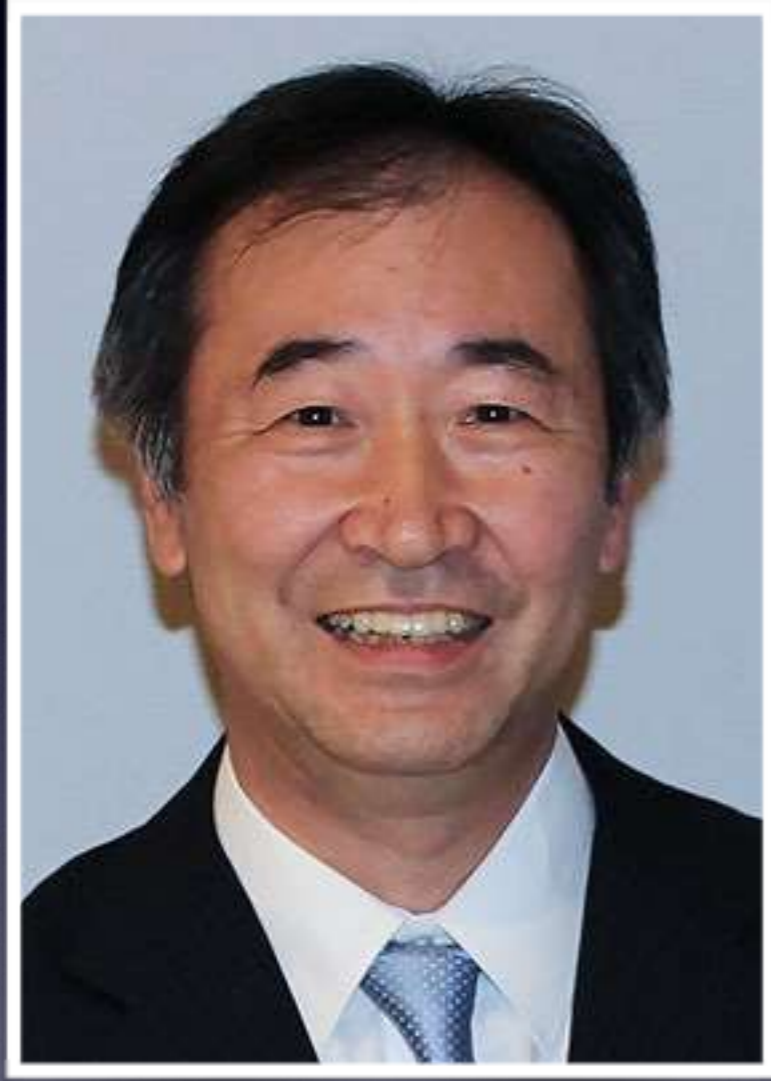


The Noble Prize in Physics 2015

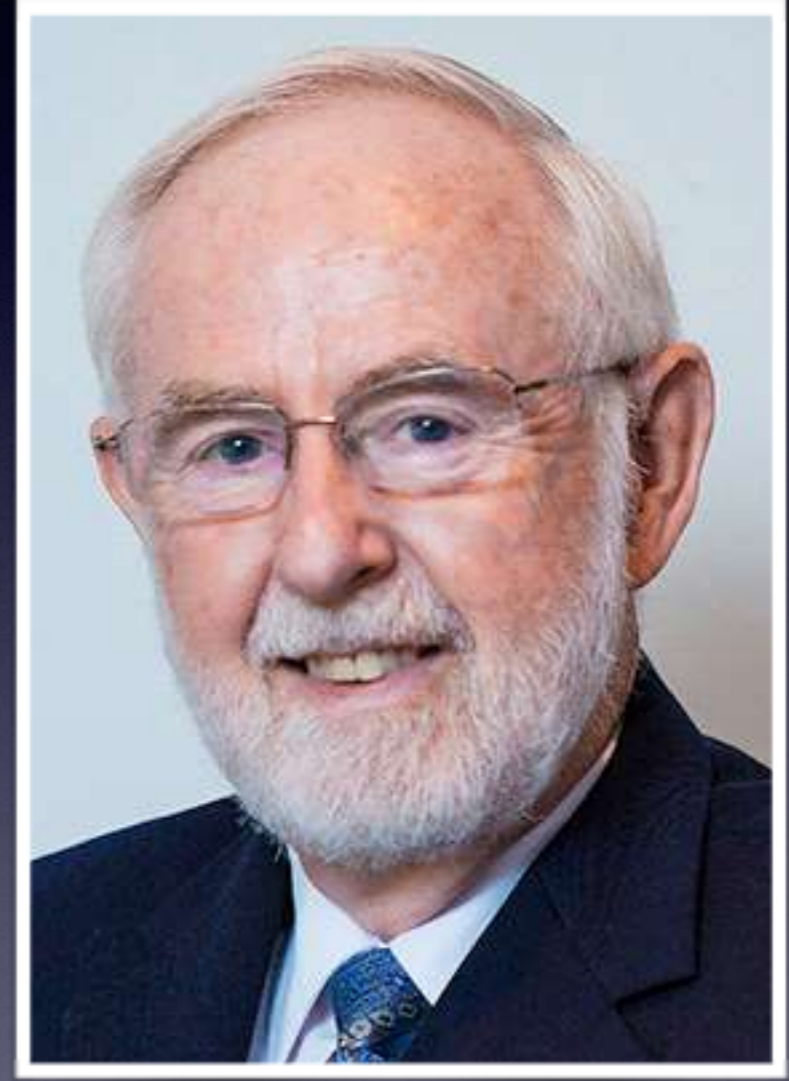
“For the discovery of neutrino oscillations,
which shows that neutrino have mass”

*Dr. Jimmy Sebastian,
Department of physics*

The recipients were



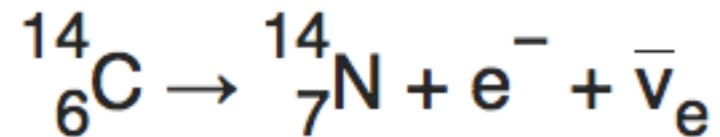
Prof. Takaaki Kajita
University of Tokyo, Kashiwa, Japan



