
1975:

Perl et al. discover the tau lepton, i.e. the third lepton family.

1977:

Lederman et al. discover the Υ particle, which is understood to be a $b\bar{b}$ bound state.

1979:

The PETRA collaboration at DESY finds the first evidence for the observation of gluons produced in $e^+e^- \rightarrow q\bar{q} + g$ processes (3-jet event).

1983:

The UA1 collaboration (Rubbia et al., van der Meer) of the $Spp\bar{p}S$ experiment at CERN discover the gauge bosons of the electroweak interaction in $p\bar{p} \rightarrow Z^0 \rightarrow l^+l^-$ and $p\bar{p} \rightarrow W^+ \rightarrow l^+\nu_l$ processes.

1995:

The DO and CDF collaborations at the Fermilab $p\bar{p}$ collider discover the top quark.

1989-2000:

The CERN LEP and SLC e^+e^- colliders precisely measure the properties of the Z^0 boson thereby confirming the Standard Model of electroweak interactions among leptons and quarks as a fully-fledged Quantum Field Theory.

The wealth of electroweak precision data enables a prediction for the mass of the Higgs boson obtained within the Standard Model:

All data favor a relatively light Higgs boson which is within the reach of the next generation of high-energy colliders !

2000:

The DONUT experiment at Fermilab finds the first “direct” evidence for the tau-neutrino.

~ 1996-present:

Experiments (e.g., SNO, KamLAND, Super-Kamiokande) which study solar (ν_e), atmospheric ($pN \rightarrow \pi X \rightarrow \nu_\mu \mu X$) and accelerator generated neutrinos, report evidence for neutrino oscillation, i.e. neutrinos change their flavor ($\nu_e \leftrightarrow \nu_\mu$, $\nu_\mu \leftrightarrow \nu_\tau$).

Neutrino oscillation implies that neutrinos are massive and mix.

The Future:

Hadron colliders (Tevatron Run II, LHC, VLHC), **Lepton colliders** (e^+e^- colliders (B-factories, high-energy linear colliders), muon collider), **Neutrino experiments** (study of solar, atmospheric and accelerator generated neutrinos), **Astro-particle physics** (dark matter search, study of high-energetic cosmic rays etc.).

We are seeking answers to many open questions, such as

- Are the weak gauge boson masses generated by the Higgs-Kibble mechanism or Where is the Higgs boson ?
- Why are there so many copies of the first generation of leptons and quarks ? What determines their mass hierarchy ? What is the origin of CP violation and how do neutrinos mix ?
- At what energy scale does the Standard Model break down and new physics emerges ? Which of the principles we believe to be fundamental will survive and what new ones will emerge to shape the new theory ?
- Is there another symmetry of nature that connects fermions and bosons called Supersymmetry ?
- How does gravity fit in the picture ?