Particle Physics: Introduction

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Week 1: September 16, 2017
Columbia University Science Honors Program

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

NEVIS LABORATORIES

Welcome!

José Crespo-Anadón

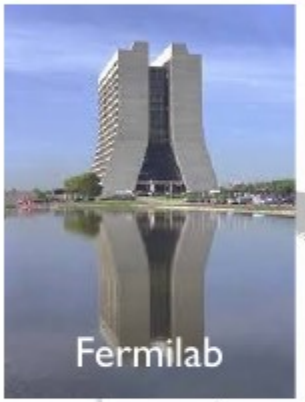
- Postdoc on Neutrino group, MicroBooNE experiment at Fermilab

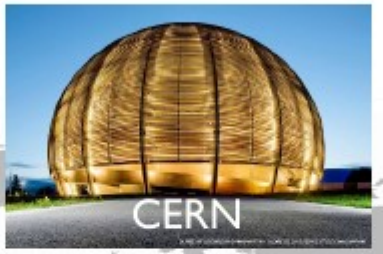
Inês Ochoa

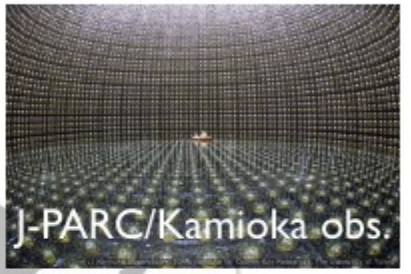
- Postdoc on ATLAS experiment at CERN

Cris Vilela

- Postdoc on T2K and Super-K experiments in Japan







Course policies

- **Attendance record counts**
  - Up to four absences
  - Lateness or leaving early counts as half-absence
  - Send email notifications of all absences to shpattendance@columbia.edu.

