# Particle Physics Research - Birmingham group

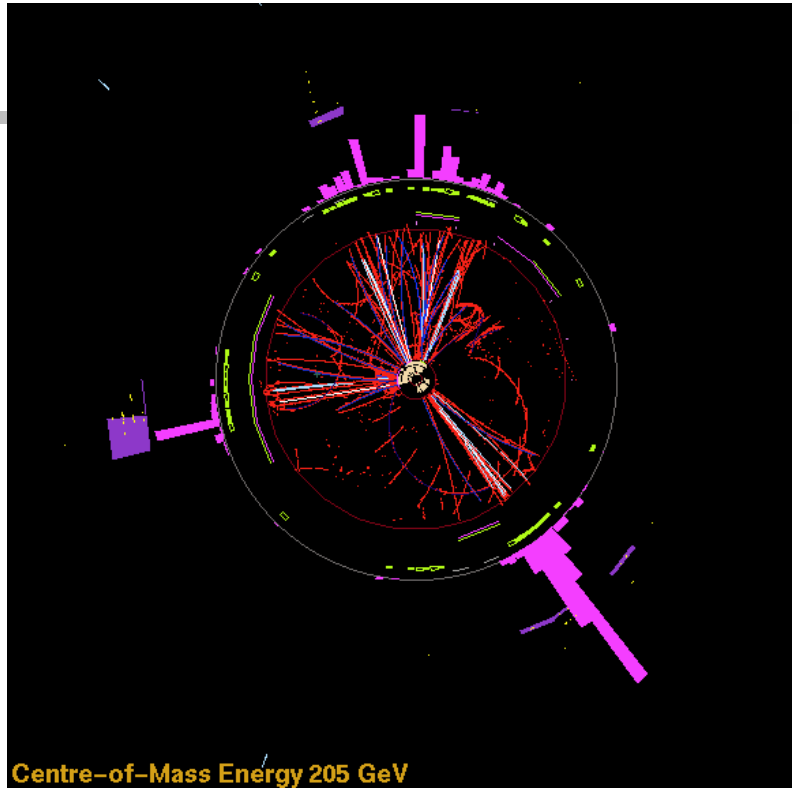
HEFCE academic staff 7

Research staff 13,

Engineers 2,

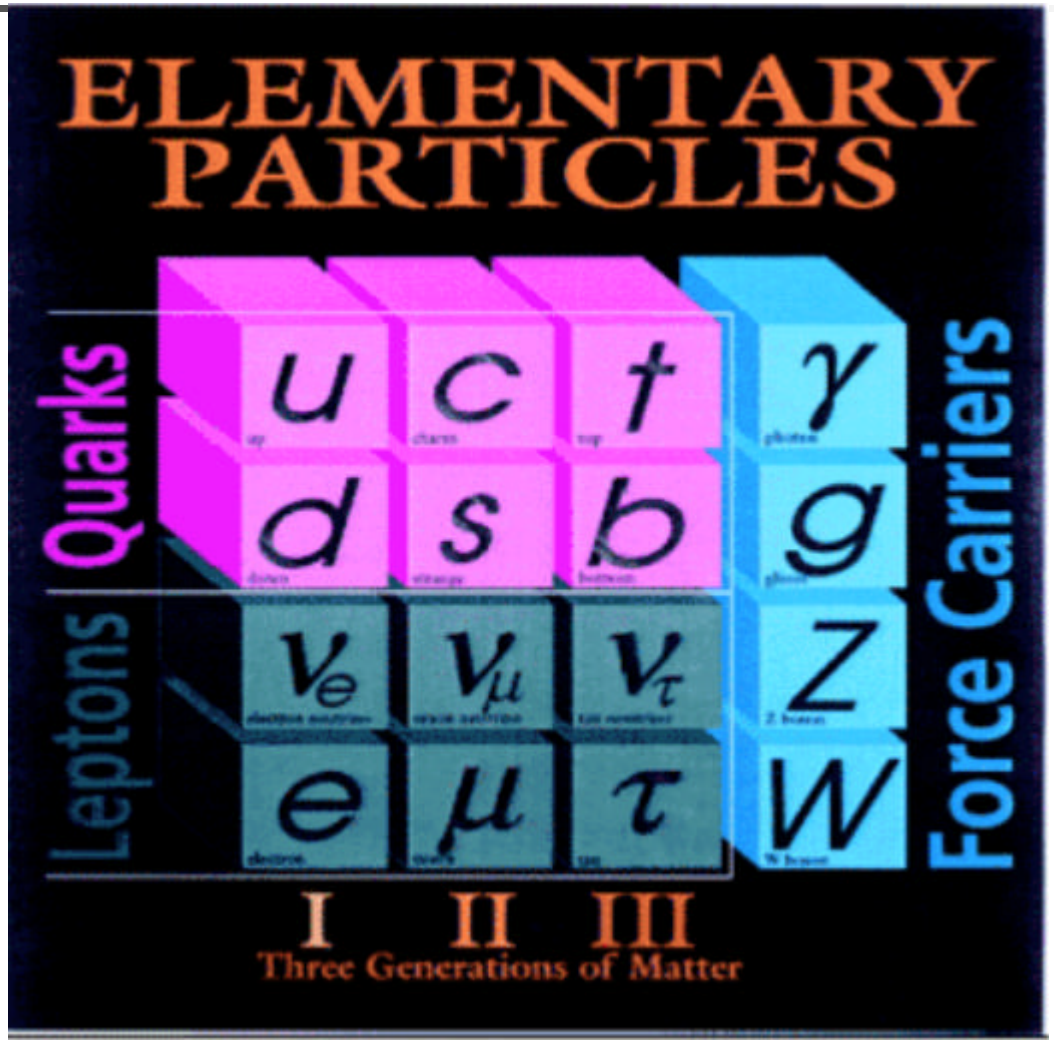
Technicians 2

PhD students 12

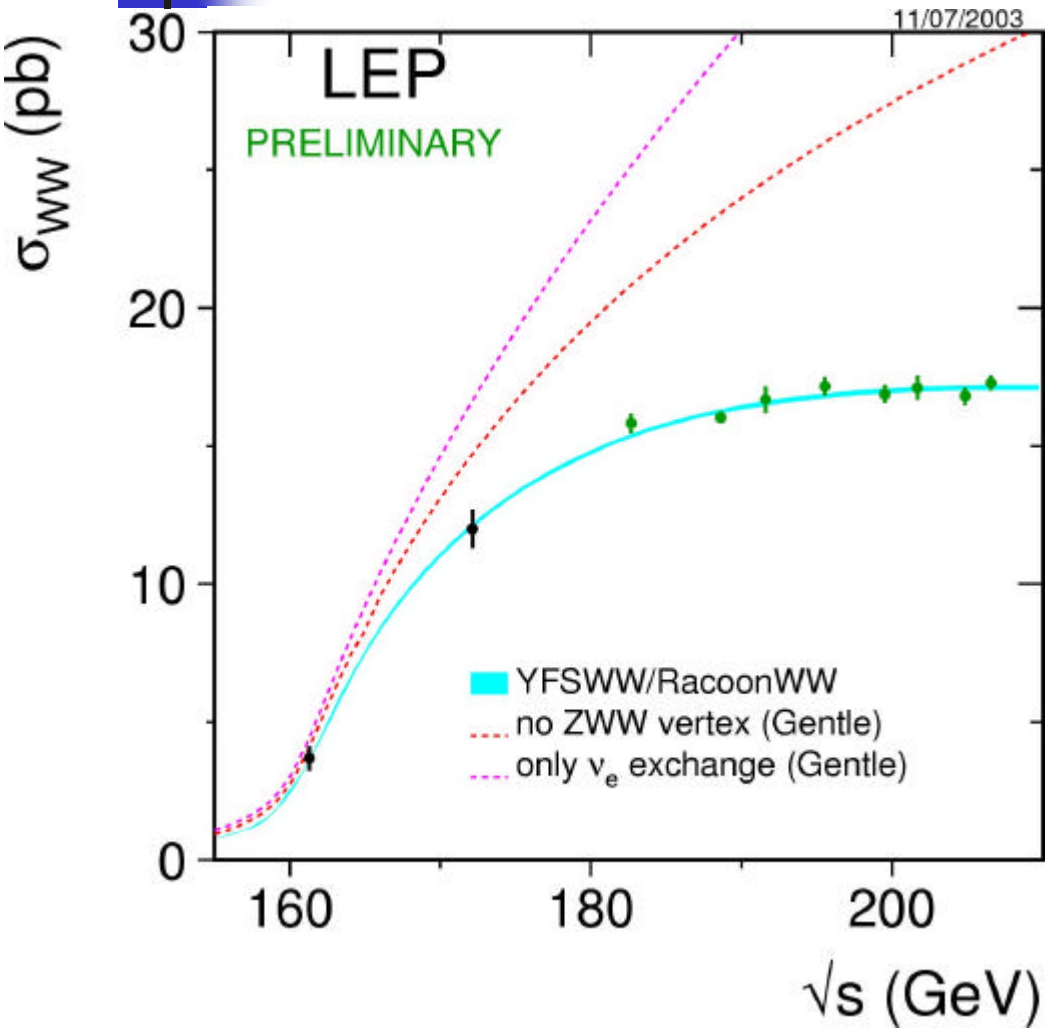


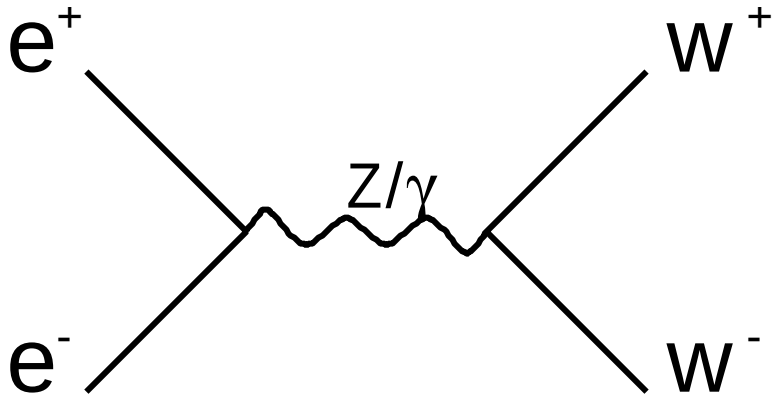
# Steve O'Neale(1948-2003)

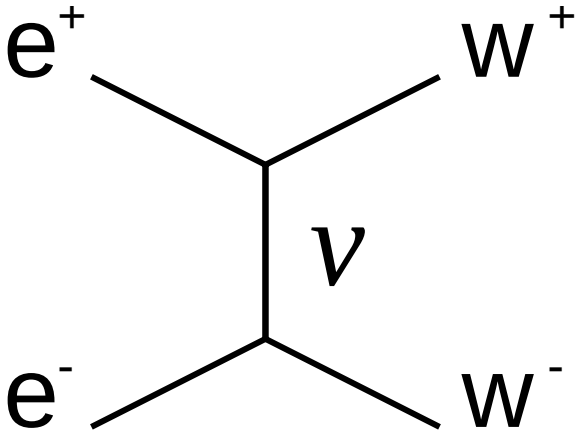
# Quarks,leptons & bosons

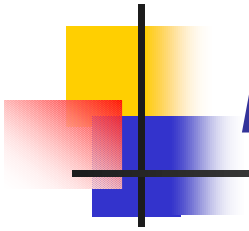


# Gauge boson couplings



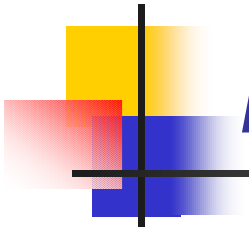





# *Key questions*

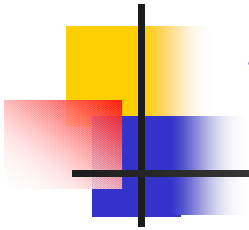
- Origin of mass
- Properties of strong interaction
- Origin of matter-antimatter asymmetry
- Unification of forces
- Neutrino masses
