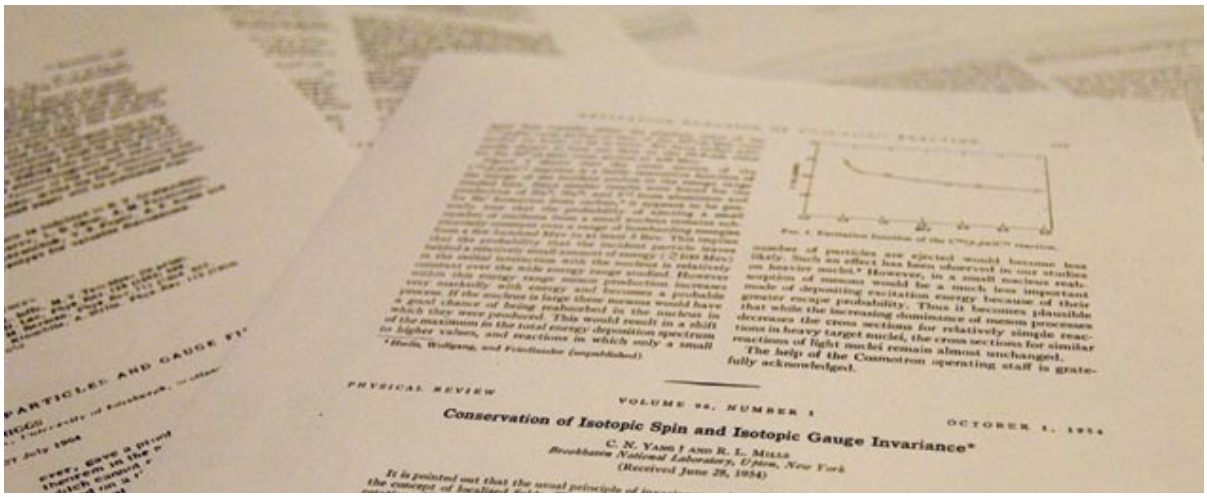
signal to background

Too famous for acknowledgement; filming a *Star Wars* fan-film at Fermilab; when waiters are physics fans; learning cyber-security through hacking; accelerator at the fair; letters: magnets, mystery ice, and marriages.



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Conservation of Isotopic Spin and Isotopic Gauge Invariance*

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(Received June 28, 1954)

Photo: Sandbox Studio

Name of fame

Counting the number of citations of a particular paper is one way to measure its impact and importance. But it is by no means the only gauge. Ettore Majorana's famous paper, "Theory of the symmetry of electrons and positrons," has only 154 citations in the SPIRES database, yet physicists around the world have heard about Majorana neutrinos. The titles of more than 700 scientific articles mention the name Majorana! Yet the vast majority of these articles do not cite the original work.

Majorana's case is not an exception. From Yang-Mills equations to the Schwarzschild radius, the ground-breaking work by many physicists has been honored by associating their name with a discovery. Yet the number of citations of their papers is not keeping up with their fame. Yang-Mills is mentioned in the titles of almost 4500 papers, yet the original article has fewer than 1200 citations. Schwarzschild gets mentioned 750 times in titles, but none of his papers has more than 40 citations.

The ultimate name of fame might belong to physicist Peter Higgs. Three of his papers have about 1000 citations each. Yet the titles of 7500 papers mention the name Higgs—not counting the numerous popular science articles on the Higgs boson. That's a name of fame that even Albert Einstein cannot keep up with. His name appears in the titles of "only" 3000 papers in the SPIRES database.

Heath O'Connell, Fermilab

Star Wars lands at Fermilab

Fermilab physicist Darren Crawford shares a birthdate, May 25, with the first *Star Wars* movie release. Now he is making his own mark on the fabled sci-fi fantasy series. Crawford is producing a *Star Wars* fan movie and plans to shoot scenes at Fermilab this spring. "I've already scouted some spots," says Crawford. "A lot of *Star Wars* characters will be wander-ing around for a few days."

Crawford is writing, casting, shooting, directing, and editing the 2 1/2-hour film, *Star Wars Forgotten Realm*. The story fits into the *Star Wars* timeline between Episode 3 and Episode 4, at the start of the rebellion against the Empire. "Two rebels are shot down on a planet and they come across a Jedi who has been stranded there for years," says Crawford. "The Empire finds the Jedi, and Darth Vader confronts him."

Crawford says he knew the film would work the moment a local fan arrived to audition for the part of Darth Vader. "He was about 6'5" and he had

Parody: Sandbox Studio

the fiberglass helmet…the whole thing," says Crawford. "His reading just blew me away." In addition to hundreds of other local actors and family members (Crawford's six-year-old daughter will play the young Princess Leia), nine Accelerator Division employees will act, provide music, create computer-generated special effects, and construct the sets. Fermilab's Bruce Worthel, who is trained in martial arts, will provide light-saber choreography.

Like other fan projects, *Forgotten Realm* benefits from the goodwill of George Lucas, *Star Wars* director and executive producer. He encourages fans to contribute their own stories as long as they don't make money using the *Star Wars* trademark.

