signal to background

Breathable foam for fire prevention; swords to plowshares; naming LHC magnets; more than 4000 LHC-related papers in SPIRES database; Fermilab's remote operations center; LHC summer schools at Fermilab and SLAC.

Photos: Maximilien Brice, CERN

Fire-fighting foam

When the CERN safety team and I heard the loud rumbling 25 meters underground, we weren't concerned. With no warning, it would have been frightening, but the rush of water through pipes overhead presaged a thrilling event. All of us on the second tier of the enormous CMS cavern waited through the noise for what seemed an incredibly long minute. Suddenly we were in a winter wonderland as white fluffy foam gushed from a dozen blowers along the ceiling. It was a deluge in which college foam-party fans could only dream to play.

In just two minutes, seven cubic meters of water were mixed with foaming liquid to create 5600 cubic meters of foam, enough to be knee-deep. The cavern's volume is 40,000 m^3; however, the foam system is designed to fill 120,000 m^3 since foam tends to collapse onto itself. If the CMS detector were installed, taking up most of the cavern, the foam would surge around the equipment to fill every nook.

With luck, this test will be the only time the foam is poured into the cavern—it is intended to put out any major fire that might start, but it would damage many of the fragile detectors of the experiment. And if, by accident, somebody is in the room when the system is activated, they needn't fear drowning. The foam is breathable; however, swimming lessons might be useful.

Carolyn Lee, CERN

From swords to plowshares

Despite struggling through economic failure during the 1990s, Russia's devotion to scientific collaboration in high-energy physics has grown stronger.

Teaming up with the European laboratory CERN, scientists from the 18 member states of the Joint Institute for Nuclear Research in Dubna, Russia, built part of the new Compact Muon Solenoid detector for the Large Hadron Collider. Making the particular subsystem—the Hadron Calorimeter Endcap—demanded almost 300 tons of brass. To secure the metal, the organization kicked off a unique recycling project in Murmansk.

There, at a Cold-War-era navy yard, workers disassembled thousands of artillery shells. A foundry melted down the thermos-shaped cartridges and sent the brass to a machining shop in Minsk, Belarus. After more than two years of work, the Dubna-led collaboration shipped its masterpiece to become part of the 12,500-ton CMS particle detector at CERN.

Dan Green, the US program manager for CMS who supervised the project, says the group of about 100 engineers was a perfect fit. "They're very smart and well-educated," he says. "I just had a lot of confidence in those guys." With the CMS finished and the LHC nearly complete, the Russians will continue their legacy of international collaboration, says Green. "They're great physicists."
Dave Mosher

Magnet Jessica

What do an 18-month-old baby and a 19-foot-long superconducting magnet have in common?

In 1987, people across the United States watched a drama unfold in Midland, Texas. Eighteen-month-old Jessica McClure had gotten trapped about twenty-five feet underground in an unused well. The 8-inch opening to the well made it impossible for workers to simply pull her back up. After 58 hours of digging, Baby Jessica was finally rescued.

Fourteen years later, a similar event captivated the Fermilab Community. A 19-foot-long superconducting magnet for the LHC had gotten stuck in the 30-foot-deep hole of a new vertical collaring press after the coils had been fixed in place. When technicians tried to raise the magnet, the collars clamped around the coil made the magnet a little too wide and it couldn't be brought up. After hours of effort and applying huge forces, the collared magnet finally exited through the hole at the top of the press. The magnet was named Jessica, in honor of the tiny namesake and her happy recovery.

Every magnet since has received a name, but the origins of the additional names are of a more personal nature. "Many people put a lot of time and effort into developing these magnets and may never get quoted in *symmetry* magazine," said Jim Kerby, the US LHC accelerator project manager. "The names are a way of acknowledging their efforts."

After Jessica came Alex, named for the grandson of Arnie Knauf, one of the magnet's designers. Many names of family members and close friends of people involved in the project have followed. Although there have been name requests from outside the project, for now the naming of magnets will be kept inside the family.

