The LHC: The greatest physics experiment of history

Photo: Reidar Hahn, Fermilab

We are on the eve of one of the greatest experiments in the history of physics. The Large Hadron Collider, a 27-kilometer ring straddling the Swiss-French border, is pushing the frontier of exploration into the fundamentals of our universe.

The machine is currently being prepared for first injection of the high-energy proton beams, due in the next few months. Soon after, the largest detectors ever made will be peering into the debris of collisions, a tangle of data that physicists will dissect, examine, and probe in their journey to reveal long-sought secrets of nature.

In recent years, particle physics has been revolutionized with the discovery that 95% of the universe is missing. The Large Hadron Collider will answer many significant questions about the part of the universe we know and start to reveal critical information that will guide our exploration of the rest. The LHC will answer much, but it will raise just as many new questions for the ongoing scientific enterprise.

Projects like the LHC are almost indescribably complex, requiring many tens of thousands of person-years of effort. Experiments on this scale need a long-term, consistent commitment to make them feasible. CERN has built an outstanding structure for managing large-scale, international collaboration, and the pursuit of scientific goals through this means has brought many additional non-scientific benefits to the partners and society as a whole.

This issue of *symmetry* is dedicated to the imminent switch-on of the Large Hadron Collider. It can only skim the surface but presents views of the science, technology, international collaboration, and humanity of the LHC.

Although not a CERN member state, the United States has one of the largest contingents of scientists working on the LHC. In the fiscal year 2008 federal budget, the United States fully honors its commitment to the LHC program. However, last minute cuts to the science budget, made as a consequence of political tussles, seriously threaten the future health of high-energy physics (and other sciences) in the United States.

Whether the US government is able to justify its claim to support the physical sciences, and whether it will be able to generate confidence in itself as a good partner in international scientific projects, hangs in the balance.

However, science goes on, and the promises and opportunities of particle physics are now greater than at any time in the past few decades.

David Harris, *Editor-in-chief*

Symmetry
PO Box 500
MS 206
Batavia Illinois 60510
USA

630 840 3351 telephone
630 840 8780 fax
www.symmetrymagazine.org
mail@symmetrymagazine.org

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