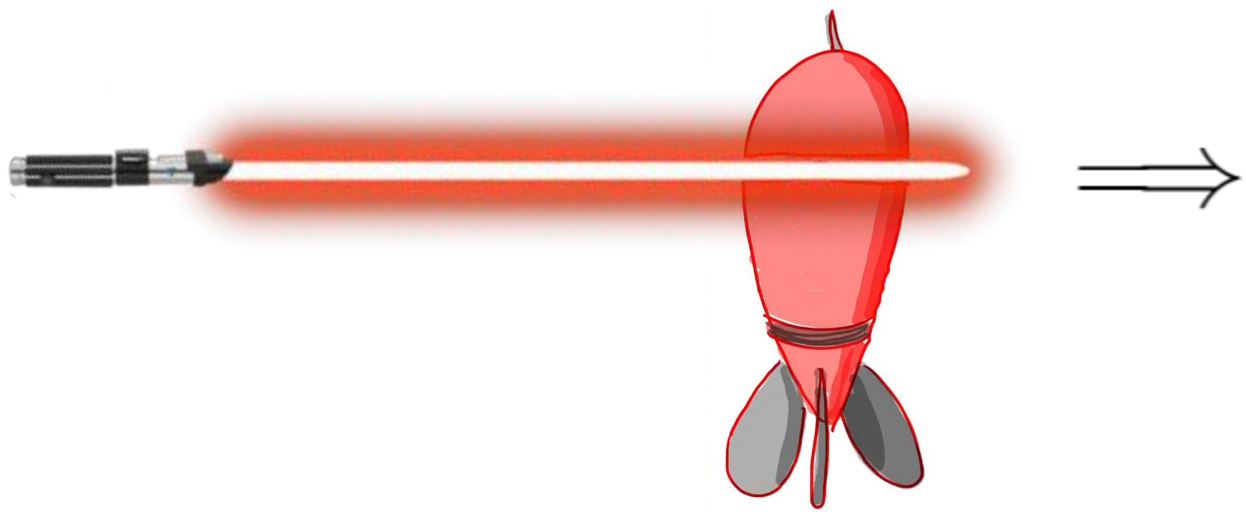
Quantum Mechanics



Working Bombs :



Defective Bombs :



Light simply Passes through!

So, can you figure out a strategy to tell me with certainty,
if this bomb is working or not?*

* Without of-course exploding the bomb duh

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if this bomb is working or not?*

In a world governed by laws of classical mechanics, its Impossible

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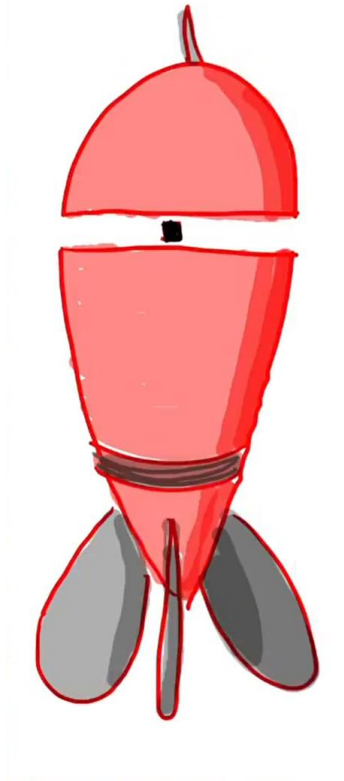
So, can you figure out a strategy to tell me with certainty, if this bomb is working or not?*