- Please, no cell phones during class

- **Please, ask questions!**

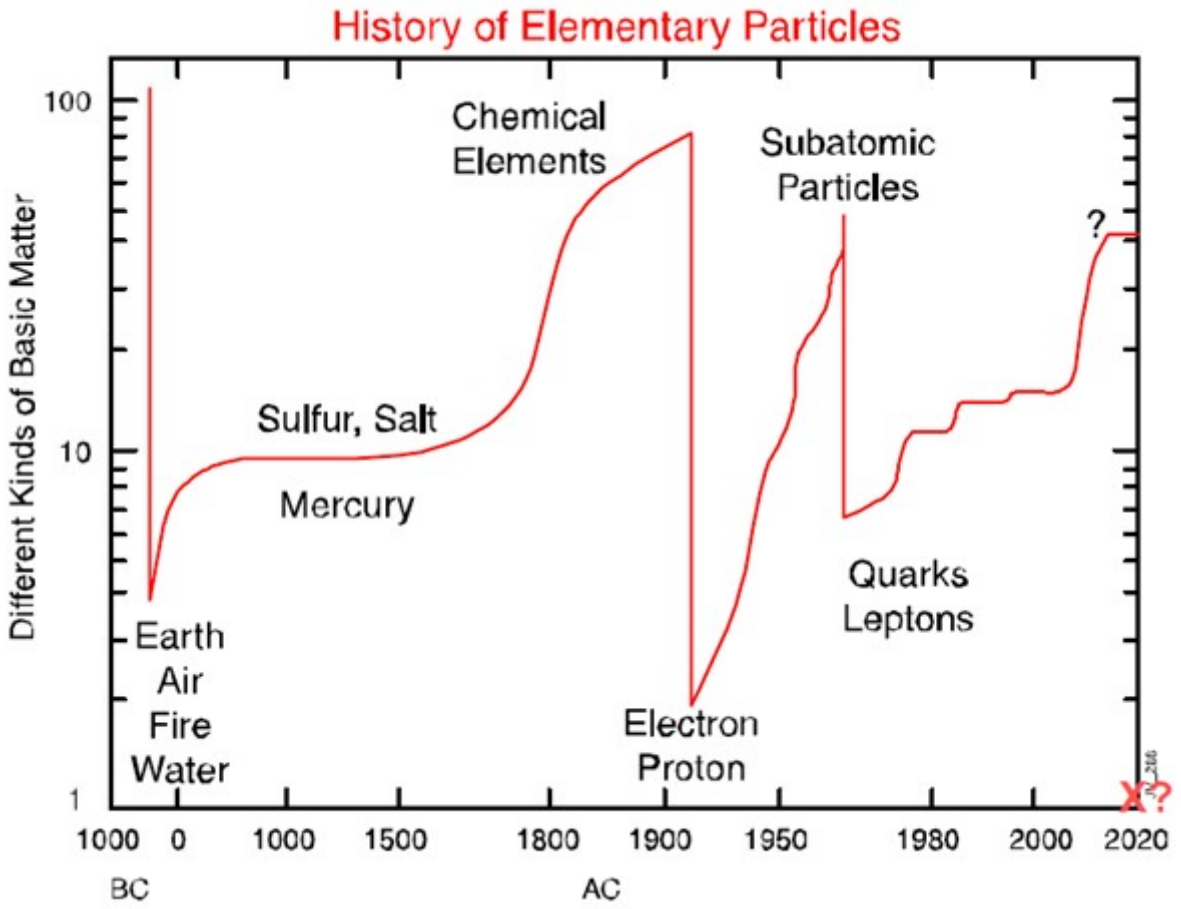
- Lecture materials

  https://twiki.nevis.columbia.edu/twiki/bin/view/Main/ScienceHonorsProgram

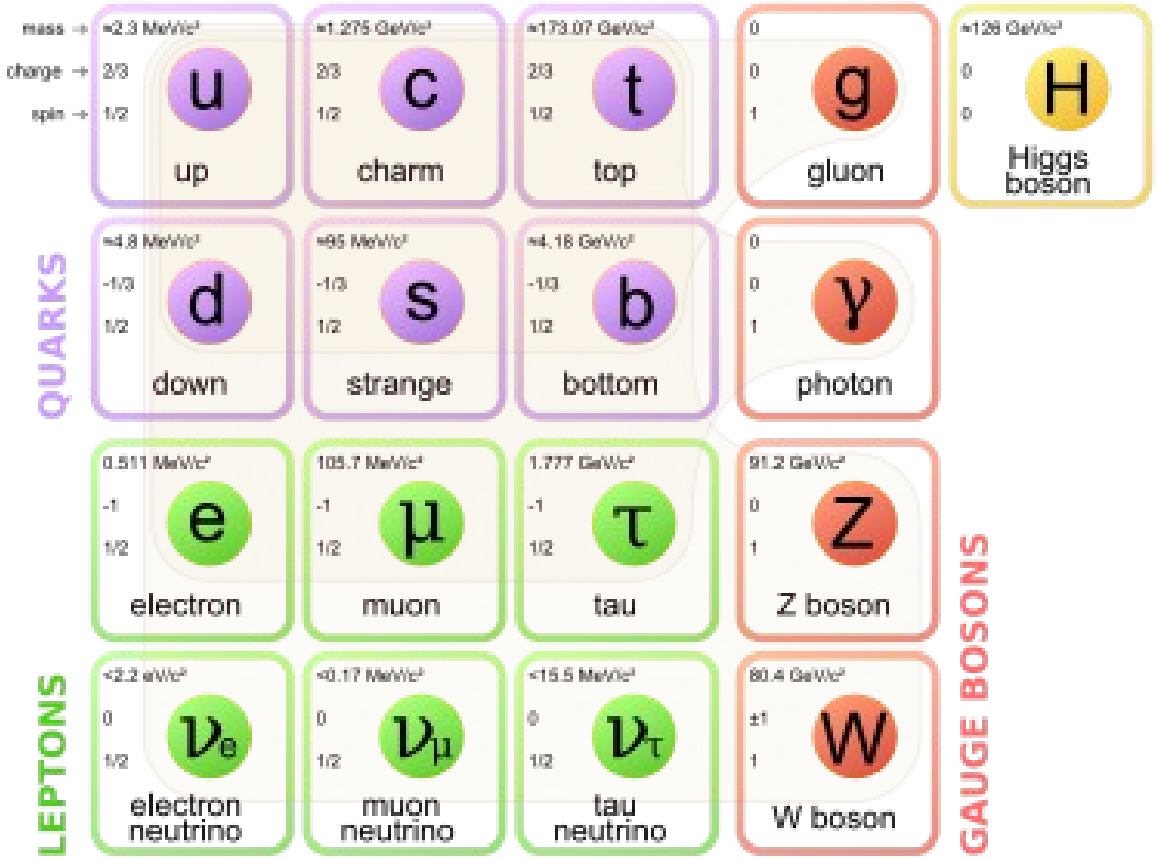
Schedule

Month	Day	Lecture	Teacher
September	16	Introduction	José
	23	History of Particle Physics	José
	30	No classes -- Yom Kippur	-
October	7	Special Relativity	Inês
	14	Quantum Mechanics	Inês
	21	Experimental Methods	Cris
	28	The Standard Model - Overview	Cris
November	4	The Standard Model - Limitations	Cris
	11	Neutrino Theory	José
	18	Neutrino Experiment	José
	25	No classes -- Thanksgiving	-
December	2	LHC and Experiments	Inês
	9	The Higgs Boson and Beyond	Inês
	16	Particle Cosmology	Cris