Crawford doesn't mind having to pay for his film project out of his own pocket.

"I've wanted to do this for years," says Crawford. "That first day, when everyone was assembled…it was like a feeling of euphoria."

Siri Steiner

"Soup, salad, or Higgs?"

A snowstorm hit the Chicago area on February 13, before the start of the DOE/NSF agency review at Fermilab of the US ATLAS and US CMS collaborations, the US contributions to two of the Large Hadron Collider experiments. A number of people were trying to fly in–both reviewers and reviewees–and we got started late that evening with only some of the people attending. Our dinner plans also fell through, so at the suggestion of DOE reviewer Pepin Carolan, we went to a restaurant called Riva's in nearby Naperville with a few people willing to brave the weather: Carolan and Saul Gonzalez of DOE, Joel Butler of US CMS, and myself.

At Riva's, we encountered a huge panoramic painting of the Chicago skyline, done by a local artist, and several monitor screens displaying stock information and business news. And then we encountered Dave the Waiter. It was pretty quiet in the restaurant, and Dave asked us what we were doing out on that stormy night. We told him we were at Fermilab for a review, and that got him going at high energy.

He asked whether Fermilab would discover the Higgs. He asked about new results from the lab with Higgs indications at around 160 GeV. He knew about CERN and the LHC. We told him we needed him on one of our reviews. He was better informed than some of our colleagues.

Dave the Waiter made our day, given all the weather problems and all our difficulties getting the review started.

Michael Tuts, Nevis Labs, Columbia University, DZero experiment at Fermilab

Expert "hackers" challenge students

Tim Rupp and Joe Klemencic, two of Fermilab's computer security wizards, posed as the bad guys to offer a challenge in the Indiana state-wide college cyber defense competition held at Indiana Tech. With their role-playing, Klemencic and Rupp helped to educate the tech-savvy students about what motivates the enemy.

Sponsored by the National Science Foundation, the competition pits top students in computer science programs against would-be hackers to teach them about business security in a realistic environment. During the two days of the competition, the college teams completed business tasks sent to them by a White Team, representing managers, while fending off attacks from a Red Team, portraying hackers.

At Indiana Tech, teams from IT and Ivy Tech Community College set up simulated business environments in networked classrooms. From another classroom, the Red Team, consisting of Klemencic, Rupp, and the personal computers they'd lugged from home, tried to break into their computers. Because the teams focused most of their energy on preserving their computing infrastructure and resources, the Red Team successfully compromised their systems, says Klemencic. Unbeknownst to the students, they accessed the teams' web servers and personal data, such as usernames and passwords.

Photo: Fred Ullrich, Fermilab

In a debriefing session on the final day of the competition, Klemencic and Rupp disclosed their strategies and tools to the surprised teams. "We had to drive into them that the bad guys aren't out to ruin their systems," says Rupp. "It's money that drives them. Systems can be replaced, but once data is lost, you can't get it back."

Rupp participated in the competition last year as a senior on IT's team. He did several summer internships at Fermilab before graduating and coming to work for the Computing Division in June 2006. Although his team lost the 2006 competition by only a fraction of a point, he's learned from Joe to keep on top of current hacker technology. "We talk all day long about new exploits that are coming," he says.

Christine Buckley

Letters

Marvelous engineering

The article on Fermi's magnet (*symmetry*, Dec 2006) included the quote, "When it became superconducting, it was ugly and took weeks and weeks to come online." This quote is not accurate and takes away from the marvelous achievement of converting the Chicago Cyclotron Magnet (CCM) from normal conducting to superconducting. The work done by Eddie Leung, Howard Hart, Gene Smith, and the whole Lab 3 team in Research Services deserves proper recognition.

Although it is correct that it took a week or so to cool such a large magnet down, powering it took less than one hour. The conversion saved an order of magnitude in the 2 MW electrical power consumption of the magnet (taking into account the power needed for helium refrigeration and buss work). Despite its huge size, the CCM in operation had a smaller heat leak than a single superconducting dipole magnet in the Tevatron collider. This was true despite the 1.2 million pounds of force attracting each coil to the iron yoke when excited. There was some excellent Fermilab engineering in that magnet!

Bob Kephart, Fermilab

Photo: Terry Anderson

Aliens?

This photo was taken in Campbell, California, February 23, 2007, 7:20 a.m. Subject matter was a 2000 Honda Accord sunroof. Car was facing due north, half a tank of gas, and 36 lbs of air pressure in 3 of the 4 tires. AccuWeather says the coldest temperature during the night was 34 degrees Fahrenheit. Wind speed was 1-5 mph out of the NW and the relative humidity was in the low 90s with no measurable precipitation.

I often have a layer of frost on my car during the colder days of winter but have never seen anything like this. Can anyone explain how these strange patterns were etched in ice on the roof of my car?

