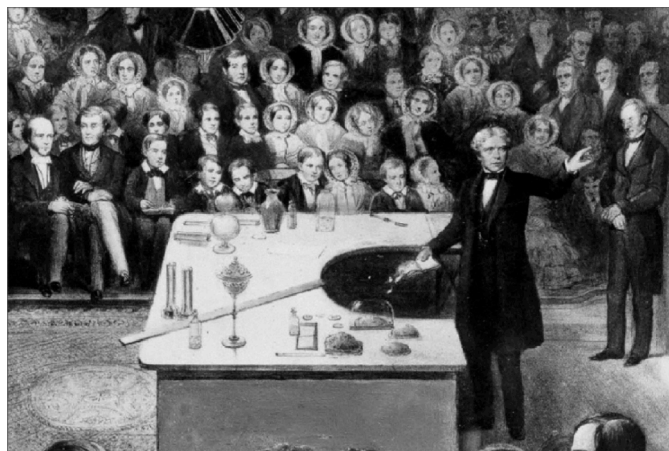


PHYSICS OUTREACH & ENGAGEMENT

Letter from the Chair



Michael Faraday delivering a Christmas Lecture in 1856

In the mid 1800s, English scientist, Michael Faraday gave a series of lectures aimed towards the general public and especially young adults with the hopes of conveying scientific phenomena. His intentions were to raise awareness and inspire them. This series became known as The Royal Institution Christmas Lectures, a series of lectures on a single topic, which have been held in London each year since 1825 and still continues today. The lectures present scientific subjects in an informative and entertaining manner. Michael Faraday initiated the first Christmas Lecture series in 1825. This came at a time when organized science education for people was scarce. A pioneering researcher, Michael Faraday was also one of the seminal science communicators.

Dear FOEP Members

With this issue of the newsletter I would like to welcome again what has become a regular news feature of the APS Forum on Outreach and Engaging the Public: The FOEP Newsletter. The

Continued on page 2

JOIN US

To join FOEP at no cost prior to renewing your APS membership, send an email to membership@aps.org with your request to add FOEP to your membership. Please note that if you currently belong to two or more forums, FOEP will be added at no charge for the remainder of your membership term. On your next membership renewal notice, you will see a Forum subtotal that will include \$8 for every Forum membership over two.

VOL. 3 NO. 1 MARCH 2016

In this issue



Letter from the chair
-1-



Medal and Fellow Awards
and Nominations
-4-



FOEP News
(Survey Results, Membership,
Meetings: Invited Sessions)
-7-



Spotlights on Outreach and
Engaging the Public
-11-



Presenting Physics to
Regular People
-14-



Outreach News, Resources,
and websites
-15-



Funding Information
-18-

*A publication of The Forum on Outreach and
Engaging the Public - FOEP -
A forum of the American Physical Society*

FOEP is one of seven APS Forums that are a membership-driven group of people – any APS member can join – with a common interest that falls outside the research-oriented focus of the APS divisions.

This is an important time in outreach activities, and the FOEP has an essential role to play. I am honored to serve FOEP and its members as Chair of the Executive Committee during this time of opportunity and challenge. Exciting breakthroughs in physics are occurring at an accelerating rate, and these advances should be advertised and explained to the public. I believe that FOEP can be a key voice in articulating and championing the importance and impact of physics to broad audiences. We also need to remain focused on the participation of graduate students and post-docs who are joining our community.

Our community has not yet managed enough to engage the general public in the excitement of physics research, and if possible to educate them in understanding the importance of this research to their daily lives. This is an important challenge that will not easily be addressed, but it is critical to make efforts to do so, in part to attract the next generation of physicists, but also to ensure that the value of our research is clear to the public.

I believe that FOEP serves the physics research outreach community itself very well through the dedication of the Executive Committee, and I am keen to be involved in this important task. The FOEP publishes a newsletter, sponsors invited sessions, gives the yearly Nicholson Medal Award, proposes APS Fellows, and helps support conferences on physics outreach. We especially need to ensure that the March and April Meeting remain a venue for promoting our activities and fostering the interactions that will lead to even greater impact. Finally, your participation and interest in the FOEP activities listed below is very much appreciated and welcome. We encourage you to participate in any form appropriate.

- APS Fellows

In 2015 FOEP was again honored to handle the successful nomination of four new Fellows of the APS for their efforts and contribution to engage the public in the excitement of physics. More information is given by Ivan Schuller, chair of the 2015 Fellowship Nomination Committee, on pages 5 and 6 in this newsletter. This year deadline for you to submit nominations is May 2, 2016. Please learn more at: <http://www.aps.org/programs/honors/fellowships/>.

