

NUCLEON SPIN

Elliot Leader
Imperial College London

Spin in a relativistic context is a subtle concept!

This was brought out dramatically in 1988, when the results of the European Muon Collaboration (EMC) experiment at CERN on polarized deep inelastic lepton-hadron scattering (usually abbreviated as 'polarized DIS') seemed to imply that the contribution to the proton's spin coming from the spin of its quarks was compatible with zero. The EMC paper was the most cited experimental paper for several years, and led to a major theoretical effort which eventually showed that the 20 year old, and long accepted, theoretical treatment was incomplete.

More recently, a classic and much cited paper on angular momentum sum rules, i.e. theoretical relations between the nucleon spin and the angular momentum of its constituents, was also shown to be incorrect.

Both these matters will be covered in the lectures.

The main topics are:

- 1) A brief reminder of the role of DIS in the discovery of partons.
- 2) What is measured in polarized DIS—the structure function g_1 .
- 3) The parton model for g_1 and the longitudinal polarized parton densities.
- 4) The EMC experiment and the "spin crisis in the parton model".
- 5) Resolution of the "spin crisis" via the axial anomaly (the theory of the axial anomaly will be discussed in some detail in the lectures of Stefano Forte).
- 6) Transverse polarized parton densities and their measurement.
- 7) Angular momentum sum rules—problems in their derivation.
- 8) The most general sum rule and a new transverse spin sum rule.