



**FERMILAB FRIENDS FOR  
SCIENCE EDUCATION**

**ANNUAL REPORT**

2014

P.O. Box 500, MS 777  
Batavia, IL 60510-5011

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



*Fermilab Friends' graphics incorporate an image of one of Robert Wilson's best known sculptures, Möbius Strip. Slicing a Möbius strip lengthwise results in two interlinked loops, an appropriate metaphor for the relationship between FFSE and the Fermilab Education Office: separate, yet tightly linked.*

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Brian Yanny

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Elisabeth Klotz

Merle Olson

Selitha Raja in Memory of Rajendra Raja

### A Tribute to Marge Bardeen, an ever-present leader of Fermilab Friends for Science Education

In 2009, after 25 years as president, Marge Bardeen stepped down from leading Fermilab Friends for Science Education. With the close of this term, ending May 2015, she leaves the board with a legacy that will remain unmatched. Of course, the Education Office will remain under Marge's guidance as manager.

A tribute written for the 2009 celebration is an apt remembrance of Marge's service to FFSE.

### *Ideas often wither. Even great ideas.*

*Friends of Fermilab (now Fermilab Friends for Science Education) might have withered, too.*

*Instead, in the space of a few days during the bitterly cold beginning of February 1982, two people made crucial recruiting decisions. Leon Lederman recruited Stanka Jovanovic to start Friends of Fermilab. Stanka, in turn, recruited Marge Bardeen.*

*The reasons Stanka turned to Marge won't fit on this sheet of paper. Even in a miniscule font, Marge's CV alone would crowd her photo right off the page. By 1982, Marge's experience included—among many other things—a math degree, graduate studies in computer science and education, motherhood; and work as a computer programmer, a school board president, and a teacher in Hadley Junior High School's Gifted and Talented program.*

*Knowing what we know now about the durable, influential science-education machine Stanka and Marge helped to build, it's possible to anticipate Friends of Fermilab's bright future in the way Marge responded to Stanka's initial invitation on that wintry day back in 1982. As Stanka tells it, "Marge thought for a moment, and said yes, but only if teachers have the say in what programs Fermilab offers."*

*Marge's founding insistence on a central role for teachers shaped Friends of Fermilab. Many years, many struggles, many successes, and many collaborators later the decision to treat classroom teachers as full partners has everything to do with testimonials such as this one from a QuarkNet Fellow:*

*"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."*

*This spirit of connection, rejuvenation, wonder, and discovery permeates Friends of Fermilab's ever-growing legacy. The spirit has defined well-known programs such as Beauty and Charm, Particles and Prairies, Beneath the Ashes, Topics in Modern Physics, Science Adventures, Phriendly Physics, ARISE, LInC and QuarkNet. It's what built the Lederman Science Center and Fermilab's Education Office. It's what continues to spread far beyond Fermilab as Marge shares her wisdom and experience with educators and scientists from other labs, the U.S. Department of Energy, the National Science Foundation, and organizations in Europe.*



## FROM THE FFSE PRESIDENT

May 5, 2015

Dear Friends,

2014 and the year to come will prove to be pivotal years for Fermilab Friends for Science Education. 2014 was very much about people. I want to acknowledge several in this letter.

Long-standing program leaders Jim Cox and Barb Romack retired from leading one of the first Education Office programs, *Beauty and Charm*. Pat Franzen, a very loyal board member and *Particles and Prairies* program leader, retired from the FFSE board. Thanks go to Gayle Millman for providing administrative assistance to FFSE for a number of years.

But, as true friends, Jim Cox and Pat Franzen volunteered their talents and time to support FFSE. Jim is working closely with membership and book-keeping. Pat is helping with communication by writing newsletters and annual report content. We continue to be very grateful for continuing support from Liz Quigg, LaMargo Gill and Anne Mary Teichert whose help is essential to FFSE.

This report highlights programs that are now staples for families and students: the Family Open House, Outdoor Fair and STEM Career Expo. Schools, teachers and families appreciate the program scholarships for workshop fees, field trip transportation and family Science Adventure classes. Your support makes these programs and support possible.

With approval from Fermilab and support from an anonymous donor, the Community Foundation of Fox River Valley, and the John E. Meyer Family Endowment Fund, an additional outdoor exhibit known as the *Particle Wave* was completed during the summer of 2014. This new exhibit will incorporate two demonstrations under the guidance of Fermilab Education Office docents. Students will investigate the concepts of waves and sympathetic oscillations.

