

## Press release

Weizmann Institute of Science

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## Weizmann Institute Scientists Make Significant Contributions to LHC Findings

**Senior members of the Institute's Particle Physics and Astrophysics Department have taken leading roles in the search for the Higgs boson.**

Today's announcement from the Large Hadron Collider (LHC) at CERN points to promising signs for the existence of the Higgs boson. Weizmann Institute scientists have been prominent participants in ATLAS, one of the two experiments to produce results in the search for this elementary particle. Prof. Giora Mikenberg was the ATLAS Muon Project leader for many years and now heads the Israeli LHC team. Prof. Ehud Duchovni heads the Weizmann Atlas group as well as a small group looking for SUSY signals. Prof. Eilam Gross is currently the ATLAS Higgs physics group convener. All are members of the Weizmann Institute's Particle Physics and Astrophysics Department, and they have been part of the effort to find the Higgs since 1987.

ATLAS and its sister experiment in the LHC, CMS, have been searching for the Higgs boson, thought to be the particle that gives all the other elementary particles their mass. The Higgs is predicted by the Standard Model of Particle Physics, which provides a framework for all of the subatomic particles in nature. The Higgs is the one piece of the Standard Model that has not been proven to exist, and some scientists believe that the model will have to be rethought if the Higgs is not found.

Gross: 'In 2011 the LHC particle accelerator in Geneva collided over 300 trillion (a million million) protons. All of that enormous energy (7 trillion electron volts) went into the effort to produce the Higgs boson. But in each collision, other similar particles are created and there is no way to foresee what we will find. The chances of a collision producing a Higgs boson are so small that only about a hundred are expected to be observed over the course of a year.'

Finding possible signs of a Higgs involved looking for statistical anomalies in the data (compared to what the results would look like if there were no Higgs) in the expected mass range. The problem is that once these anomalies appear, the scientists had to rule out statistical flukes. But several weeks ago, it was noticed that 'extra' events in the probable Higgs range had accumulated in the experimental results during 2011. Gross: 'We couldn't believe our eyes -- we looked at the screen for ages before we started to digest what we were seeing. In the past three weeks, the entire Higgs search team in the ATLAS experiment have checked and rechecked the results from every possible angle. We checked for errors... for bugs in the program.'

The ATLAS results suggest that there could be a Higgs boson with a mass of around 126 GeV, and that there is just a 1 in 5000 chance that the extra events they observed in this particular mass are the result of a statistical fluke and not the creation of a Higgs boson. Such fluctuations might still disappear, so the proof is still not at all conclusive, but scientists believe that it bodes well for the next round of LHC collisions, set to begin in April 2012.

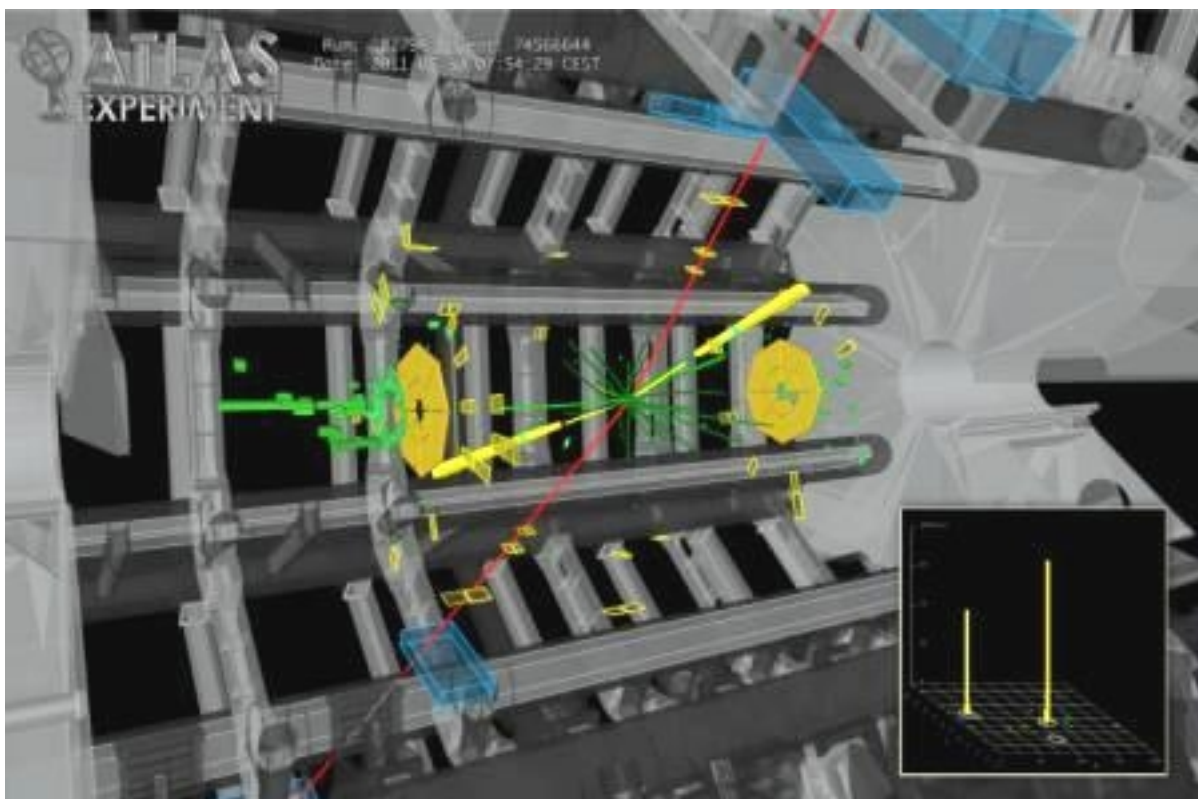
Prof. Ehud Duchovni's research is supported by the Friends of Weizmann Institute in memory of Richard Kronstein; the Nella and Leon Benoziyo Center for High Energy Physics; and the Yeda-Sela Center for Basic Research. Prof. Duchovni is the incumbent of the Professor Wolfgang Gentner Chair of Nuclear Physics.