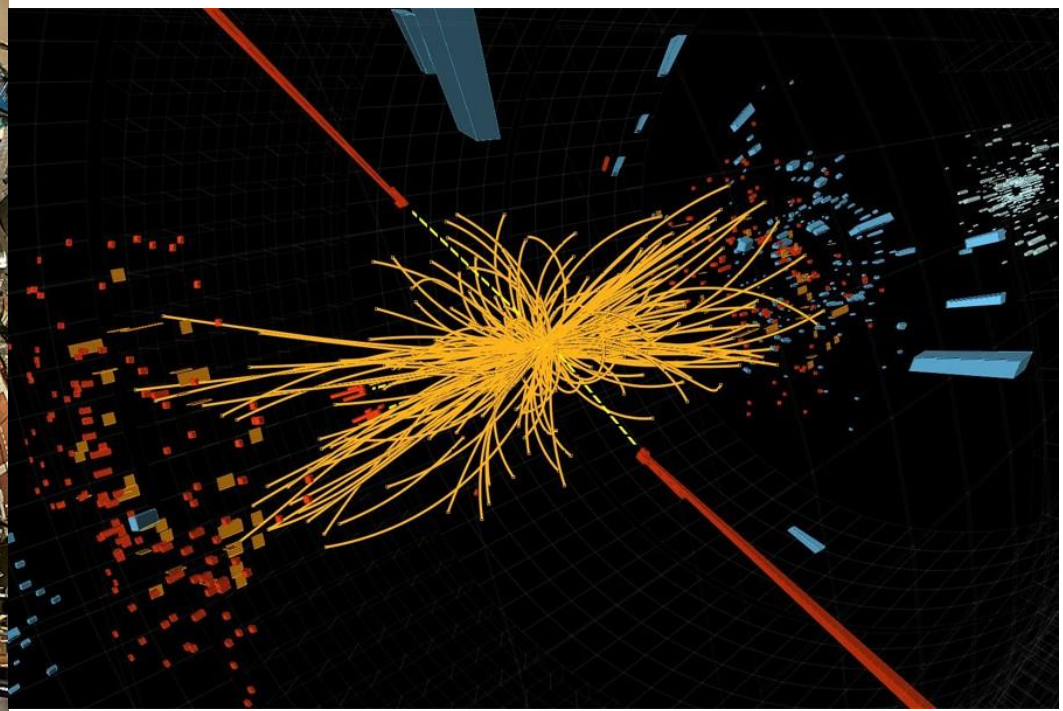


In a world governed by laws of classical mechanics, its Impossible

However, because we live in a world governed by laws of Quantum mechanics, We can indeed have some strategy to identify the working bombs!*

* Without of-course exploding the bomb duh

Aerial View of the Large Hadron Collider in Geneva



4th July 2012 ! Higgs Boson Discovery !

Including Neutrino Physics !

What about Dark matter, Dark energy ?

Gravity at Quantum scales ?

Matter - Anti-matter Asymmetry ?

String Theory, SuperSymmetry, ...

Various Opportunities

$\Longrightarrow$ Work as a Researcher @ CERN or countless other Particle Physics experimental setups like SLAC, FermiLab, DESY, EIC, DUNE, SNOLABS, ...

$\Longrightarrow$ Conduct research through academic mediums as a faculty or research assistant

Relevant starting skills

First Read/Study Non-relativistic Quantum mechanics, and see if you really like the mathematics involved**