The annual "Members Only" events have become something to look forward to each year. In December 2014 we were honored to be one of the early groups to see the Muon g-2 magnet. Chris Polly, project manager, explained the experiment's goals and shared details of the historic move of the magnet from Brookhaven National Laboratory on Long Island, New York. Plans are underway for another memorable physics tour in 2015. Watch your email for details.

We have been working with the Office of Partnerships and Technology Transfer and the Fermilab Legal Office to renew the agreement FFSE has with Fermi Research Alliance. A new Cooperative Research and Development Agreement, CRADA, is the document that will formalize our partnership. We plan to work toward a positive and productive partnership that is supportive to all involved—one that continues to support the mission of Fermilab Friends for Science Education.

We are thankful for the continuing interest and support of our members. We want to be an organization that involves you. If you have contacts for funding, suggestions for membership or member events, please contact me.



Susan M. Dahl  
President, Fermilab Friends for Science Education

A handwritten signature in blue ink that reads "Susan Marie Dahl". The signature is written in a cursive style and is placed on a white rectangular background.

## FFSE thanks

the many volunteers who give of their time and talent to actively and creatively support innovative science programs at Fermilab!

Over 200 Education Office volunteers are recognized at the annual volunteer reception. Meet a few of them here.



**Dave Harding** is deputy head of Fermilab's Technical Division and serves on the FFSE Board of Directors. A devoted volunteer, Dave assists at the Family Open House every year, attends the STEM Career Expo and helps organize school tours at the Industrial Building. He developed the Physics of Sports classroom presentation and visits area schools to present it.



**Jen Raaf** is co-spokesperson for the LArIAT experiment. Jen is a valued resource who talks to the docents, groups of visitors and participates in panels for teacher groups.



**Jim Zagel** is an engineer in the Accelerator Division. Jim does classroom presentations and talks to scout groups. Jim supports FFSE with attendance at the STEM Career Expo.



**Ryan Campbell** is the Fermilab ecologist. He meets with workshop teachers and is an indispensable resource for docents with questions about the environment.



**Maurice Ball** is an engineer in the Accelerator Division. He talks to school groups when he is available. Maurice contributes to the STEM Career Expo and participates in panels for teacher groups.



**Jamie Blowers** is the head of the Machine Shop and the Quality and Materials Departments. Jamie visits schools to give classroom presentations and participates in panels for teacher groups.

### Fermilab Friends for Science Education Mission

Fermilab Friends for Science Education supports innovative science education programs at Fermilab. Its mission is to:

- Enhance the quality of precollege science education in public and private schools.
- Encourage young people to pursue careers in science and engineering.
- Promote a broader public awareness and understanding of science.

## PROGRAMS IN 2014

### FERMILAB FAMILY OPEN HOUSE

The 10th annual Fermilab Family Open House on February 8 drew nearly 3,000 visitors.

This year they enjoyed tours of the new Muon g-2 storage ring, the DZero detector, the Linac and the Main Control Room.

Tours of the Remote Operation Centers for CMS and for Fermilab's neutrino experiments also proved popular.

Fermilab scientist Brian Nord took visitors on a journey through the cosmic structure of the universe and Jerry Zimmerman—aka Mr. Freeze—wowed



audiences with his popular cryogenics demonstrations.

Once again, guests enjoyed interacting with students from surrounding area high schools, who hosted numerous science exhibits.

Fermilab Ask-a-Scientist volunteers stayed busy all afternoon fielding questions from young and old.

In short, the open house was a rousing success in its tenth anniversary year.

As ever, the event was supported in part by the gift of an anonymous donor to FFSE.

### STEM CAREER EXPO

What does a scientist do all day?

How difficult is it to be a mechanical engineer?

What is the daily life of an economist like?

How much and what type of math is used in these careers?

On April 23, the lab offered Chicago-area high school students a valuable opportunity to ask those questions in person.

The annual STEM (science, technology, engineering and mathematics) Career Expo held in the atrium and second floor of Wilson Hall put these students face-to-face with people actually doing the type of jobs they will be applying for in the coming years.

Over 130 professionals donated their time and energies to make the 2014 STEM Career Expo a resounding success.

