

FERMILAB FRIENDS FOR SCIENCE EDUCATION

ANNUAL REPORT

2007



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From the Fermilab Director



A handwritten signature in black ink that reads "Piermaria Oddone".

*Piermaria Oddone, Director
Fermilab National Accelerator Laboratory*

A very important report of the National Academy of Sciences produced by a distinguished committee of educators, scientists, industrialists and public policy experts under the leadership of Norman Augustine, CEO emeritus of Lockheed Martin Corporation, highlights the importance of science education for the future well-being of the nation. The report, entitled "Rising Above the Gathering Storm," makes recommendations on the actions that we need to take as a nation to maintain our economic competitiveness and well-being in the 21st century.

The three top actions recommended by this committee address the urgent need to improve science and mathematics education. Action A-1, titled "Recruit ten thousand teachers, educate ten million minds," describes a program to attract thousands of new teachers educated in the basic sciences, engineering and mathematics. Action A-2, "Strengthen two hundred and fifty thousand teachers' skills, inspire students everyday," makes specific recommendations on summer institutes, advanced science and mathematics training for teachers, and the development of world class K-12 curriculum materials. Action A-3, "Enlarge the pipeline," recommends creating incentives and opportunities for middle-school and high-school students to pursue science and mathematics.

I am very proud of the role that the Fermilab education program plays in providing students and teachers of the surrounding community access to the resources of our great scientific laboratory. With the help of our Fermilab Friends for Science Education (FFSE), we have created a program that is very much in the spirit of the recommendations above and that is inspirational to both teachers and students. I am very grateful for the support that FFSE provides to our education program.



From the FFSE President

In 1983, 25 program years ago, Friends of Fermilab offered its first, and Fermilab's first, teacher professional development program, the Summer Institute for Science Teachers. It was an exciting time when we all—Friends, instructors and participants—were pioneers in a new education adventure.

Needless to say, none of us knew what an adventure it would become. Friends has supported over 70 activities and raised over \$5.6 million from members and 38 public and private contributors. Programs range from staff development programs to conferences and student programs. In addition, we have supported the development of a variety of resources for teachers. Friends' success led to the establishment of the Fermilab Education Office and the construction of the Lederman Science Center.

From the hairstylist who remembers her exciting eighth grade field trip to Fermilab, to the family who traveled from California just so their son could come to the Family Open House; from the master teacher who says we have expanded her horizons and made her a more knowledgeable teacher, to the QuarkNet teacher who comments, *"Your program rejuvenates my soul. It connects me with a cadre of intelligent and excited educators. It reinvigorates my teaching and provides me avenues to extend and enliven the projects that I can offer my students. Without the QuarkNet program I am sure that I would have left teaching years ago,"* our programs have an enormous, lasting impact on students and their families and teachers alike. Our programs receive the highest marks. We have an impressive record!

With the publication of this *Fermilab Friends Annual Report* I will end my tenure as President, a position I have held since 1996. As past president I ensure a smooth transition to new leadership. We in the Education Office look forward to an even brighter future with Fermilab Friends at our side!



Marjorie G. Bardeen

*Marjorie G. Bardeen, President
Fermilab Friends for Science Education*



PROGRAMS

Fermilab Family Open House

On February 11, FFSE hosted the 2007 Fermilab Family Open House. Children and parents enjoyed hands-on activities and presentations designed to stimulate young imaginations and convey the excitement of science.

As in former years, tours of the Linac and Main Control Room attracted crowds throughout the afternoon, and Jerry Zimmerman provoked oohs and aahs with his cryogenics demonstrations. Dave Johnson of the SciTech Museum in Aurora demonstrated historic electrical experiments using his own beautiful handmade devices, and CDF, DZero and the Magnet Factory opened their doors to guests. As a special treat, visitors could tour the newly

opened Remote Operations Center for the LHC.

Among the hands-on activities, two new offerings proved especially popular: a light show demonstrating spectral lines produced by different gases and Bradford Hansen-Smith's "Geometry of Wholemovement" activity, in which children explored geometry by folding paper plates into intricate patterns.