Prof. Arthur B. McDonald
Queen's University, Kingston, Canada

A brief history of neutrino

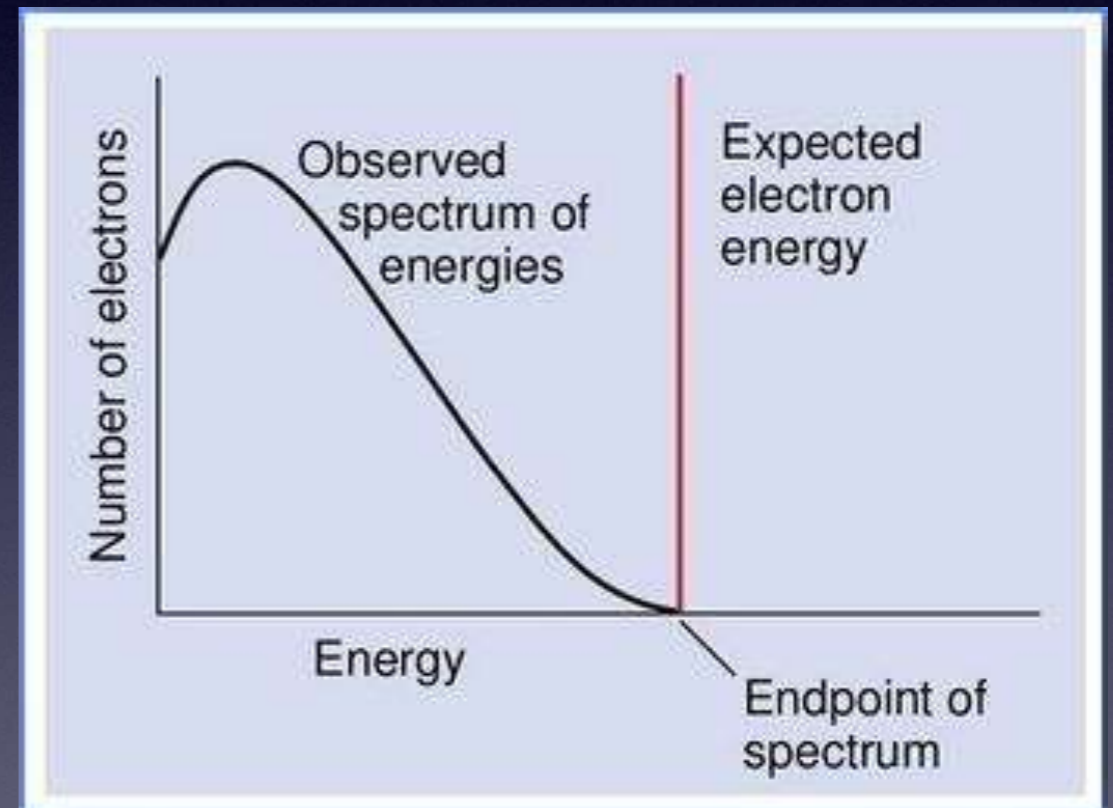
Beta decay - 1896



The neutrino was proposed by Wolfgang Pauli in 1930.