Prof. Eilam Gross's research is supported by the Friends of Weizmann Institute in memory of Richard Kronstein.

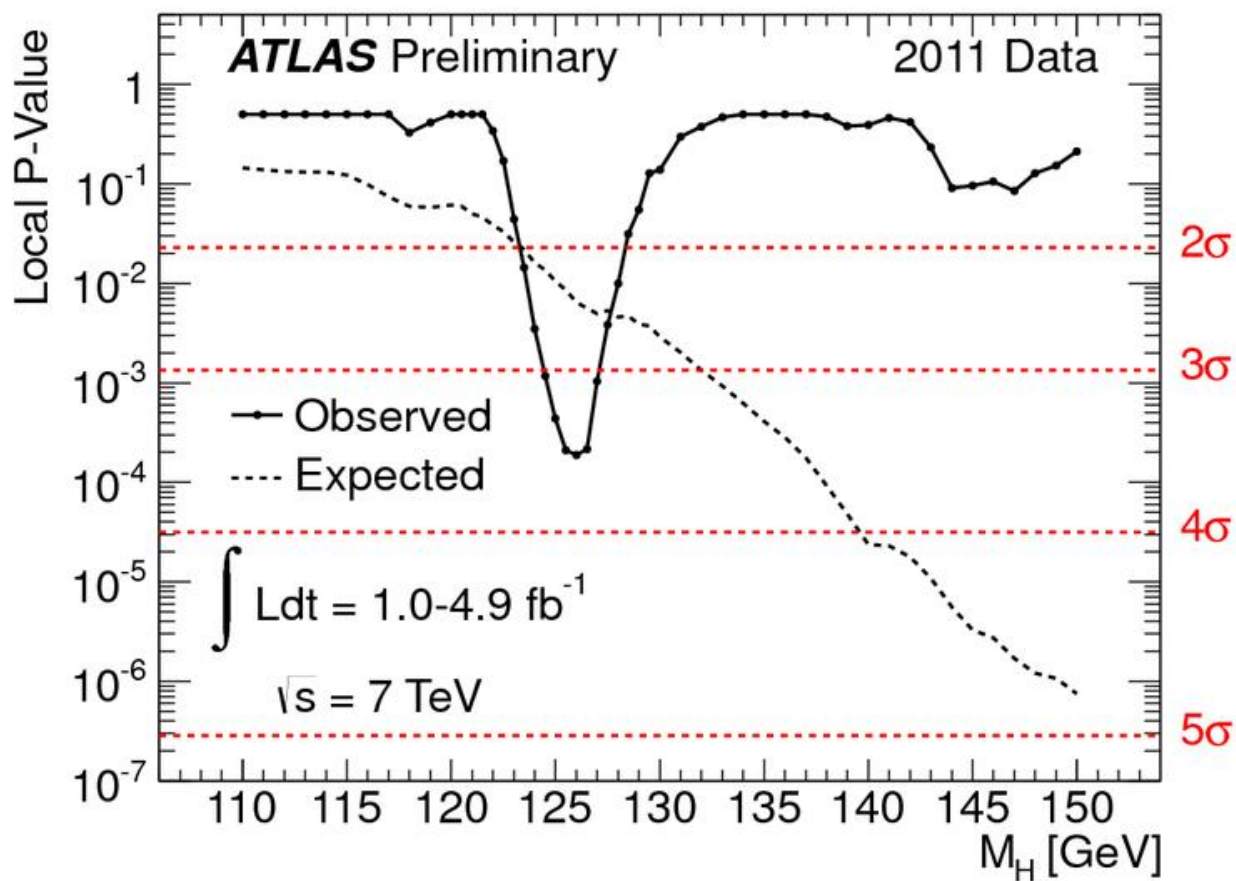
Prof. Giora Mikenberg's research is supported by the Nella and Leon Benoziyo Center for High Energy Physics, which he heads. Prof. Mikenberg is the incumbent of the Lady Davis Chair of Experimental Physics.

The Weizmann Institute of Science in Rehovot, Israel, is one of the world's top-ranking multidisciplinary research institutions. Noted for its wide-ranging exploration of the natural and exact sciences, the Institute is home to 2,700 scientists, students, technicians and supporting staff. Institute research efforts include the search for new ways of fighting disease and hunger, examining leading questions in mathematics and computer science, probing the physics of matter and the universe, creating novel materials and developing new strategies for protecting the environment.

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Atlas experiment



Results of a collision that could represent a Higgs boson from the Atlas experiment