Evolution of the number of elementary particles

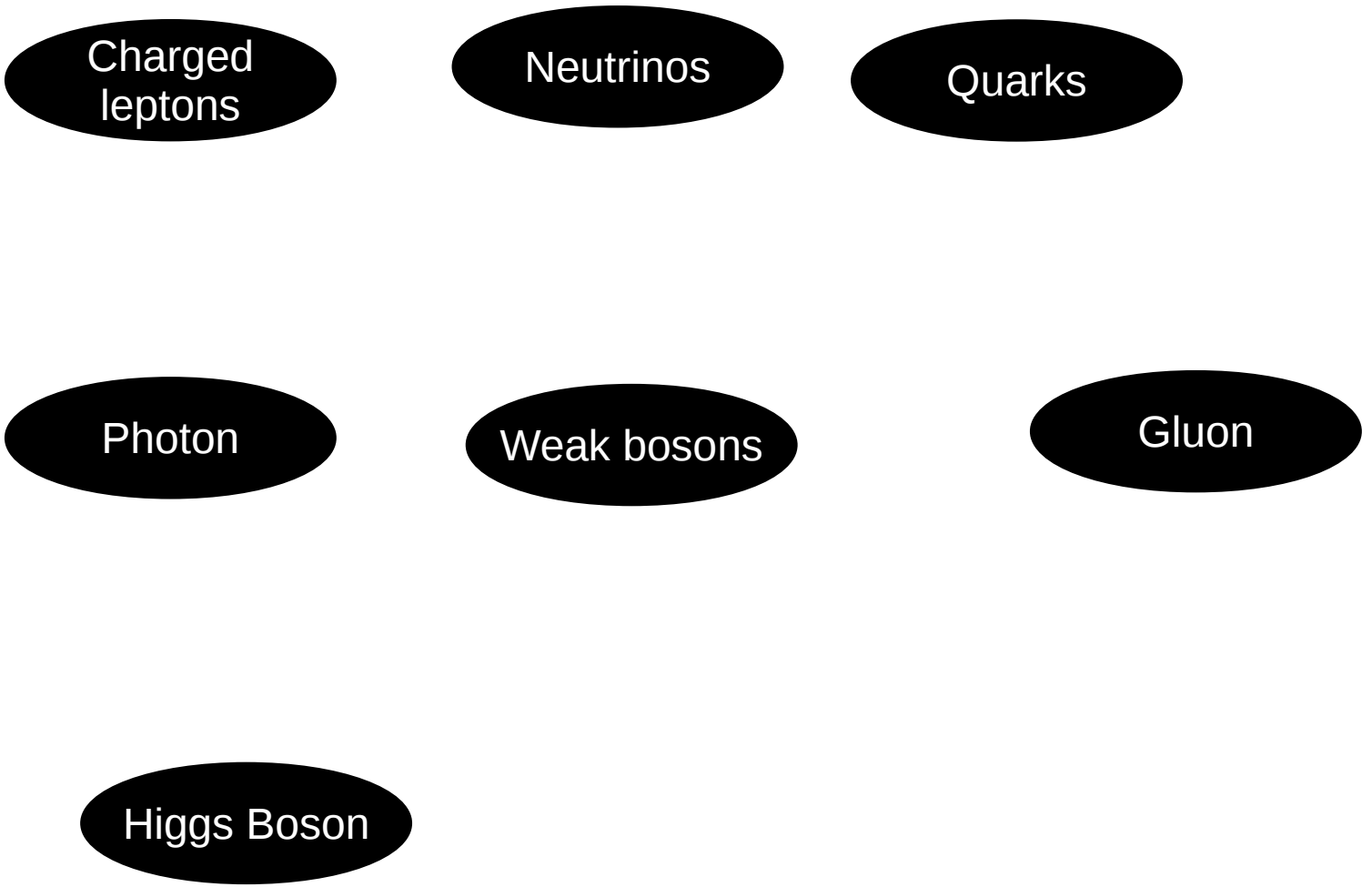


The Final Periodic Table?