"I have done a terrible thing, I have postulated a particle that cannot be detected."

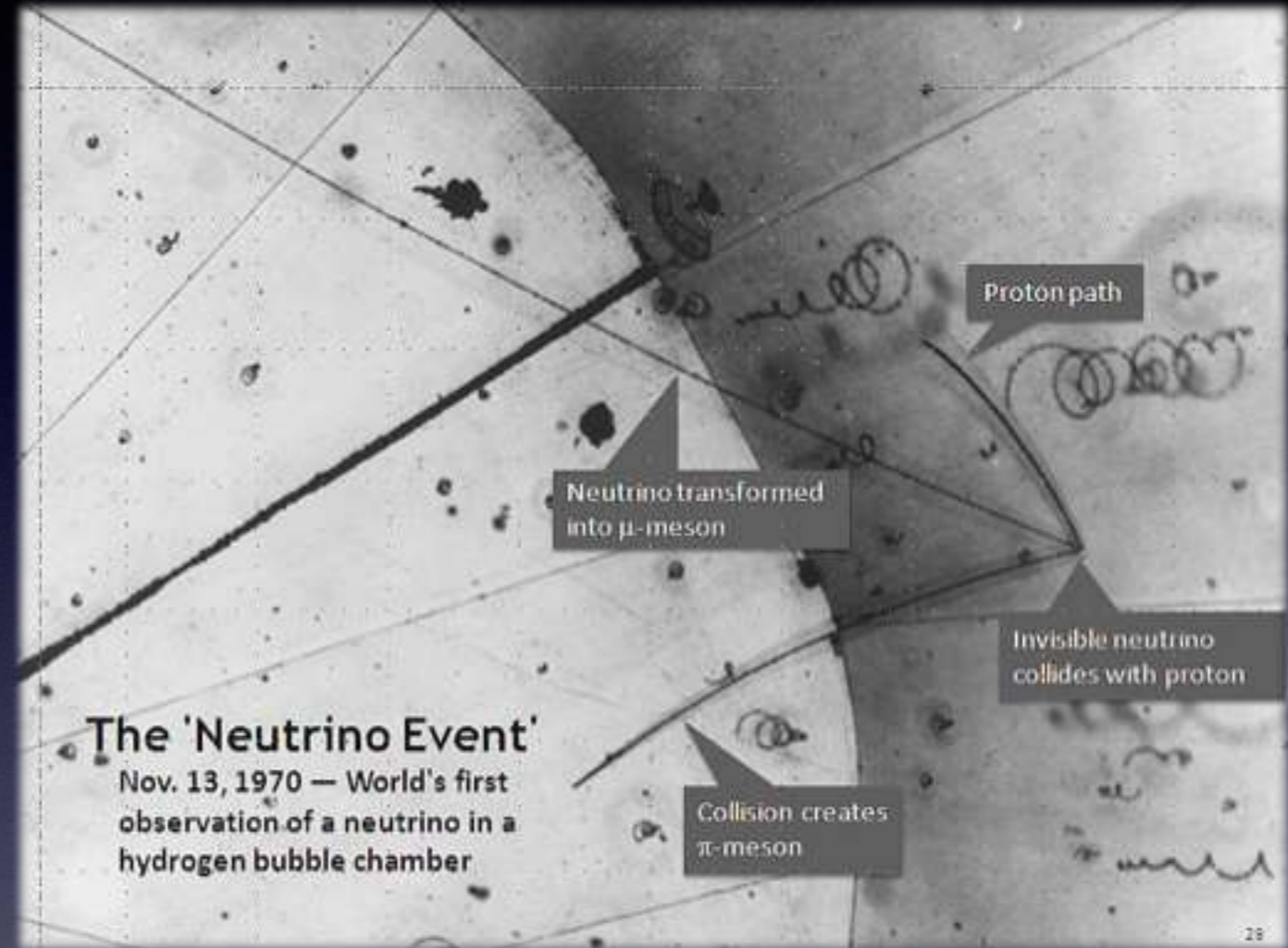
Enrico Fermi called this particle the neutrino which meant "little neutral one"



