The High Energy and Particle Physics Prize 2013

ATLAS collaboration (CERN, CH)
CMS collaboration (CERN, CH)

For the discovery of a Higgs boson as predicted by the Brout-Englert-Higgs mechanism

Michel Della Negra (CERN, now at Imperial College London, UK)
Peter Jenni (CERN, now at Freiburg University, DE)
Tejinder Virdee (Imperial College London, UK)

For their pioneering and outstanding leadership rôles in the making of the ATLAS and CMS experiments.

In July 2012, the ATLAS and CMS collaborations announced the discovery of a new heavy particle at a mass around 125 GeV. Its properties were strikingly similar to those of a Higgs boson, a long-sought particle expected from the mechanism for electroweak symmetry breaking that was introduced almost 50 years ago by Robert Brout, François Englert and Peter Higgs. Experimental confirmation of the Higgs boson presented monumental challenges because of its relatively large mass and small production rates in cleanly detectable modes. The observation has required the creation of experiments of unprecedented capability and complexity, designed to discern the signatures that correspond to the Higgs boson. Their creation has required the use, and in many cases the development, of cutting-edge technologies. In addition, the gigantesque structures were supplemented with appropriate software and computing systems that enabled the analysis of the vast amounts of data that had to be collected. This work has required the collective efforts of over three thousand physicists and engineers from each experiment. These teams collected the data and analyzed it to establish that a Higgs boson, very much like the one in the Standard Model, exists.

The prize recognizes the collective efforts of the ATLAS and CMS collaborations, as well as those of three physicists, P. Jenni for the ATLAS experiment and M. Della Negra and T. Virdee for the CMS experiment, who provided pioneering ideas and led the teams that designed, constructed and commissioned the detectors over the course of nearly twenty years.

The discovery of a Higgs boson signifies the existence of a fundamentally new type of particle. As a particle of spin zero, the Higgs boson is fundamentally different from all other elementary particles that have spin one-half or spin one. With its mass now measured by the two experiments, all properties of the Higgs boson are predicted by the Standard Model, and can thus be confronted with experimental data in the hunt for new physics and the search for a deeper theory of nature.

For further reading: http://www.sciencemag.org/content/338/6114/1558.full