About 2,000 guests attended the open house and children who collected five stamps from participating in activities received a plastic Fermilab piggy bank to take home as a souvenir.



SPARKS Program

In the spring of 2007, two docents from the Lederman Science Center, Sue Dumford and Sue Sheehan, and one parent-volunteer, Joani Nelson, visited Brookfield Zoo for three days of training in the SPARKS (Supporting Parents in Advocacy, Reform, and Knowledge in Science) program. The goal of the training was to learn how to run a workshop for parents who want to explore science with their children but are unsure how.

Dumford, Nelson and docent Gail Poisson went on to recruit 35 parents from the area for a two-day workshop aimed at demystifying science and getting parents comfortable with inventing and leading science-oriented activities. Parents received a \$50 stipend to participate in the program.

At the workshop, held on two Saturdays in October and November, participants observed bison behavior and drew or wrote about it, then shared their observations with others. They netted insects and learned how to classify them. Tom Peterson, an engineer in the Technical Division, talked with them about his work at Fermilab and also about his

avocation as a butterfly specialist, teaching them where to look for caterpillars and cocoons. The parents sampled activities such as soil coring and plant identification that students do during Particles and Prairies field trips.



A young visitor examines fossils in rocks at the Family Outdoor Activity Fair sponsored by Fermilab and SPARKS.

As part of the SPARKS program, participants were required to teach other families about science, so to fulfill this obligation, some oversaw hands-on activities at the Fermilab Family Open House; others helped put on a Family Outdoor Activity fair during April of 2008.

"It was fabulous! Everyone had so much fun," commented Sue Dumford. "The parents came up with the best ideas. One let her child stay up late and look at the sky so that they could make a star chart. A father had no time for his 'homework' of doing a science activity with his child, so, since he had to take

the water heater apart, he let his child help him and he showed the child how it worked. Some parents made measurements with plants; others looked at rocks. 'Is this really science?' they asked us? We told them, 'Yeah! It's all good stuff!'"

PROGRAMS

FFSE: The first 25 years

Twenty-five years ago, a new organization, “Friends of Fermilab,” offered its first program: a four-week Summer Institute for Science Teachers. From the beginning, Friends’ mission was to support the teachers who work to educate and inspire the next generation of scientists.

Now known as Fermilab Friends for Science Education, this organization has amassed a strong record of achievement. From multiweek institutes which provide teachers ample time to deepen knowledge and skills; to weeklong study units helping teachers prepare students to encounter the science and scientists of Fermilab; to research appointments allowing in-service and pre-service teachers to partake in the excitement of scientific exploration; FFSE has found many ways to fulfill its mission. It has expanded the skills and horizons of a generation of teachers, many of whom have become leaders in their fields.

The end of the first 25 years seems like an appropriate time to look over the achievements of the past as we move forward into the next quarter century of service to science educators.

Here are just some of the programs which have benefited from Friends’ support over the years:

Multiweek Institutes

- Summer Institute for Science and Mathematics Teachers
- Topics in Modern Physics
- Summer Institute for Chicago Science and Mathematics Teachers
- Summer Science Project
- Teaching Integrated Mathematics and Science (TIMS)
- Academy Hands-On Activities (AHA!)
- Illinois Leadership Institute
- Leadership Institute Integrating Internet, Instruction and Curriculum, (LIInC/LInC ATC)
- Fermilab ARISE (American Renaissance in Science Education Program)
- Summer Secondary Physics Institutes
- Summer Secondary Biology Institute

Short Offerings

- Beauty and Charm at Fermilab
- Problem Solving in Mathematics: Elementary and Middle School Seminar
- Physics Mini-Courses
- Down to Earth at Fermilab
- From Beneath the Ashes
- Particles and Prairies
- Fractals, Dynamics and Chaos (North American Symposium)
- NightLights
- Technology Workshops
- Friendly Physics
- The Prairie—Our Heartland

Research Appointments

- TRAC/Summer Research Experience
- Fermilab Teacher Fellowship Program

Other

- Handbook of Engaged Learning Projects
- Symposia on the Nature of Science
- Hands-on-Science
- Outreach Activities
- Catching the Sun
- Quarks to Quasars
- Technology Forum
- QuarkNet

“Friends demonstrates the right way to go about things. The programs are teacher-directed, the goals are aimed at inquiry-based learning, and the programs let students walk away with a sense of where their knowledge fits in the real world...”