Beta decay spectrum of electrons

Neutrino

- A neutrino is a lepton, an elementary particle with half integer spin, that interacts only via the weak subatomic force
- In 1956 Reines and Cowan found evidence of neutrino interactions. Noble prize in 1995
- Billions of neutrinos stream through your body every second, yet only one or two of the higher energy neutrinos will scatter from you in your lifetime.
- 1 billion = 1000 000 000

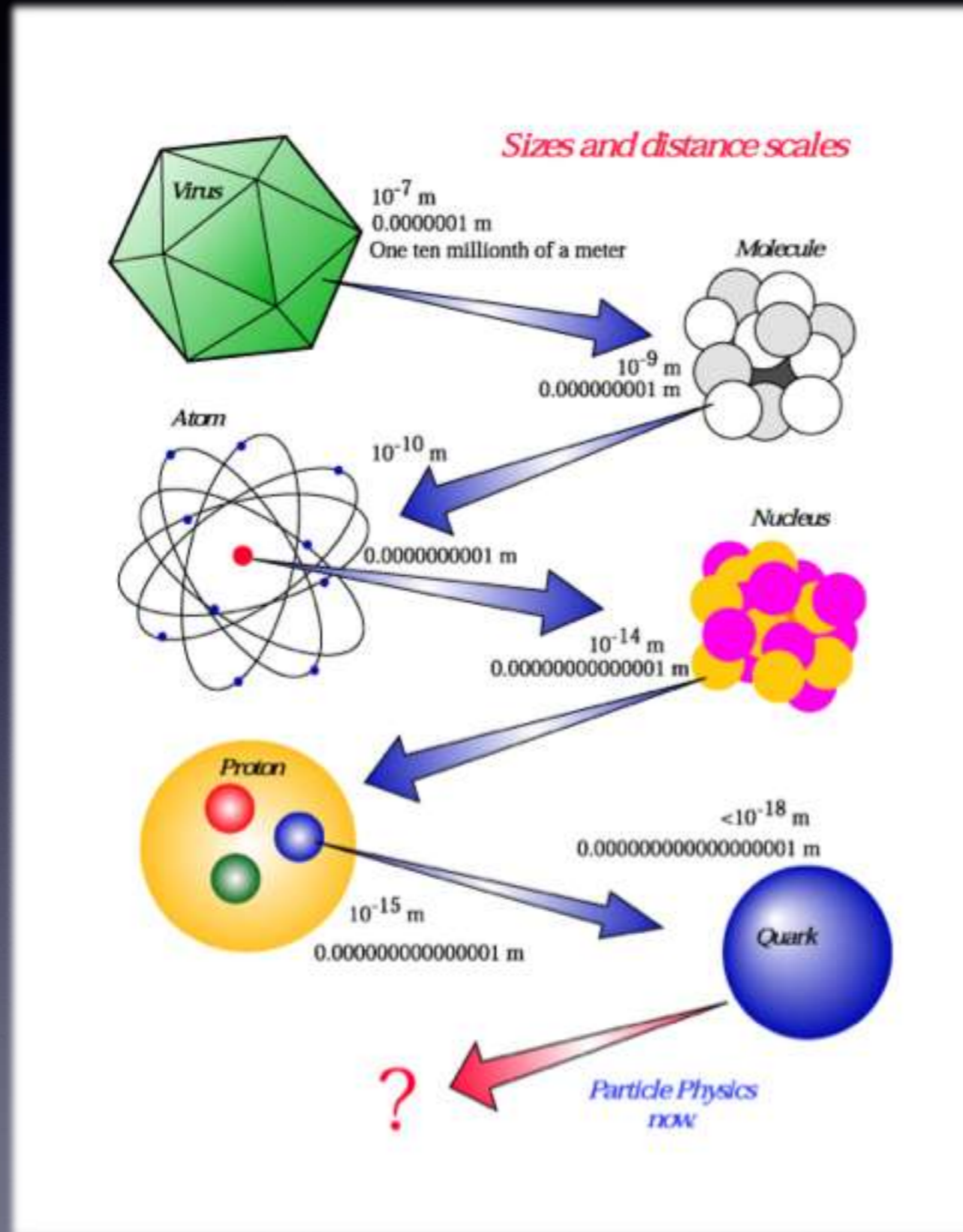


Generation 2	
Muon neutrino	ν_{μ}
Muon antineutrino	$\bar{\nu}_{\mu}$