- Three generations
- .....



# Particle Physics Projects

- Current experiments
  - Hera (H1)
  - Tevatron
  - CP violation (BaBar)
  - Neutrino observatories
- In-build experiments
  - Large Hadron Collider ( ATLAS, ALICE)
  - Long baseline neutrino beams
- Future facilities
  - Linear collider (CALICE)
  - Neutrino factory/ Muon collider

# *Collaboration and Timescale of Experiments*



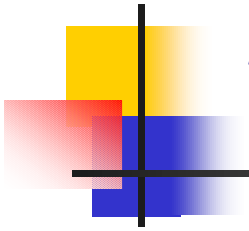
- All our experiments are international collaborations at particle colliders at

  CERN, DESY and SLAC
- Most involve detector construction and operational responsibilities
- Most take data and perform physics analyses for up to 10 years (total time 15-20 years)
- We focus on physics analysis in all of our experiments

# Links to other fields

- Challenging detector and electronics requirements – spin off technologies
- Data rates, data storage and processing require world-wide Grid computing model
- Midlands e-science centre of excellence MeSc
- Tier2 centre with Bristol, Cambridge, Oxford and RAL all consistent with our main aim

precision measurements and search for new phenomena in high energy collisions



# The experiments

- BaBar (Chris Hawkes) — CP violation
- H1 (Paul Newman) — strong interaction
- ALICE (David Evans) — quark confinement
- ATLAS (Dave Charlton) — origin of mass
- Linear Collider (Nigel Watson) — unification

- Conclusions (Pete Watkins)