Nearly 1,000 students attended the event.



### FAMILY OUTDOOR FAIR



The Family Outdoor Fair on June 8 attracted over 800 visitors.

Nine Fermilab Eco Rangers volunteered their time and six Junior Prairie Rangers earned their stewardship badges as assistants.

A popular highlight and new addition in 2014 was the participation of the Fermilab Fire Department. Children climbed into the fire truck to sit in the driver's seat, looked inside an ambulance and received fireman hats.

Children engaged in a bee and beehive project facilitated by FFSE.

Thank you to FFSE board members JulieAnn Villa, Eileen Pasero, Dave Harding and Susan Dahl for contributing their time and energy to the Family Outdoor Fair.



# CONGRATULATIONS TO HONOREES!

## DIRECTOR'S AWARD FOR EXCEPTIONAL VOLUNTEER SERVICE

Fermilab's K-12 Education Office program volunteers provide their time, expertise and creativity to serve as teachers, mentors, instructors and role models for the scientists and citizens of the future. They meet with visiting school groups, help to design and maintain exhibits at the Lederman Science Center, visit area classrooms and so much more.

In most years one volunteer is named as recipient of the Director's Award for exceptional volunteer service.

In 2014, a panel of their peers chose two outstanding volunteers who shared the \$1000 award and honor provided by FFSE at a volunteer reception held on October 20.

Physicist Eric Ramberg was honored for his commitment to Saturday Morning Physics and his work with the Sustainability Club, which involved installation of a solar panel outside the Lederman Science Center.

Eric's drive is making a difference in the attitudes of young science students and providing a positive example of science in action for a better world.

Physicist Roger Dixon also guides Saturday Morning Physics and delights in interactions between students and educators.

His enthusiastic passion for science inspires and motivates our young scientists.

Roger artfully melds education and scientific research in an interesting and meaningful manner, fulfilling Fermilab's commitment to both education and research.

Congratulations, Eric and Roger!



*Erik Ramberg and Roger Dixon*

## PROGRAM SCHOLARSHIPS

**Six teachers** received FFSE-funded scholarships for teacher workshops at Fermilab: **Larissa Aguilera**, for The Prairie - Our Heartland Teacher Workshop; **Maria Dongo**, for the Phriendly Physics Teacher Workshop; **Christopher Freund**, for the Electricity and Magnetism Teacher Workshop; **John Kubilius** for The Prairie - Our Heartland Teacher Workshop; **Janet Lindley** for the Insects at Work in Our World Teacher

Workshop; **Clintonia McNeal** for the Particles and Prairies Teacher Workshop.

**Two teachers** received scholarships for bus transportation to Fermilab field trips.

**Nine families** received scholarships enabling children to attend Science Adventures at Fermilab.

## FERMILAB SCIENCE AWARD FOR HIGH SCHOOL STUDENTS

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:

**Michael Foley, Lauren San Diego**, Aurora Central Catholic High School; **Patrick Cole, Stephen Buhrt**, Aurora Christian School; **Keaton Grizzell, Megan Imundo**, Batavia High School; **Alexander Linder, Kevin Burns**, Benet Academy; **Jack Rivera, Jason Ziwiski**, Central High School; **Saaniya Attar, Rasheed Nawaz**, College Preparatory School of America; **Raj Parikh, Lindsey Marie Sayner**, Community High School; **Julian Martinez, John Shimaneck**, Downers Grove South High School; **Jeremy Craven, Elizabeth Arand**, Downers Grove North High School; **Brandon H. Meng, Hannah E. Rice**, Dundee-Crown High School; **Gerardo Alcantara, Maribel Herrera**, East Aurora High School; **Shazia Siddiqui**, Elgin Academy; **Grzegorz Krzywicki**, Fenton High School; **Grant Schumock, Anand Patel**, Geneva High School; **Vaibahu Jariwala**, Glenbard North High School; **Tarika Sandiford, Joe Dixon**, Glenbard South High School; **Andrew Huston, Leanza**