Generation 1	
Electron neutrino	ν_e
Electron antineutrino	$\bar{\nu}_e$

Generation 3	
Tau neutrino	ν_{τ}
Tau antineutrino	$\bar{\nu}_{\tau}$

The size of the neutrino?



Solar Neutrino Problem(SNP)

In recent years, theoretical models of the sun have permitted detailed calculations of the number (or flux) of neutrinos released from the sun.

Several neutrino experiments have detected solar neutrinos



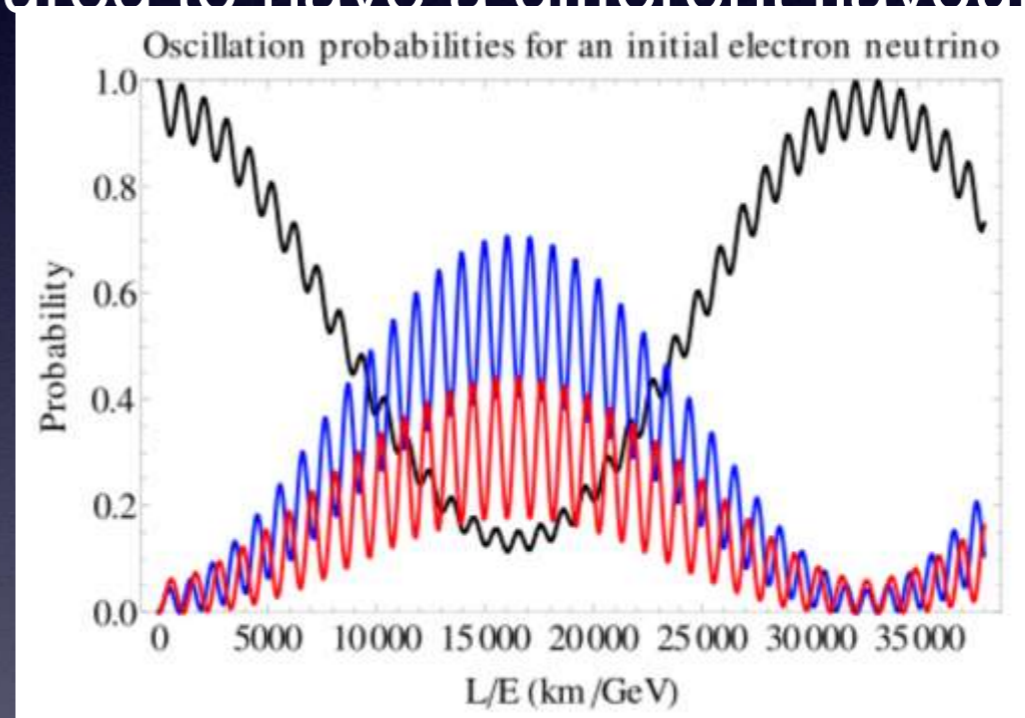
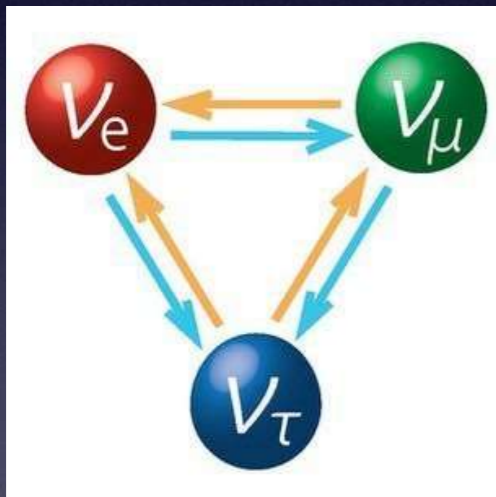
The detected flux was too low.