The full list of names: Alex, Britney, Charlie, Destiny, Eddie, Freddy, Grace, Hannah, Isabel, Jalissa, Jessica, Katie, Lisa, Maya, Megan, Nuria, Olivia, Paul, Quincy, Rica, Samantha, Tom, Ursula, Victoria, Willy, Xena, Yuenian, Zell.
Ben Berger

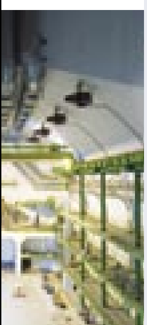



Photo: Jenny Mullins, Fermilab

Chart 1: Number of papers in the SPIRES database that focus on various particle colliders.

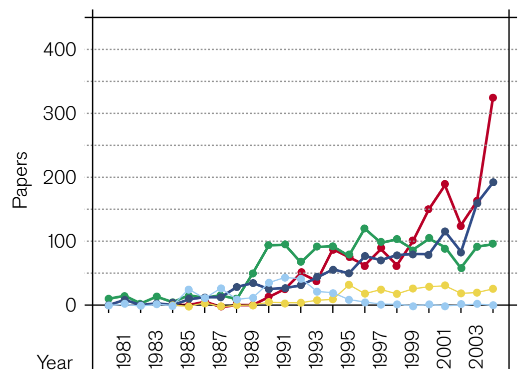
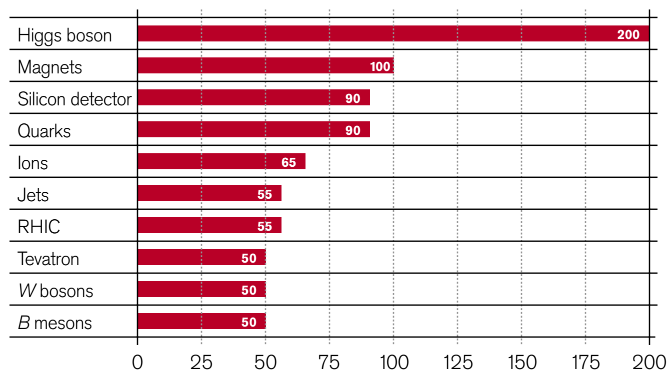


Chart 2: The most popular topics in published papers with LHC in the title

Source: SPIRES *database*



LHC papers

The Large Hadron Collider, to start up in late 2007, traces its inception back to 1979. There are already more than 4000 papers in the SPIRES database that are about the LHC, either mentioning its name in the title or referring to it in a significant way. More than a third of these papers have been published in journals, with the remainder appearing in conference proceedings, eprints, or reports.

In comparison, the Large Electron-Positron collider (LEP), which operated from 1988 to 2002, has led to slightly fewer papers, even though many papers exist that report results and analyses related to the four LEP experiments. In contrast, the LHC experiments have not yet started.

The name "LHC" begins to make a significant impact on the literature around 1984, with the appearance of the CERN Report "ECFA-CERN Workshop on Large Hadron Collider in the LEP Tunnel" (CERN-84-10-V-1 and V-2).

According to SPIRES, M. Bassetti and W. Scandale wrote the first article that mentions LHC in the title and was published in a journal. Not surprisingly, the paper was about a fundamental aspect of ring-shaped particle accelerators: magnet technology ("Limiting Effects of Parasitic Sextupoles in the Large Hadron Collider, *IEEE Trans. Nucl.Sci.* **32**, 2228-2230, 1985). Since then, references to the LHC have increased steadily over the years (see chart 1). In 2004 alone, more than 300 published papers referred to the LHC.

Today, more than 100 published LHC-related papers refer to magnets. The most popular topic in the LHC literature, however, is the Higgs boson, a particle proposed by theorist Peter Higgs and others. More than 200 papers about the LHC mention this famous and elusive particle in the title (see chart 2).

The award for the most frequently cited paper with LHC in the title goes to Savas Dimopoulos and Greg Landsberg. In 2001, they published the article "Black holes at the LHC" (*Phys. Rev. Lett.* **87**, 161602 (2001), hep-ph/0106295). So far, it has amassed 366 citations in SPIRES.