“Working on Particles and Prairies was one of the most amazing experiences I’ve had. Teachers felt it was a big deal to bring back so much data to the classroom. They were amazed that Fermilab makes it all available...”

“When my students figured out how physicists are able to read Lego plots, they felt excitement, enjoyment and accomplishment.”

Pat Franzen, Bradley University; former middle school teacher

“Elementary school is where you have to hook kids on science. Fermilab has responded to that need by coming up with programs for children of that age: Friendly Physics and the Science Adventures...”

“Some teachers have little science background. It’s important to get the kids to the lab or to get the scientists into the classrooms.”

Barb Romack, Teacher, Kaneland John Stewart Elementary School

“...The Institutes are very productive. Teachers talk to each other and share activities for the classroom. Teachers who attend stay in touch and call for more information. We make an electronic binder for activities, with DVDs and CDs. This year we asked them to bring a thumb drive. We tell them to modify the activities and make them work for their own classrooms.”

Tom Knutson, Summer Secondary Biology Institute Instructor

“I’ve worked with Friends since the early 80’s. Teachers were looking for masters programs in their specialties but couldn’t find them. Most got degrees in Education, not in a science specialty, so they didn’t have a strong science background. Friends did a needs assessment and asked teachers what they wanted...The Institutes are based on subject matter. They let teachers learn more science than they get in an Education curriculum. There’s a whole cadre of teachers in the Chicago area who went through the Institutes, then went on to become AP and honors teachers.

Lee Marek, Summer Secondary Chemistry Institute Instructor

CONGRATULATIONS TO HONOREES!

DIRECTOR'S AWARD

During 2007, more than 200 members of the Fermilab community contributed their time and talents to Fermilab's education programs. To recognize these generous volunteers, FFSE once again sponsored a reception and funded a Director's Award.

This year's finalists were **Peter Garbincius**, for his contributions to the Ask-A-Scientist program; **Terry Kiper**, for his contributions to QuarkNet; **Ron Miksa** for his work on the exhibits at the Lederman Science Center; and **Suzanne**

Weber for her contributions to Saturday Morning Physics. Each finalist received a certificate recognizing his or her contributions.

The 2007 Director's Award went to **Jerry Zimmerman**, a.k.a. "Mr. Freeze," for his cryogenics show which has delighted and educated thousands of people over the years. When presenting the award, Fermilab Director Pier Oddone commented, "He's helped enhance the Laboratory's reputation both in science and education and research."

HIGH SCHOOL STUDENT AWARDS

Every year FFSE underwrites an award program for outstanding science students attending high schools in DuPage and Kane Counties. Nominated by school faculty, each winner receives a certificate and a book at their school's award ceremony. This year's winners were:

Nicole Mueller, Kathy Wroblewska, Addison Trail H.S.; **Aly Clayton, Anna Scott**, Aurora Central Catholic H.S.; **Andrew Kustusich, Kristin Sellers**, Benet Academy; **Tyler Banas, Aude Bouagnon**, Burlington Central H.S.; **Fatima Saeed, Fahim Zaman**, College Preparatory School of America; **Jenna Bodie, Kathleen Norton**, Community H.S.; **Andy Lithio, Dale Magliola**, Downers South H.S.; **Gustavo Chavoya, Sonia Heredia**, East Aurora H.S.; **Sally Moseley, Marysia Watson**, Elgin Academy; **Amanda Lindoo**, Geneva H.S.; **Mathew Bednarz**, Glenbard North H.S.; **Calvin Studz-**