Introduction to Quantum mechanics by D.J Griffiths

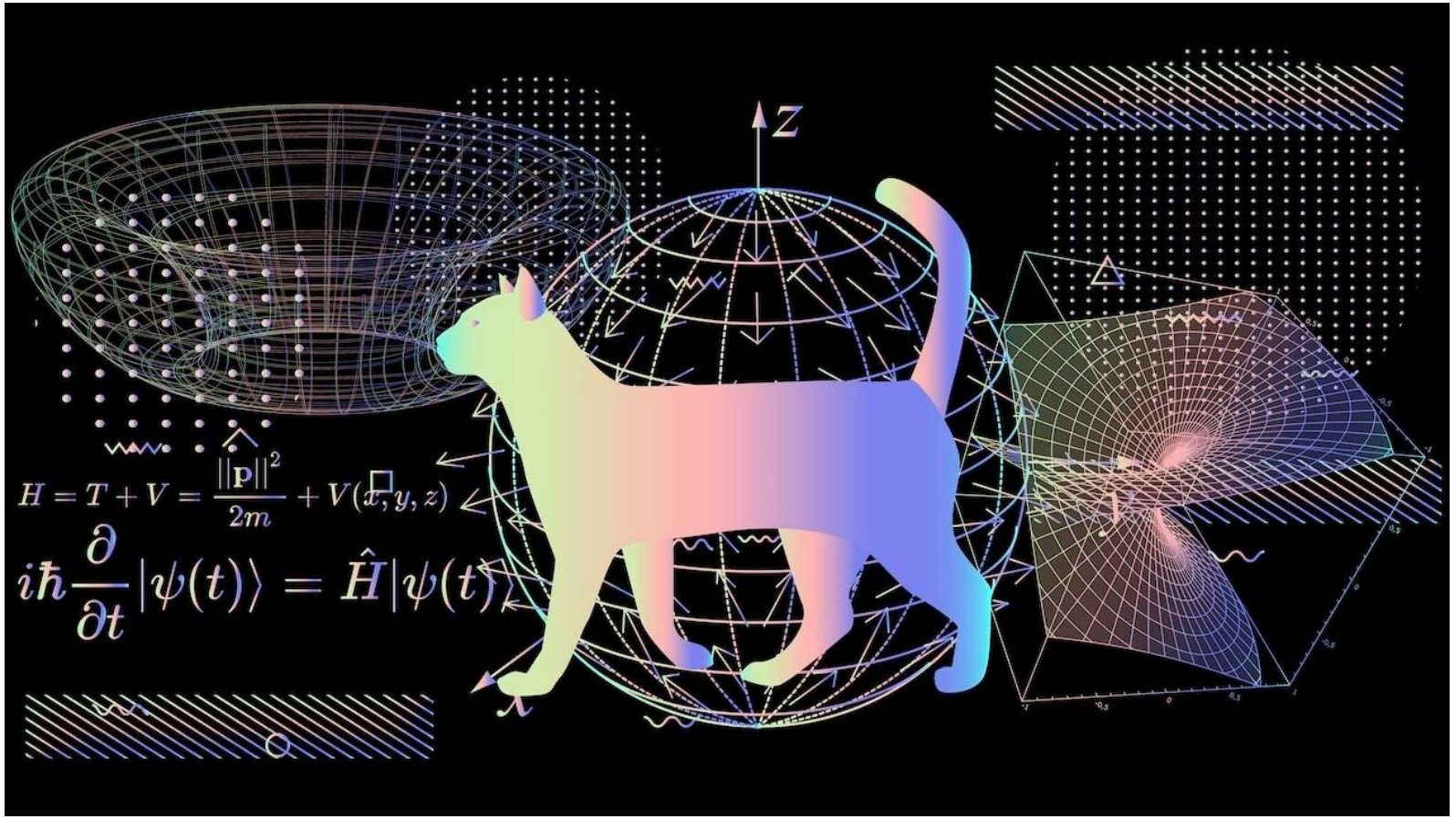
MIT – 8.04, 8.05 OCW Video Lectures, by Prof. Barton Zwiebach

Quantum Physics Video Lectures, by Prof. V. Balakrishnan at IIT Madras

***Introduction to Elementary Particles by D.J Griffiths (For Particle Physics introduction)**

** Don't try to confuse yourself with 'conceptual' understanding, just shut up and calculate

Thank you for listening!



Extra slides

"Known" Forces

force	E&M	weak	strong	gravity
range	∞	10^{-16} cm	10^{-13} cm	∞
strength	$\frac{1}{137}$	$\approx \frac{1}{30}$	≈ 1	$\approx 10^{-38} \frac{E^2}{m_P^2}$
particle	photon	W and Z	gluons	graviton?
mass	0	$\approx 100 m_P$	0 or $\approx m_P$	0