**Go**, Harvest Christian Academy; **Hayden Carder, Smriti Kanangat**, Hinsdale Central High School; **Francis Vasquez, Evan Czyzycki**, IC Catholic Prep; **Stephanie Hatz, Alex Johnson**, Illinois Mathematics and Science Academy; **Ismaeel Ghouse, Hareem Khokhar**, Islamic Foundation School; **Kayla Ryndak, Matt Posen**, Lake Park High School (East Campus); **Parth Shah, Allison Rychtanek**, Larkin High School; **Priyali (Nikki) Saxena, Mit Shah**, Metea Valley High School; **Tyler Pacana, Jordan Lazowski**, Montini Catholic High School; **Cassidy Schneider, Asmaysinh Gharia**, Naperville Central High School; **Yi Chen, Will Song**, Neuqua Valley High School; **Rebecca Fritz, Anna Ward**, Rosary High School; **Ben Smith, Teresa Dang**, St. Charles East High School; **Raheem Khan, Natalia Gawlik**, St. Charles North High School; **Katarina Kuhn, Nicholas Kolker**, St. Francis High School; **Matthew Liu, Michelle Woods**, Waubonsie Valley High School; **Erin Lisac, Laura Kovanic**, West Aurora High School; **Yuechen Pan**, Westmont High School; **Mitchel McRay, Christopher Williams**, Wheaton Academy; **Oldham Cecil, Lauren Liebman**, Wheaton North High School; **Kasey Pham, Tyler Miksanek**, Wheaton Warrenville South High School; **Paul Salamanca, Anna O'Donnell**, York Community High School.

# THE YEAR AT A GLANCE: CELEBRATING SUCCESS THROUGH THE SEASONS

*FFSE supports education programs and outreach efforts directly and in collaboration with others throughout the year.*

## WINTER

- 10th Annual **Fermilab Family Open House** on February 9 (See mini-story on center page.)
- **FFSE Members Only tour** to the Muon g-2 magnet area on December 6 provided a rare glimpse of the immense magnet settling into its new home. (See photos on last page.)
- **Get to Know the Lederman Science Center** tours drew 101 people in 2014. Tours meet at the LSC on the first Saturday of each month. Fermilab docents tailor them to a child's perspective.

## SPRING

- **STEM Career Expo** on April 23 (See mini-story on center page.)
- **High School Student Awards** went to selected science students in Kane and DuPage Counties. (See recipient list on preceding page.)
- **FFSE Annual meeting** on May 21

## SUMMER

- **Fermilab Outdoor Family Fair** on June 8 (See mini-story on center page.)
- **Wave Like a Particle exhibit** debuted in the outdoor play area at the LSC.
- **FFSE scholarship awards** for teacher workshops, Science Adventures, and field trip transportation (See list on preceding page.)
- **FFSE Snack time for teachers:** FFSE board members provide snacks to participants in summer workshops and inform them about FFSE.

## FALL

- **Volunteer Reception and Director's Award** on October 20 (See mini-story on preceding page.)
- The blue **FFSE van** transported equipment to Chicago area schools for the Classroom Presentation program throughout the year. (See numbers below.)

*Congratulations to the **Fermilab Education Office** on another year of very successful programs! Ongoing offerings include physics and prairie field trips, summer teacher programs, Science Adventures, classroom presentations, a very active scout program, and a myriad of special events.*

### **Physics and Prairie Field Trips**

**3,068** middle school students from 36 schools participated in the physics field trips, *Beauty and Charm* and *Phriendly Physics*.

**4,682** students came to study Fermilab's prairie:

- 3,969 students from 36 schools for *Particles and Prairies* (middle level)
- 541 students from 7 schools for *The Prairie - Our Heartland* (late elementary)
- 172 from 4 schools for *Insects at Work in Our World*, our newest program

### **Summer Teacher Programs**

- Engineering Applications of High School Physics: 8
- Electricity and Magnetism: 5
- Biology: 5
- Beauty and Charm: 10
- Phriendly Physics: 8
- Particles and Prairies: 11
- The Prairie - Our Heartland: 4
- Insects at Work in Our World: 3

### **Other Outreach**

- Get to Know Fermilab: **1,311**
- Ask-a-Scientist: **840**

### **Science Adventures**

**560** children participated in 48 different adventures including: *Fireflies, Sea Monsters and Glow Sticks; Making Waves with Medical Imaging; Survival Science; Nanotech Investigations; The Bugs are Back; Friction Unleashed; Lego Engineering; Club Invention; Girls' Scientific Salon; and the Prairie Ranger* program.