inski, Glenbard West H.S.; **Emily Moog, Marina Poluektova**, Hinsdale Central H.S.; **David Majewski, Nidha Mattappally**, Hinsdale South H.S.; **Donald Abuy, Katherine Perrone**, Immaculate Conception H.S.; **Maha Ahmad, Fatima Ibrahim**, Islamic Foundation School; **Alex Chen, Aaron Zaubi**, Lake Park H.S. (West Campus); **Alicia Hinkle, Hannah Klein**, Larkin H.S.; **Jared Gustafson, Tim Ludwigson**, Lisle Senior H.S.; **Michael Grant, Erin McGregor**, Montini Catholic H.S.; **Zach Rubin**, Naperville Central H.S.; **John Brucker, Dan Lin**, Neuqua Valley H.S.; **Brooke Rosheisen, Kathleen Stanley**, Rosary H.S.; **Ruthvik Basavaraj, Christopher Gedes**, St. Charles East H.S.; **Ryan Goh, Tara Orech**, St. Charles North H.S.; **Andrew Moore**, West Aurora H.S.; **Joshua Michael Veague**, Wheaton Academy; **Brigitte Bucholz, John Rosenwinkel**, Wheaton North H.S.; **Emily Disbrow, Matthew Mahowald**, Wheaton Warrenville South H.S.; **Alyssa DeVries, Will Mayers**, York Community H.S.

FRANKLIN AWARD AND SCHOLARSHIP

In 2007, FFSE partnered with the Franklin Fund to offer a new award: a \$1000 scholarship for one college-bound student in each of Kane and DuPage Counties.

The new scholarship is an effort to encourage and support student interest in science and to recognize outstanding achievement. Any senior in Kane or DuPage honored with the Fermilab Science Award is eligible. Selection criteria include grades, participation in activities such as science clubs, academic competitions, talent searches, original work and internships.

In 2007, there were three finalists from Kane County high schools. **Kathleen Stanley** of Warrenville was the recipient.

On May 23 at her school's honors assembly, Paul DesCoteaux of the Franklin Fund and Marge Bardeen, President of FFSE, presented the award and scholarship. The text of the award reads, "Presented to Kathleen Stanley in recognition of her strong academic record in mathematics and science courses and her success as a member of the Math and Chemistry Teams at Rosary High School." Kathleen, a graduating senior, hopes to major in chemical engineering.

DISTINGUISHED EDUCATOR AWARD

Laura Cox of Glenbard South High School was this year's recipient of the Distinguished Educator Award, funded by FFSE. The award is for teachers who engage students in science, provide leadership for the profession and are associated with Fermilab's K-12 education programs.

Laura received the award for "her exceptional contributions to science education through her leadership as an instructor

in Fermilab's Summer Secondary Biology Institute."

Her citation noted that, "Action is the key word in Laura's teaching whether with students in her classroom or teachers in a workshop. Teachers come away with real lesson plans, activities and labs that can be used immediately in their own classroom. They experience the same excitement and wonder of science as do Laura's students."

SCHOLARSHIP WINNERS

In 2007, seven teachers received FFSE-funded scholarships that allowed them to attend workshops or field trips at Fermilab, and two families received Science Adventure scholarships. The recipients were:

Susan Abrant: \$100 toward Beauty and Charm; **Robin Brown**: \$100 toward Family Science Adventures; **Mary Beth Hagberg**: \$100 toward The Prairie-Our Heartland;

Victoria Kehoe: \$325 toward Particles and Prairies; **Matt Langes**: \$112.50 toward Particles and Prairies; **Shannon McGuire**: \$325 toward Beauty and Charm; **Curt Schlinkmann**: \$300 toward the Summer Secondary Science Institute in Modern Physics and Fermilab; **Gail Stover**: \$100 toward The Prairie-Our Heartland; **Winnie Wong**: \$18 toward Family Science Adventures.

PROGRAM HIGHLIGHTS

January

FFSE received three grants from an anonymous donor: one for the Family Open House, another for the Symposium on the Nature of Science, and a third to develop and improve the Summer Science Institutes in chemistry and physics.

February

On February 11, Fermilab hosted its third annual Family Open House, funded by a grant from FFSE. Nearly 2,000 people enjoyed hands-on exhibits, presentations, and tours of various Fermilab facilities.

Visitors enjoyed the many hands-on activities and quizzed scientists about the science of Fermilab. Mr. Freeze gave his ever-popular cryo show, and “Ben Franklin” showed up to put on electricity demos.

