



## Coming Clean with Cosmic Rays

Do you know how many cosmic rays pass through you each second?

Come to the Lederman Science Center to experience a simulation of the darting particles that cohabit the space you stand in.

A new exhibit in the Detector Room, “Take a Cosmic Ray Shower,” uses lights and sound to bring home to visitors just how often they encounter the fallout from high-energy collisions occurring naturally in the Earth’s atmosphere.

The exhibit appropriately takes the form of a shower stall since scientists talk about the spray of particles as “cosmic ray showers.”

Six paddle-type detectors arrayed in two rows hang above the shower stall area. As passing cosmic rays light up scintillating material in the paddles, a signal travels to a readout system, which in turn activates laser lights.

Mirrors bend the laser light and deflect it downward onto the person standing below the detectors. The laser light appears at an angle which correlates with the angle at which the cosmic ray passed through the detectors.

With each blip of light, speakers emit a tiny “chirp,” and a digital counter on the wall keeps track of the number of particles over time.

The exhibit is primarily the work of four collaborators: Dave Hoppert (QuarkNet), Todd Johnson (Accelerator Division), Sten Hansen (Particle Physics Division), and Dave Dumford, husband of Fermilab docent Sue Dumford.

The idea of a walk-in detector arose from Marge Bardeen’s ob-

servance of exhibits at SLAC and CERN, while the shower stall concept emerged in early discussions about how to build a walk-in detector. It took over a year of meeting, planning and prototyping to produce the final product—but the careful work was worth it since the exhibit has been a

by “folding” the optics and bouncing their light off a mirror. Dumford, who engineered the support structure, added a plexiglass window to the bottom of the detector box to keep curious eyes at least 6” away.

When Fermilab safety personnel measured the resulting light exposure, they found it to be a reassuring four times below the acceptable limit.

The design team took special care with a number of features: they attached the detector box directly to the wall without use of support pillars so that the exhibit is handicap accessible; the flashing lasers do not activate until a visitor enters the room; the sound effects remain off until a visitor is directly under the detectors; and finally, a digital event counter is coupled with a button to allow visitors to reset the counting device to zero.

Liz Quigg, web developer for the Education Office, contributed a video that plays on a screen mounted next to the shower stall and shows an animation of a cosmic ray event over Chicago.

Middle school students on Beauty and Charm field trips will engage in various activities that involve counting particles and noting the angles at which they travel.

The grand opening for the exhibit was on September 7, and Fermilab Director Pier Oddone and Deputy Director Young-Kee Kim took turns being “zapped.”

Since then the exhibit has bathed many delighted LSC visitors in darting green lights.

You, too, are invited to stop by and take a “cosmic ray shower!”



*Fermilab deputy director Young-Kee Kim takes a cosmic ray shower at the grand opening of the new exhibit.*

big hit with visitors.

Safety concerns dictated the design of the laser array. The team wanted the detectors, lasers and electronics overhead to be visible, but they were concerned that overly-curious users might look directly into the lasers at close range.

Todd Johnson solved that problem

## Responding to Lab-wide Changes

Change is everywhere these days at Fermilab.

On September 30, the Tevatron, Fermilab's flagship accelerator for more than 25 years, collided its last beams of particles.

The closure has shifted the laboratory's focus from the Energy Frontier (the Tevatron) to the Intensity Frontier (experiments with neutrinos and rare particles) and the Cosmic Frontier (astrophysics, dark matter, dark energy).

Ripples from this change penetrate every corner of the laboratory, including the Education Office, so planning is underway to adjust to the new environment.

The decommissioning of the two big Tevatron detectors, CDF and DZero, is going to provide an unusual opportunity for some student groups.

The CDF detector will be secured and opened up in such a way that groups may enter the collision hall and view the innermost layers of the enormous device. A section of the Tevatron tunnel adjoining the collision hall will also be accessible.

DZero's detector will remain in place and accessible as well, but due to its distance from Wilson Hall, it will be seen only by small groups on special tours.

A sleek new building for the Illinois Accelerator Research Center (IARC) will be an altogether new addition to Fermilab's site.

IARC will bring together scientists from national laboratories, universities and private industry and provide them with a perfectly tailored venue to work on the next generation of particle accelerators.

The IARC facility will attach to the CDF assembly building and incorporate CDF's high bay construction area. It will house technical, office and training facili-

ties and provide areas for test accelerators and related equipment.

The question for the Education Office is: How can student programs at Fermilab benefit from these changes?

In October, Spencer Pasero will conduct a needs assessment with a group of teachers who have been active in Education Office programs over the years to address just that question.

What revisions and updates can be made to the Beauty and Charm program to reflect Fermilab's new emphasis on the Intensity and Cosmic Frontiers?

How should new facilities be incorporated into middle school and high school tours?

These and other questions will be addressed as teachers who use the programs invent ways to take advantage of the changing landscape at Fermilab.

Changes to scientific equipment aren't the only changes in the air: Wilson Hall is also about to undergo a facelift.