### **Classroom Presentations**

**28,528** students enjoyed 163 presentations including:

- *Charge! Electricity and Magnetism;*
- *Space, Time and Einstein;*
- *Forces and Motion;*
- *Space, Time and the Universe;*
- *Light and Color;*
- *Physics of Sports;*
- *Importance of Science;*
- *Physics in the Real World;*
- *Cryogenics Show.*

An FFSE-funded van provides transportation to area schools for the scientists and their materials. (Meet some of the scientist volunteers on page 7 of this report.)

### **Scouts**

**1,168** scouts from 68 troops participated in badge programs.

## PERSONNEL

### *The success of the 2014 FFSE education programs rests with these outstanding program leaders.*

**Kristin Appiah-Word**, Lawndale Academy, Chicago • **Michael Bachrodt**, Fremd High School, Palatine  
**Elizabeth Benatti**, teacher, retired • **Lauren Birth**, St. Peter Catholic School, Aurora • **James Browne**, Amboy High School • **SueZ Bruno**, Gates Elementary School, Aurora • **Jill Burke**, Franklin Park School District 84 • **Trudi Coutts**, Naperville Community Unit School District 203 • **James D. Cox**, teacher, retired • **Karl Craddock**, Fremd High School, Palatine • **Larry Cwik**, Seton Academy, South Holland • **Jason English**, Fremd High School, Palatine • **Todd Ernst**, Valley View School District 365U • **Michelle Fabian**, Batavia High School • **Amy Fehrman**, Johnson Elementary School, Warrenville • **Patricia M. Franzen**, Bradley University, Peoria • **Barbara Greenberg**, teacher, retired • **Bill Grosser**, Oak Park and River Forest High School • **Mary Ann Janiak**, teacher, retired • **Randy Jones**, Glen Ellyn School District 41 • **Elizabeth Karnik**, Western Springs School District 101 • **Steve Keefe**, teacher, retired • **Nikki Kitzmiller**, Rotolo Middle School, Batavia • **Tom Knutson**, teacher, retired • **Ellen Kohlmeir**, biomedical scientist • **Robert Lewis**, Downers Grove North High School • **Paul Madsen**, Rosary High School, Aurora • **Lee R. Marek**, University of Illinois, Chicago • **Stefany Montgomery**, Larkin High School • **Jill Mueller**, West Chicago Middle School • **Radomir Niewrzol**, Glenbard North High School, Carol Stream • **Mary Sue Offut**, SciTech and Field Museum volunteer • **Glenda Peck**, Alice Gustafson Elementary School, Batavia • **Pat Pentek**, West Chicago Middle School • **Barbara A. Romack**, teacher, retired • **Alexandra Rosborough**, Geneva High School • **Chris Ruffolo**, Neuqua Valley High School • **Susan Sanders**, Glenbard School District 87, Glen Ellyn • **Katherine Seguino**, Naperville Central High School • **Larry Spires**, Metea Valley High School, Aurora • **Marsha Stierwalt**, Alice Gustafson Elementary School, Batavia • **Patrick Swanson**, Hoffman Estates High School • **Becky VanDyke**, Glen Ellyn School District 41 • **Phillip VanDyke**, Aurora University • **Karen Weigt**, Kaneland John Stewart Elementary School, Elburn • **Wayne R. Wittenberg**, Benjamin Franklin School, Glen Ellyn

### *Many Fermilab scientists give their time generously to education programs throughout the year.*

Corey Adams • Mark Adams • Michael Albrow • Wayne Baisley • Maurice Ball • Leo Bellantoni • Jamie Blowers  
Mark Bollinger • Chuck Brown • Ryan Campbell • Kermit Carlson • Tom Carter • Alex Chen • Dave Christian  
Penelope Constanta • Andrew Dalesandro • Fritz DeJongh • Roger Dixon • Brian Drendel • Martin Frank • Lynn Garren • Sandra Geib-Ingram • Doug Glenzinski • Stefan Gruenendahl • Sten Hansen • David Harding • Elvin Harms • Anne Heavey • Michael Herr • Samantha Kaushalya Hewamanage • Sergo Jindariani • Cindy Joe  
Amber Johnson • David Johnson • Todd Johnson • Jim Kalina • Young-Kee Kim • Terry Kiper • Donna Kubik  
Jerry Liebfritz • Don Lincoln • Sarah Lockwitz • Margaret Marks • Carrie McGivern • Matthew Muettter • Dennis Nicklaus • Brian Nord • Ruth Pordes • Chris Quigg • Jen Raaf • Erik Ramberg • Paul Reimer • Kurt Riesselmann  
Rob Roser • Josh Rubin • Jason St. John • Jamie Santucci • Niki Saoulidou • Chris Stoughton • Gary Teafoe  
Marcia Teckenbrock • Rod Walton • Mike Weis • Jeremy Werner • Chris White • Herman White • Jim Zagal  
Jerry K. Zimmerman