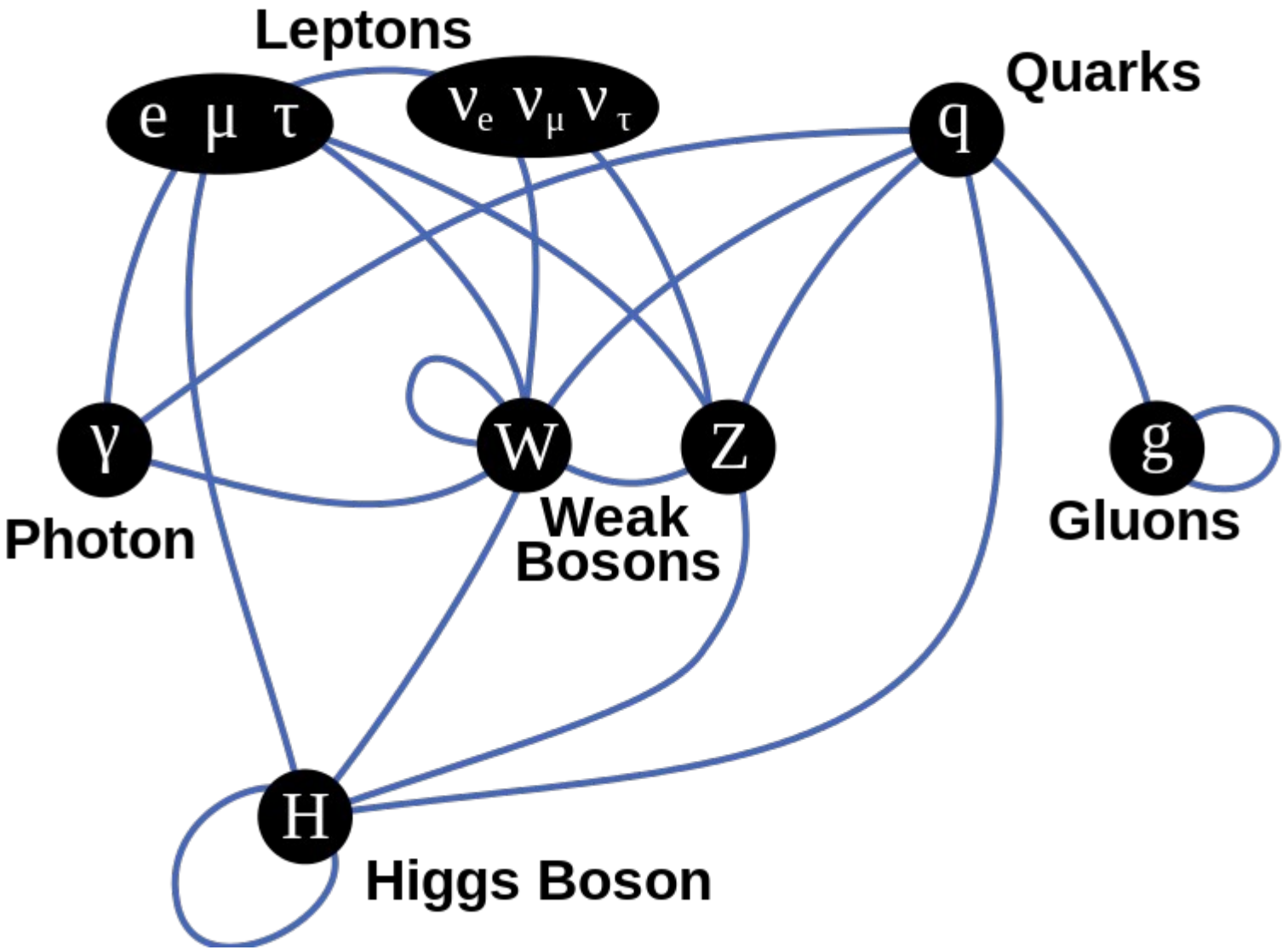


Quiz

- Draw lines between the fermions and the bosons that can interact with them



Standard Model solution



By en:User:TriTertButoxy, User:Stannered - en:Image:Interactions.png, Public Domain, https://commons.wikimedia.org/w/index.php?curid=3496370

Powers of Ten (1977)

https://www.youtube.com/watch?v=0fKBhvDjuy0

Quantum Field Theory