March

Workshops at the Teacher Resource Center served 76 students and 21 educators from surrounding colleges and school districts. Presentations focused on mathematics and science curriculum examination and development.

April

On April 22, Weird Science presented the 20th annual Wonders of Science show in Ramsey Auditorium. The show was sold out for the fourth consecutive year.

In the ENTICE Schoolyard Habitat Development Workshop, 28 teachers planted prairie and wetland plants in the wagon plot south of the Lederman Science Center, among other activities. ENTICE workshops are supported by funds from the Illinois Department of Natural Resources to FFSE.

May

In the first months of the year, 4,666 students from 47 schools participated in the Beauty and Charm and Friendly Physics field trips at the Lederman Science Center.

June

Thirty-one Science Adventures for children in kindergarten through seventh grade drew 326 participants during the summer. Offerings included Snow Crystals, Lego Engineering, Spring Bike Safari, and Survival Science Camps.

Nearly one thousand scouts from 72 troops worked on science-related badges at the Lederman Science Center.

July

During the summer, 93 teachers attended workshops for various programs. These included Summer Secondary Biology and Physics Institutes, The Prairie–Our Heartland, Beauty and Charm, and Particles and Prairies.

August

Thirty-two volunteers collected data for the prairie quadrat database during the summer months. The Fermilab Prairie Public Quadrat Program gave volunteers an opportunity to participate in real science and to further prairie restoration. Data from the program supplements information collected by middle school students who participate in Particles and Prairies during the fall and spring.

September

As part of “Fox Valley Reads,” a high school program through the Aurora libraries, 60 participants toured the prairie and swept for insects.

The Education Office and Jerry Zimmerman (“Mr. Freeze”) represented Fermilab at the second annual Science in the City event at Daley Plaza.

October

During the fall season, 52 schools and 5,358 students attended Particles and Prairies and The Prairie–Our Heartland field trips at the LSC.

At the St. Charles Scarecrow Festival, Fermilab’s entry, “Ben’s Illuminating Experience,” built by Fermilab engineer Todd Johnson and docents David Seymour and Mary Hawthorne, won 3rd place in the mechanical division.

November

During the fall, around 5,000 students came on field trips to the Lab. The Lederman Science Center hosted the first SPARKS (Supporting Parents in Advocacy, Reform and Knowledge in Science) workshop.

FFSE has a new look to its website as part of the relaunch of the Education Office website. Check it out at ed-fnal.gov/ffse_new/index.shtml.

December

At the annual Director’s Volunteer Reception, Fermilab Director Pier Oddone presented the Director’s Award to Jerry Zimmerman for his many years of volunteer work in educating students about cryogenics. Four finalists, Peter Garbincius, Terry Kiper, Ron Miksa, and Suzanne Weber, also received recognition. This year more than 200 volunteers were invited to the reception, sponsored by FFSE, as a way of thanking them for their contributions to science education.

Throughout the year, volunteers including scientists and docents visited classrooms within 90 miles of Fermilab as part of the ongoing classroom visitation program. In 2007, over 11,000 students attended these presentations on optics, electromagnetism, space and time, force and motion, cryogenics, and the physics of sports.

PERSONNEL

The success of the 2007 FFSE programs rests with these outstanding program leaders.