### *Education Office staff administers and supports Fermilab programs.*

**Marjorie G. Bardeen**, Manager • **Ketevan Akhobadze**, Educational Facilities Coordinator • **Andrea Cox**, Administrative Support Assistant • **Susan M. Dahl**, Education Specialist • **LaMargo A. Gill**, Editor  
**Maureen Hix**, Administrative Support Assistant • **David Hoppert**, Laboratory Technician • **Gayle Millman**, Administrative Support Assistant • **Spencer L. Pasero**, Education Program Leader • **Robert Peterson**, Education Specialist • **Elizabeth K. Quigg**, Computer Specialist • **Sue Sheehan**, Education Program Leader  
**Tanja Waltrip**, Program Administrator

### *Docents facilitate student field trips and other Education Office activities and supervise the Lederman Science Center.*

Lynda A. Ballingall • Donna Blankenship • Maureen Boyer • Mary Campbell • Muriel Cease • Susan Dumford  
Vida Goldstein • Jane Gravelle • Lori Haseltine • Helen D. Huie • Jacqueline J. Krock • Nancy Lanning • Dawn Miller • Wendy G. Mouche • Toni Mueller • Mary Jo Murphy • Paula Mytych • Mark Pennington • Gail Poisson  
Bob Shaw • Felicia Svoboda • Anne Mary Teichert • Yvonne Twomey • Dorothy Yurs

## REVENUES AND EXPENSES

	2014 (audited)	2013 (audited)
<b>Revenue/Contributions (\$000)</b>		
Contributions/Foundations	\$ 48.5	\$ 25.2
Membership	15.1	20.3
Other	4.6	8.3
<b>Total Revenue/Contributions</b>	<b>\$ 68.2</b>	<b>\$ 53.8</b>
<b>Expenses</b>		
Program Services	\$ 61.1	\$ 39.8
Administrative Overhead	18.6	12.4
<b>Total Expenses</b>	<b>\$ 79.7</b>	<b>\$ 52.2</b>
<b>Change in Net Assets</b>	<b>\$ (11.5)</b>	<b>\$ 1.6</b>
<b>End of Year</b>	<b>\$ 120.9</b>	<b>\$ 143.9</b>

## ACKNOWLEDGEMENTS

Fermilab Friends for Science Education depends entirely on contributions and grants. We thank Fermilab Friends for Science Education members, Tree of Knowledge contributors, and the following organizations for their generous support of Fermilab education programs:

United States Department of Energy  
Fermi Research Alliance, LLC  
American Express  
Anonymous Donor  
Batavia High School  
Community Foundation of the Fox River Valley  
Geneva High School  
Invent Now, Inc.  
Selitha Raja in Memory of Rajendra Raja  
Valley Education for Employment System

## “Members Only” Tour to the Muon g-2 experiment

The “Members Only” tour of the Muon g-2 experimental site provided a

rare glimpse into a new and exciting phase of Fermilab exploration. More than 30 Friends and friends of Friends attended the tour.

Muon g-2 (pronounced “gee minus two”) will use Fermilab’s powerful accelerators to explore the interactions of short-lived particles known as muons using a strong magnetic field in “empty” space.

Scientists know that even in a vacuum, space is never empty. Instead, it is filled with an invisible sea of virtual particles that—in accordance with the laws of quantum mechanics—pop in and out of existence for incredibly short moments of time. Scientists can test the presence and nature of these virtual particles with a particle beam traveling in a magnetic field.

FFSE members met with Project Director Chris Polly to learn more about the experiment and its goals as the BIG magnet is put into service.



Down the steps to see the magnet.



In a utility room of the new building.



Viewing the cryogenic systems.



Chris Polly explains the magnet move from Brookhaven.



Installation proceeds on the magnet.



Member Wayne Wittenberg and other guests listen and view equipment.