Travis Brooks, SLAC

Monitoring the LHC from across the ocean

When the LHC collider and its experiments are being switched on in 2007, scientists around the world will be eager to monitor the start-up in real time. But physicists won't have to be at the LHC site to monitor the hardware they built or to determine what tuning they need to do.

Welcome to LHC@FNAL, a remote operations center at Fermilab, where scientists will find the same consoles and monitoring systems used 4400 miles away at the European laboratory CERN, the home of the LHC. To be constructed this fall, this center (opposite page) will give scientists real-time access to the vital data of the CERN accelerator complex as well as the CMS detector.

LHC@FNAL is a central component of the LHC Physics Center at Fermilab. Since not all US collaborators will be able to travel to CERN on a regular basis, the LHC Physics Center will offer particle physicists from US institutions the opportunity to meet and to work together as part of the international collaboration without the long flight across the Atlantic. Similarly, US accelerator scientists who are part of the LHC Accelerator Research Program (LARP) will be able to collaborate with their LHC counterparts in commissioning and monitoring US-provided magnets and instrumentation as well as

Illustration: Gary Van Zandbergen, Fermilab

participate in accelerator studies as part of the commissioning of the collider and future LHC upgrades.

"Almost everybody in the United States is able to fly to Fermilab for one day and then go back and teach the next day," says University of Maryland physicist Sarah Eno, who works on the CMS experiment. This summer, about 70 people are spending part of their time at the Fermilab LHC Physics Center, rather than CERN, to write software and to evaluate test data, getting the CMS detector ready for data taking.
Kurt Riesselmann

A long commute to summer school

This August, one hundred and fifty postdocs and advanced graduate students from around the world will gather on the Illinois prairie to enhance their understanding of particle colliders at the CERN-Fermilab Hadron Collider Physics Summer School. There they'll gain a deeper understanding of collisions between quark-composite particles (hadrons), learn about LHC detector components and detector signals, study calibrations of detectors, and review expectations for physics results.

Over the course of nine and a half lecture-filled days, small groups will break off from the regular classes for more intimate discussion. "We'll give students the chance to ask questions in a less formal, more school-like atmosphere," says co-director Jeff Appel.

Students will tour Fermilab and discuss hadron collisions with physicists who have decades of experience at the Tevatron, currently the world's most powerful collider. In the evenings, students and veteran physicists will join for dinner followed by discussion sessions and social events.

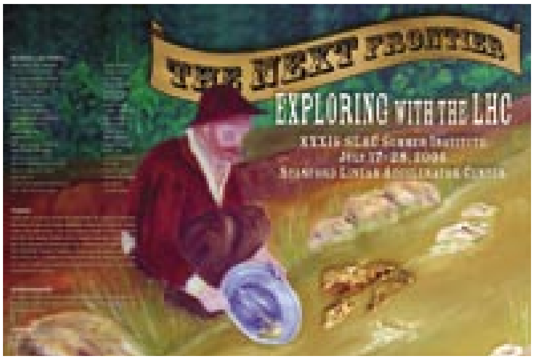
Meanwhile, farther west, a similar summer school began sessions on July 17. The 34th Annual SLAC Summer Institute in Stanford, California also focused on LHC physics.

"It's not just for experts," says John Jaros, one of four committee co-chairs for the program. "We get students from all across the globe."

SLAC's two-week program offered morning lectures, afternoon tours, and discussion and poster sessions where, Jaros says, "students get to put the lecturers on the hot seat." There were also social events, a soccer game, dinners, and a contest to try to answer the big questions, such as "What will be the biggest thing to come out of the LHC?" An expert panel was set up to choose the winning answer. With a mixture of particle physicists and astrophysicists attending, Jaros expected an "intellectually vibrant interface…with a good European contingent."

Back at Fermilab, the mix of summer school students from European and American institutions is expected to be fifty-fifty, with a few participants coming from other regions of the world. "It was nice to see [from the application pool] that the balance among the various components of the community was so even, both across experiments and geography," says Appel, who was flooded with applicants in May.

Next year's CERN-Fermilab session will be held in Switzerland, with the Americans making the trans-Atlantic commute to school.
Siri Steiner



Sources: Fermilab and SLAC