Michael Albrow, Fermilab • **Michael Bachrodt**, Fremd High School, Palatine • **Richard Billings**, Glenbard West High School, Glen Ellyn • **Sue-Z Bruno**, Gates Elementary School, Aurora • **Joseph Cave**, Naperville School District 203, Naperville • **John Chamberlain**, Glenbard North High School, Carol Stream • **Jennifer Ciaccio**, West Chicago High School, West Chicago • **Trudi Coutts**, Naperville School District 203, Naperville • **James D. Cox**, Clarendon Hills Middle School, Clarendon Hills • **Laura Cox**, Glenbard South High School, Glen Ellyn • **Karl Craddock**, Fremd High School, Palatine • **Larry Cwik**, teacher, retired • **Robin Dombeck**, Maple Middle School, Northbrook • **Jason English**, Fremd High School, Palatine • **Amy Fehrman**, Johnson Elementary School, Warrenville • **Patricia M. Franzen**, Wild Enterprises, Metamora • **Sharon Gatz**, Beebe Elementary School, retired, Naperville • **Barbara Greenberg**, National Louis University • **Carolyn Gresh**, West Chicago School District 33, West Chicago • **Randy Jones**, Glen Ellyn School District 41, Glen Ellyn • **Marge Keefe**, St. Charles School District 303, St. Charles • **Steve Keefe**, teacher, retired • **Tom Knutson**, Glenbard North High School, retired, Carol Stream • **Leon Lederman**, Fermilab • **Donna Lemmer**, Lombard School District 44, Lombard • **Robert Lewis**, Downers Grove North High School, Downers Grove • **Mary Lou Lipscomb**, Illinois Math and Science Academy, Aurora • **Paul Madsen**, Rosary High School, Aurora • **Lee R. Marek**, University of Illinois, Chicago • **Chris Marszalek**, Twin Groves Junior High School, Buffalo Grove • **George McGuire**, Hinsdale South High School, Hinsdale • **Stephen Meehan**, Naperville Community School District 203, Naperville • **Bill Mikuska**, State Microscopical Society of Illinois, Chicago • **Jill Mueller**, West Chicago Middle School, West Chicago • **Paul Nienaber**, Fermilab • **Marcy Novak**, Lombard School District 44, Lombard • **Mary Sue Offut**, SciTech and Field Museum Volunteer, Aurora • **Pat Pentek**, West Chicago Middle School, West Chicago • **Chris Quigg**, Fermilab • **Tom Redig**, Downers Grove North High School, Downers Grove • **David Ritchie**, Fermilab • **Barbara A. Romack**, Kaneville North Elementary School, Elburn • **Niki Saoulidou**, Fermilab • **Jean Slaughter**, Fermilab • **Patricia Smolucha**, Winfield School District 34, Winfield • **Michael Syphers**, Fermilab • **Robert Thompson**, Glen Ellyn School District 41, Glen Ellyn • **Linda Valerio**, Fermilab • **Chris White**, Fermilab • **Herman White**, Fermilab • **Wayne R. Wittenberg**, Glen Ellyn School District 41, Glen Ellyn • **Jerry K. Zimmerman**, Fermilab • **Anna Zuccarini**, Crone Middle School, Naperville

Education Office staff administers and supports the program leaders.

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Docents facilitate student field trips and other Education office activities and supervise the Lederman Science Center.

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REVENUES AND EXPENSES

	2006 (audited)	2007 (preliminary audited figures)	25 years (1982-2007)
Revenue/Contributions (\$000)			
Public Agencies	\$ 2.8	\$ 2.1	\$4,235.3
Private Foundations	51.1	112.7	824.2
Membership	17.8	21.9	337.1
Other	23.2	6.3	395.1
Total Revenue/Contributions	\$ 94.9	\$ 143.1	\$5791.8
Expenses			
Programs	\$ 65.5	\$ 79.6	\$4193.9
Administrative Overhead	31.1	30.2	1428.6
Total Expenses	\$ 96.6	\$ 109.8	5622.5
Excess (deficit) of Revenue/Contributions over Expenses	\$ (1.7)	\$ 33.4	\$ 169.4

ACKNOWLEDGEMENTS

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United States Department of Energy
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THE YEAR IN PICTURES



High school students discuss physics with scientist Hans Jostlein.



Learning about prairie and wetland ecosystems on a Beauty and Charm field trip.



Making kaleidoscopes for the Science in Everyday Life badge.



Boy Souts ponder acceleration for the Scientist badge.



Exploring the Lederman Science Center on a middle school field trip.



Middle school students examine aquatic life at the LSC pond.

I was quite interested to find that two out of fifteen of the science staffers I met in visiting Congress two weeks ago knew about Fermilab from school visits when they were in school. Neither were staffers from nearby states, but one had lived in Oak Park and the other in Indiana.

In addition, talking about the Fermilab Education Office and the various programs like WYP school visits helped a lot in our discussions.”

Fermilab scientist Jean Slaughter