For safety reasons, protective railings are to be installed on the open stairways in the atrium, followed by construction to level the atrium floor.

These projects will alter traffic flow for many months and they have caused the Education Office to reschedule one of its most popular events, the Fermilab Family Open House.

Originally planned for February 12, 2012, the open house will most likely be held on a Sunday in late April, either April 22 or 29.

Please consult the Fermilab Family Open House website (<http://ed.fnal.gov/ffse/openhouse/>) for updates.

## 2012 Events—Mark Your Calendar!

- **WONDERS OF SCIENCE**

<http://ed.fnal.gov/events/wos>

- **STEM CAREER EXPO**

<http://ed.fnal.gov/programs/careerfair/>

- **FERMILAB FAMILY OPEN HOUSE**

<http://ed.fnal.gov/ffse/openhouse/>

- **FERMILAB FAMILY OUTDOOR FAIR**

<http://ed.fnal.gov/events/outdoor-fair/>

**Sunday, February 12**

**Wednesday, April 11**

**Sunday, April 22 or 29 (tentative)**

**Sunday, June 10**

Would you like to volunteer at any of these events? Have questions?  
Send e-mail to Gayle Millman at [millman@fnal.gov](mailto:millman@fnal.gov).

## Board of Directors Changes

The FFSE Board of Directors welcomes two new members: Colin Huie and Jamie Mosser.

Huie participated in the SPARKS (Supporting Parents in Advocacy, Reform and Knowledge in Science) program through the Lederman Science Center and was instrumental in procuring science education grants to FFSE from his former employer, Cargill. An engineer by training, he is

homeschooling his four children.

Mosser is the Assistant State's Attorney for the Kane County State's Attorney Office in St. Charles.

Three other board members began new terms in May: Eileen Pasero returns as Treasurer; Michael Knapp assumes the position of Vice President, Programming; and Pat Franzen is the new Vice President, Membership.

### Membership renewal season is here!

Renewing for 2012 is easy:

Go to <http://ed.fnal.gov/ffse/> to renew your membership online.  
Or download a membership form and mail it to us.

Donations and contributions to the **scholarship fund** or to the **Tree of Life** may also be made at <http://ed.fnal.gov/ffse/> or by mail.

We hope that you will stay with us for another year as we work to create new, innovative science education programs and make the best use of unique Fermilab resources!

### ??? A Question for You ???

News Notes is published by FFSE twice a year and mailed to every current member of Friends.  
We post each issue online at <http://ed.fnal.gov/ffse/newsletters/>.

??? Which format do you prefer to read ???

**If you would prefer to read online, we will notify you by email when an issue is posted.  
Let us know your preference: online, print or both.**

To make the change, please send e-mail to Gayle Millman at [millman@fnal.gov](mailto:millman@fnal.gov).

Thank you!

FFSE members are partners with Fermilab in support of K-12 education.  
As a not-for-profit organization FFSE underwrites:

- Teacher scholarships
- High school student awards
- Family Science Adventure scholarships
- Field trip transportation assistance scholarships
- Van to transport scientists and equipment for classroom presentations
- Programs in need of special funding arrangements
- Annual members-only events
- Annual public events

FERMILAB FRIENDS FOR SCIENCE EDUCATION MAKES A DIFFERENCE!



## Membership Form

Annual Dues: Director's Club..... \$1,000  
Patron..... \$500  
Sponsor..... \$250  
Dual..... \$100  
Regular..... \$50  
Joint FFSE/ISTA membership..... \$39  
Teacher..... \$10

*Please check the appropriate membership category and enclose your check made out to **Fermilab Friends for Science Education**. Include matching funds from your company, if applicable.*

Name \_\_\_\_\_

(Partner) \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Telephone \_\_\_\_\_

Employer (self) \_\_\_\_\_

Employer (partner) \_\_\_\_\_

Matching Funds (yes) (no)

## Honorary Board of Directors

Edwin L. Goldwasser  
Stanka Jovanovic  
Leon M. Lederman  
Piermaria J. Oddone  
John Peoples, Jr.  
Norman F. Ramsey  
Judith J. Schramm  
Michael S. Witherell

## Board of Directors

Susan Dahl, *President*  
Marjorie G. Bardeen, *Vice President, Nominating*  
Patricia M. Franzen, *Vice President, Membership*  
Michael Knapp, *Vice President, Programs*  
Jamie Mosser, *Secretary*  
Eileen J. Pasero, *Treasurer*

Karl W. Craddock    Cynthia Marler  
Roger Dixon        Glenda Peck  
David Harding      Selitha Raja  
Colin Huie         JulieAnn Villa  
Bruce L. Chrisman, *Ex-Officio Board Member*

Visit Fermilab Friends for Science Education at:  
<http://ed.fnal.gov/ffse>

## Fermilab Friends for Science Education

P.O. Box 500, MS 226  
Batavia, IL 60510-5011