Terry Anderson, SLAC

Physics bliss

It was very nice reading the article on couples in physics in the January/February issue of *symmetry*. Satyajit Behari and I are also physicists happily married to physics, and have been working together at Fermilab since 2000. Satyajit has been working on analyses within the *B* physics group. He was heavily involved in the CDF Run IIb silicon upgrade project and currently is one of the on-call experts for the CDF experiment providing silicon detector maintenance and running. I was previously at CDF (1999-2003), and I have been at DZero since 2004, also working on analyses in the *B* physics group. A precious gem in our life, our daughter Barnali, was born in 2002. She attends the Fermilab daycare center and will be 5 years old this month. We were heartened to see the stories of others who are happily married, and happily married to physics.

Tania Moulik, Fermilab

Fermilab fleece

I thought it might amuse you to know that I've spotted a Fermilab full-zippered fleece in the *Concord Monitor*.

The story is an account of a lecture given in Concord, New Hampshire, by Brother Guy Consolmagno of the Vatican Observatory. The story is accompanied by a photo of Guy, who has given a colloquium at Fermilab ("Visitors from Another World: Searching for Meteorites in Antarctica," April 1998) and visited on several other occasions, wearing his Fermilab fleece jacket.

Guy is the author of *Brother Astronomer*, and co-author of the popular *Turn Left at Orion*, a guide to using a small telescope. He also has a new book coming out in the fall.

I don't suppose that Jesuit astronomers are fashion trendsetters, but it's still nice to see the Fermilab logo turn up in an unexpected place.

Bill Higgins, Fermilab

BNL job bank

The commentary by Marc Sher on "The two-body opportunity" (Dec 2006) highlights both the problem of finding suitable positions for dual-career couples in physics and the advantages of hiring them together. Indeed, his comments are true for couples in any scientific discipline. To make finding positions easier for couples in the sciences, Brookhaven National Laboratory has become one of the founding members of a new job bank that will facilitate dual-career appointments.

In February, Brookhaven Lab joined the Metropolitan New York and Southern Connecticut

Higher Education Recruitment Consortium (HERC). The HERC website, a collaborative effort developed by Columbia University, Yale University, and New York University, is meant to provide job seekers with comprehensive listings of positions in higher education and research institutions, with special emphasis on facilitating dual-career appointments and enhancing diversity. The website provides augmented information resources, networking, and outreach programs as well as information on the local area of interest to the job seeker and his or her partner.

The HERC website provides applicants with the ability to seek jobs by institution, job criteria, keyword, and/or geographic area. HERC sites are found around the country, including California, New England, and New Jersey. One of the long-range goals is to establish HERCs in other parts of the country.

For additional information, check out the website: www.mnyscherc.org.

Marsha Kipperman
Manager, Employment
Brookhaven National Laboratory

Letters can be submitted via letters@symmetrymagazine.org

Photo courtesy of Austin Ellsworth

Accelerator at the fair

Science fair season is here, so we at *symmetry* were not surprised when 12-year-old Austin Ellsworth of Spring, Texas, called with a few questions about his science fair project.

More surprising was the nature of the project: Austin had built a model of a linear accelerator, which seemed an unusual undertaking for a sixth grader.

"It's not a working model," he said, reassuringly. "To preserve the life of the whole city, I could not use working atoms. I had to fit this into a grocery bag, so it had to be small." What's more, the rules of the fair allowed him to spend no more than $25.

His accelerator is a piece of plastic pipe that contains a series of electrical contacts wired to 13 light bulbs. When Austin slides a metal wrench down a wide slit in the top of the pipe, as if swiping a credit card on a payment machine, the bulbs light up one after the other to represent the particle's journey. (The originally-planned rolling metal ball did not make good enough contacts.) The last light bulb is red, signifying that the particle has hit its target.

It may not fit the classic hypothesis-experiment-conclusion mold, but the project did get Austin thinking. He came to believe that someday, although maybe not in his lifetime, particle accelerators will become the equivalent of oil wells, generating antimatter that is shipped in futuristic containers to power plants and reunited with matter, releasing huge amounts of energy "so you can use the energy, like, to power your car, or whatever you want."

He was happy to learn that physicists at the Ecole Polytechnique in Palaiseau, France, had built a table-top particle accelerator, with potential uses in research and medicine.

"They say it's somewhat underpowered compared to conventional accelerators, but the fact that it exists is what matters—and that it works," Austin said. "I thought, 'Hallelujah, this is the evidence I need to show that particle accelerators are not too big! They're getting smaller.'" He speculates that Moore's law, which successfully predicted the trend toward smaller and more powerful computers, eventually will apply to accelerators, too, and who knows where that will lead?

Austin said he likes to read—"a lot on planes and baseball. Those are my two great loves." Science is another. As the Redd School Spring Science Festival approached, he was reading Stephen Hawking's *A Brief History of Time*, savoring the bits about black holes and antimatter even though "sometimes it kind of started reading like Portuguese to me."

He built his model with the help of his grandfather, who, Austin says, used to work for Lockheed and "is a fix-it-all, all-the-time man." The finished product, fastened to a wooden base and sprouting wires, came in on time and $10 under budget. He'll soon find out if it won a prize.

Glennda Chui