It appears that far too few neutrinos are detected than can be consistent with the known energy output of the sun.



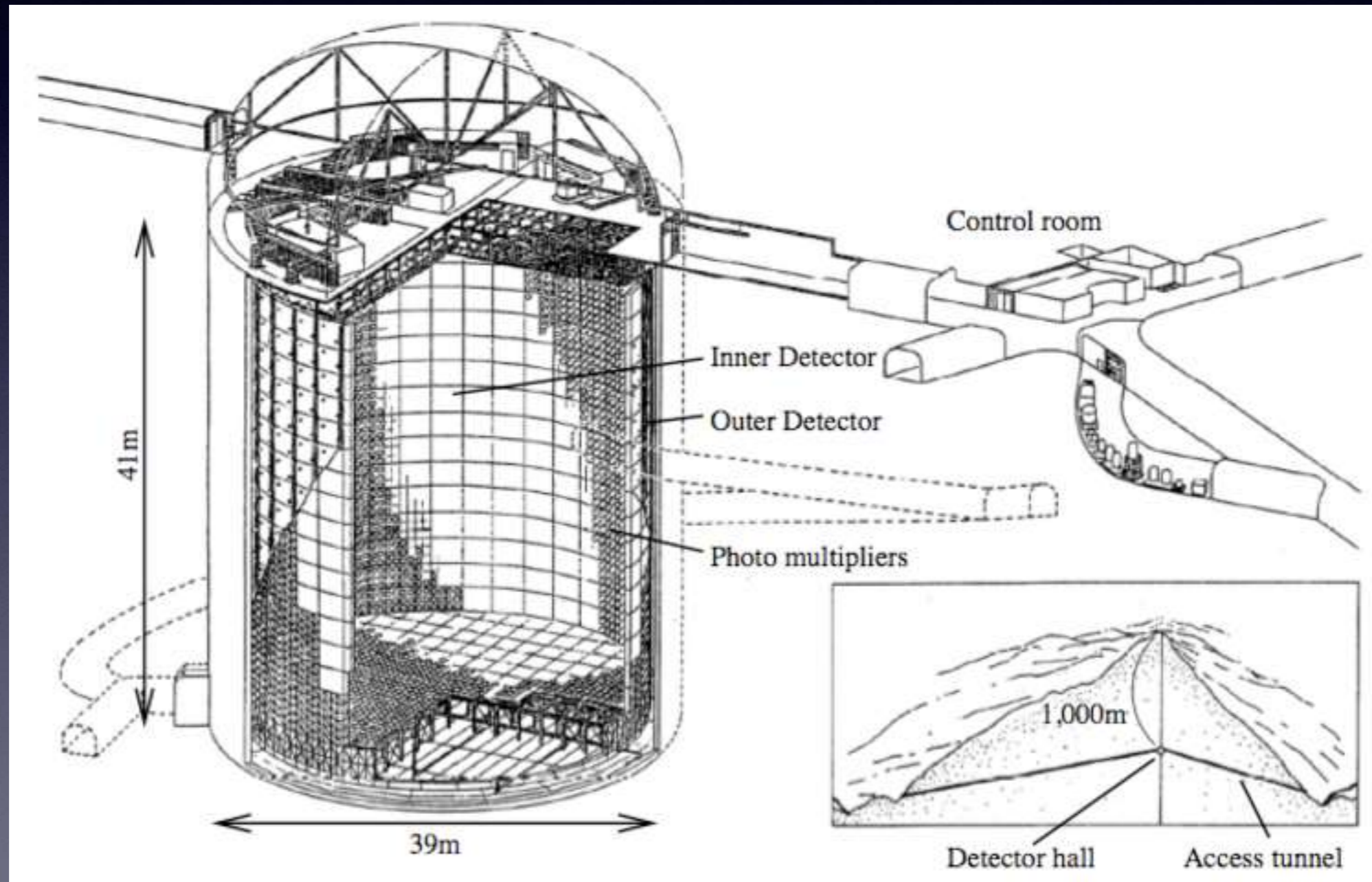
Neutrino Oscillations

- Neutrino oscillation is a quantum mechanical phenomenon whereby a neutrino created with a specific lepton flavour (electron, muon, or tau) can later be measured to have a different flavour.

