



FERMILAB FRIENDS FOR SCIENCE EDUCATION exists to support innovative science education programs.

Fermilab at LabFest

Fermilab was a year-long participant in Science Chicago's LabFest, a series of events throughout the Chicago area featuring exhibits designed to impress all comers with the excitement of science. The outdoor events were free, and thousands of spectators visited various Chicago public schools, parks and libraries to participate in the fun.

Fermilab, with funding through FFSE, joined museums, laboratories, universities and scientific societies in providing activities for the celebration. At the Fermilab booth fest-goers could experiment with force and motion while staffers fielded questions about physics and the laboratory. At LabFest's grand finale in Millennium Park, neutrino physicist David Schmitz and DZero physicist Michael Cooke entertained the crowd of 8,000 with a cryogenics demonstration.

Fermilab's team of volunteers included staff members **Penelope Constanta, Michael Cooke, Lynn Garen, David Harding, Anne Heavey, Amber Johnson, Michael McGee, Thomas Meyer, Jennifer Pursley, David Schmitz, Diego Tonelli** and **Jim Zagel**. Education office staffers **Susan Dahl, Spencer Pasero and Sue Sheehan**, and docents **Lynda Ballingall, Sue Dumford, Maureen Hix, Dee Huie, Dawn Miller, Mary Jo Murphy, Mary Ann Stowell, Felicia Svoboda** and **Anne Mary Teichert** also worked the booth at sites from Lincolnshire to Joliet.



Lynda Ballingall, Mike McGee and Mary Jo Murphy at the Fermilab booth



Can they accelerate the ball?



Michael Cooke and David Schmitz with liquid helium



A cryogenic cannon - how cool is that?!

2009 Distinguished Educator Award

"Every teacher, at some point, should experience a unit or lesson that shapes their teaching and models future lessons. Beauty & Charm was that for me," says Sandy Katula, recipient of FFSE's Distinguished Educator Award for 2009.

Now an assistant principal at Columbia Central School, Katula formerly taught 8th grade science at Central Middle school in Tinley Park. Six years ago she attended the summertime B&C teacher training workshop at Fermilab and was impressed with the approach. "Putting emphasis on the process, not just on drilling vocabulary, is something in which I've always believed. The purpose of learning is not just to understand the words [in the science units]; it's for students to understand the process. Beauty & Charm is a unit that can serve as a model for others."

Following the unit, Katula brought her students on a virtual field trip to Fermilab. She sought to expose them to a scientific environment, and, most importantly, to give them insight into the cutting edge of knowledge about the physical world.

"I wanted them to experience some of the frustrations involved in the study of particle physics. Although the content is not specifically stated in the standards, the process and thinking skills are invaluable. I would tell students that they're learning about concepts that most of their parents never learned."

Challenging herself to learn more was part of the appeal of B&C for Katula. "Sometimes when students had questions, I wouldn't have answers and it would make me go deeper into the materials. It's rejuvenating for a teacher to have to learn something new—it gets you sparked again," she says.

Katula's first involvement at Fermilab began years before she took the Beauty & Charm workshop. Finding herself in a district with a highly regimented, vocabulary-ori-

ented approach to science, Katula felt impelled to involve herself in curriculum planning. She asked Susan Dahl at the Teacher Resource Center for assistance in finding material to support a richer approach to science instruction.

Katula drew on Fermilab education resources again when she enrolled in a Summer Secondary Science Institute in Physics. "The SSI's were challenging for me," she says. "Physics was never one of my strong points and it was a challenge to be with high school teachers who had a deep grasp of a lot of the material. But I found that everyone was very accommodating and helpful and the program became a resource I could tap into at any time." Why did she take on this challenge? "As a teacher, as in life, you want to take your weakness and make it your strength."



Now in her second year as an administrator, Katula says that she would like to get her entire science department out to Fermilab. She is pleased that two teachers from the school took the Beauty & Charm workshop together last summer and she feels that they will benefit from having done their training together. "Together they can work through the unit and make the necessary modifications for our population," she remarks. "It helps to have someone in close proximity thinking about the same issues at the same time."

The text of the 2009 Distinguished Educator Award cites Katula for "Her exemplary approach to teaching science through a conceptual, hands-on and student-centered approach." It further notes that, "Through participation in a classroom-centered program, Beauty & Charm, and a teacher professional development program, Summer Science Institutes, Sandy has increased her content knowledge and teaching strategies. As a leader, Sandy listens to her colleagues and helps make decisions based on student needs. 'She is always striving to be the best teacher she can be.'"



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Points of Intersection

Support for a “Physics First” curriculum in high school science education has steadily grown over the last couple of decades, with ARISE (American Renaissance in Science Education), a program initiated by Leon Lederman, playing a leadership role in the movement. Support for Physics First has come from many sources, and over the years educators involved in it have forged alliances and developed materials with other groups pursuing compatible goals.

Fermilab recently collaborated with one such organization, the Concord Consortium, a not-for-profit education research and development group in Concord, Massachusetts. FFSE received funds from Concord for a review of materials in the *ARISE Curriculum Guide* with the aim of identifying activities compatible with units in the Concord SAM (Science of Atoms and Molecules) project, a collection of atomic and molecular model-based units for high school science students.

Fermilab invited high school physics teachers Jason English (William Fremd High School, Palatine, IL) and Keith Kuykendall (Tinley Park High School, Tinley Park, IL) to undertake the review. They surveyed thirteen SAM units and for each one, identified ARISE links which supplement the SAM material.

English, a physics teacher, found the review especially interesting. “It happened that much of the chemistry material fell to me,” he said. “It was interesting to see Concord’s take on using physics to teach chemistry—and probably beneficial to Concord to have a physics teacher’s perspective. I enjoyed seeing what kids would learn as they advanced in the curriculum. I don’t usually get to see that.”

Kuykendall was excited by the material’s potential for motivating students. “During the process of integrating the

materials, I actually completed every exercise from the perspective of a student,” he said. “The set of animations chosen as the core of the Concord project give terrific insight into the atomic and molecular bases for phenomena that we ordinarily observe on a macroscopic scale. That such concepts can be reduced in many cases to elementary concepts of mechanics or electrostatics is astounding to students.”

Following the review, Kuykendall found immediate applications for his work when he incorporated some Molecular Workbench animations into his own classroom demonstrations. In addition, he invited students to complete the SAM unit as an extra credit task.

Kuykendall remains especially impressed by the Physics First concept underlying both the ARISE and SAM projects. “If there is one thing to strongly recommend the unified ARISE/SAM materials,” he says, “it’s the tremendous way that these materials work together to show how basic concepts we ordinarily pigeon-hole as “physics” underlie all of the important unifying concepts of chemistry and biology.”

The result of their work can be found on the Concord website at:

<http://molo.concord.org/database/search/results/?keywords=arise&concept=&module=>

The ARISE links are under “Extensions and Connections.”

For additional information:

The Concord Consortium: <http://www.concord.org>

The SAM Project: <http://sam.concord.org/>

The ARISE Project: <http://ed.fnal.gov/arise/>

ARISE Instructional Material Guides:
<http://ed.fnal.gov/arise/guide.html>

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- Franklin Award
- High school student awards
- Family Science Adventure scholarships
- Annual Fermilab Family Open House
- Van to transport scientists and equipment for classroom presentations
- Symposia on the Nature of Science
- Programs in need of special funding arrangements

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