**Dirac Equation**

Paul Dirac discovered this equation in 1928. The history of the Dirac equation illustrates perfectly how a pursuit of mathematical consistency can lead one to a deeper understanding of Nature. Dirac's goal was to find an analogue of the Schrödinger equation\* which takes into account that electrons cannot travel faster than the speed of light. Dirac regarded a prior proposal in this direction (the Klein-Gordon equation) as unsatisfactory because it appeared to predict negative probabilities. Dirac's elegant equation solved this problem, but this was only the beginning of a new chapter in physics. Dirac showed that his equation predicts the correct magnetic moment for the electron. But the equation also seemed to predict the existence of electrons with negative energy. In 1932 Dirac made the brilliant proposal that the vacuum is a sea of electrons with negative energies, and that an {\it absence} of one these electrons is a particle with a positive energy and charge. The logic of the equation forced Dirac to conclude that this is a new particle, a positron. Soon after, the positron was experimentally discovered, and Dirac's theory became accepted. Dirac's equation applies not only electrons and positrons, but to all known fermions (particles with half-integer spin). The Dirac equation is fundamental both to the Standard Model of elementary particles and supersymmetry\*. Dirac's equation also plays important role in the Atiyah-Singer index theorem\*.

\* These also appear on this wall