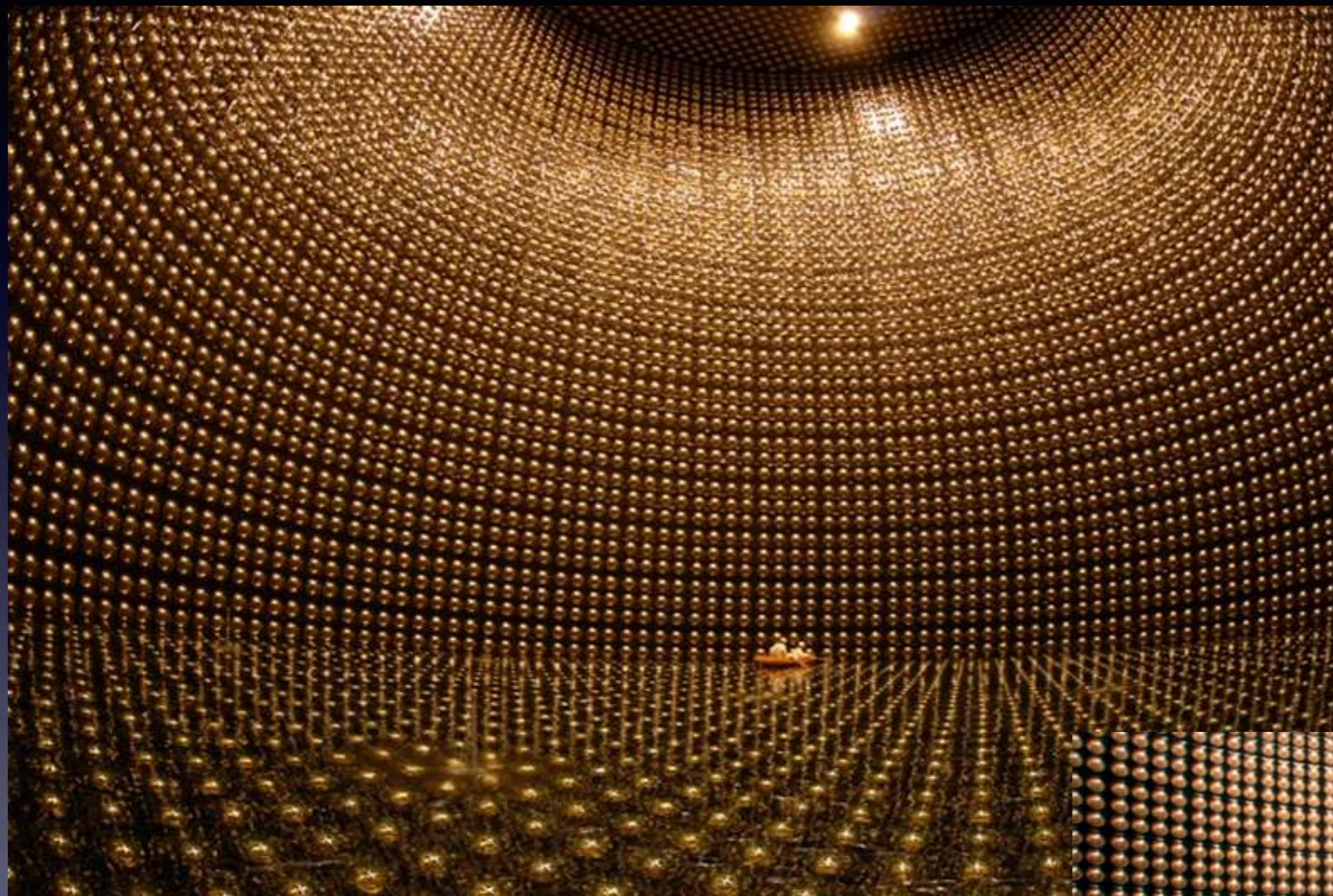


- The probability of measuring a particular flavour for a neutrino varies periodically as it propagates through space

Neutrino detector



Neutrino detector

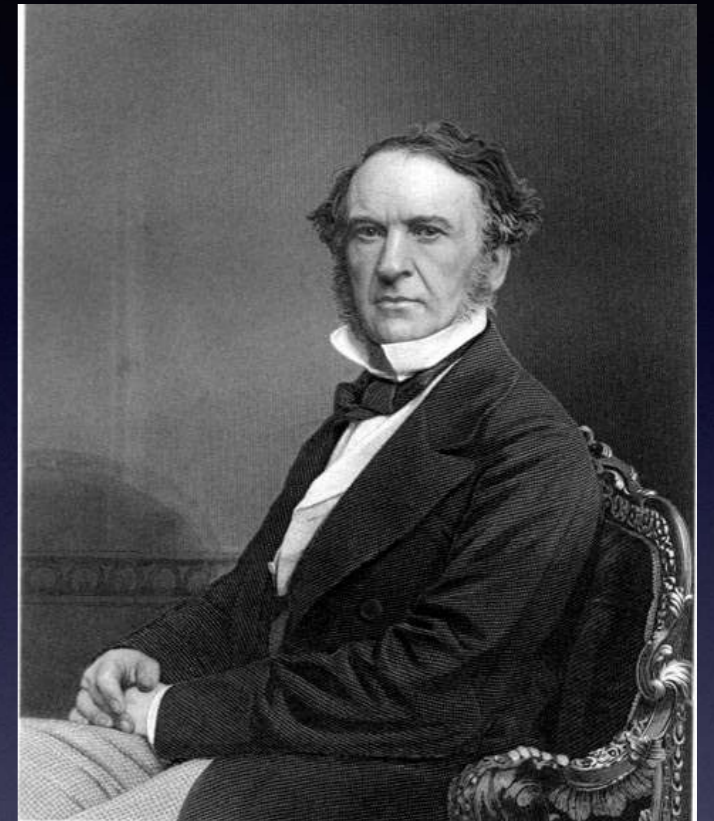


Why study neutrino?

But what good is this electricity ?



Michael Faraday



William Ewart Gladstone

May be soon you can tax it.