



## IU professor contributes to particle accelerator

By Megan Meyer | IDS | September 11, 2008

At 4:28 a.m. Wednesday, a machine 27 kilometers in circumference shot into action, and an IU professor contributed an important piece of equipment to the machine.

The Large Hadron Collider, the giant particle accelerator straddling the border between France and Switzerland, underwent its first test run Wednesday. Scientists and engineers injected two proton beams through a ring.

They hope the LHC will be a monumental tool in furthering understanding of the fundamental elements of matter and the universe.

IU professor of elementary particle physics and CERN Fellow Harold Ogren has spent 15 years building an important piece of equipment for one of the four experiments running at LHC. Much of that equipment was built on the IU-Bloomington campus.

He spoke in Swain Hall West on Wednesday afternoon to explain the significance of this event and to dispel misconceptions circulating in the media.

"This is a machine of superlatives," Ogren said. "It's the biggest in every way."

First, the speed at which the proton beams move through the accelerator is 99.99 percent the speed of light. Just one-eighth of the machine itself would be the world's largest refrigerator. It also contains the coldest chunk of matter in the universe, with an iron core at 1.9 degrees Kelvin, or -271.3 degrees Celsius.

LHC has the most perfect vacuum in our solar system, having about 10 times less pressure than the surface of the moon, Ogren said.

It is the most powerful supercomputer to date, with a distributed computing network scattered around the globe, Ogren said. Fred Luehring, an IU research scientist, is the head of one of five computing centers in the United States.

Finally, it is the largest proton accelerator ever made, Ogren said.

"LHC will not be superseded by another proton accelerator for the next several hundred years," he said.

Ogren explained in his talk some of the inner workings of LHC in order to cast off fears the laity has expressed concerning the accelerator's inadvertent creation of black holes. The Earth has been hit about  $10^{22}$ , or 10 sextillion, times in its history by collisions like those to be performed at LHC. Ogren and his colleagues say humans' obliviousness to these events proves their unimportance.

Additionally, the energy levels produced by the LHC prohibit the creation of small black holes because that would mean breaking the laws of gravity.

However, if small black holes are produced, they would evaporate far too quickly to

be directly perceived, decaying in about  $10^{-27}$  seconds.

ATLAS, the experiment with which Ogren is affiliated, is one of four experiments being conducted. The barrel detector modules of the TRT, or Transition Radiation Tracker, were constructed at IU then assembled 100 meters underground at the LHC in Europe.

“It was like a ship in a bottle,” he said. “All the parts had to be sent down through two small silos.”

The ATLAS experiment will be able to take data this fall and has already been looking at cosmic rays for many months.

Ogren said scientists in the community are placing bets as to what and when great discoveries will be made, ranging from new dimensions to as-of-yet unseen particles.

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