- Dwight Nicholson Medal

Our Forum is also in charge of the Dwight Nicholson Medal for Outreach, that shall be awarded to a physicist who either through



Letter from the Chair, continued

continued
the Chair,
continued



Continued on page 3

public lectures and public media, teaching, research, or science related activities, has successfully stimulated the interest and involvement of the general public on the progress in physics. More information about the two 2015 awardees is given on page 4 of this newsletter by Dan Dahlberg, chair of the 2015 selection committee. The launch date for the 2016 online nomination system is not yet decided.

- FOEP Survey

FOEP wished to have an overview of the outreach activities of its members. These are separate from education activities, so direct teaching and related activities are not considered outreach here. The experience gained by this survey is presented on page 7 in this newsletter by Michael Barnett, organizer of this very interesting initiative.

-FOEP Bylaws

The revised FOEP bylaws, which mostly account for changes in APS governance and which were approved by our membership, have now been approved by the APS Council.

- FOEP Invited Sessions

One of the main responsibilities of the Forum is to organize FOEP Invited Sessions at the March and April meetings of the APS. These are described later in this newsletter.

We thank all those that have run for election for the FOEP Executive Committee. The new elected members are:

Chair-Elect: Itai Cohen

Vice Chair: Larry Gladney

Members at Large: Alice Bean, Heide Doss, and Amber Stuver

We thank outgoing members of the committee:

Ivan Schuller, Sidney Perkowitz and Brian Schwartz

Yvan Bruynseraede

Forum on Outreach and Engaging the Public

FOEP's goal is to increase the public's awareness of physics by providing a forum within APS for the large number of physicists currently involved in a diverse array of outreach and public engagement activities. FOEP fosters the development and dissemination of outreach activities such as blogging, multimedia, video, pop culture, popularizations, press relations, politics, "amateur" and distributed science, science cafes, and public shows and lectures. The Forum organizes and sponsors sessions at the March and April APS meetings and will issue a semiannual newsletter.



Letter from the Chair, continued

continued
the Chair,
continued



2015 Dwight Nicholson Medal for Outreach Awards



Charles M. Falco University of Arizona

"For his award-winning "The Art of the Motorcycle" exhibition for the Solomon R. Guggenheim Museum (co-curator), and his work with the renowned artist David Hockney on the optical science utilized by the grand master artists; each unique project has made the public aware of the contributions of science to their daily lives."

Background:

Professor Charles M. Falco has joint appointments in Optical Sciences and Physics at the University of Arizona where he holds the UA Chair of Condensed Matter Physics. He received his BA (1970), MA (1971) and Ph.D. (1974) from the University of California, Irvine. His research is in condensed matter physics studying various physical properties of thin film materials grown by chemical deposition, sputtering, and Molecular Beam Epitaxy, and he has published more than 275 scientific manuscripts, co-edited two books, has seven U.S. patents, and given over 400 invited talks at conferences, research institutions, and cultural organizations in 32 countries. Honors include the Alexander von Humboldt Senior Distinguished U.S. Scientist Award, Industrial Research 100 Award, Technology 100 Award, AICA Design Exhibition Award, NAEA Ziegfeld Lectureship Award and most recently an invited presentation in the opening ceremony of the 2015 United Nations "International Year of Light." He is a Fellow of the American Physical Society, the Institute of Electrical and Electronics Engineers, the Optical Society of America, and the Society of Photo-optical Instrumentation Engineers (SPIE). Full details are at:

<http://www.aps.org/programs/honors/awards/nicholson.cfm>

David Elazzar Kaplan, Johns Hopkins University

"For his extraordinarily innovative and effective efforts in public outreach, and in particular for his production of the documentary film, Particle Fever, that allows nonscientists to experience the scientific world and discoveries as they really are."

Background:

David Kaplan is a professor of particle physics at Johns Hopkins University. He received his Bachelor's degree at UC Berkeley in 1991 and his PhD at the University of Washington in 1999. He is a leader in developing theoretical physics beyond the standard model, including theories to explain the Higgs boson, dark matter, and the cosmological constant. He also leads the effort to finding ways of testing such theories in novel experimental methods. He is an APS Fellow, a Sloan Fellow, and a Kavli Fellow. He has had a significant impact in bringing science to the public, mainly as creator and producer of Particle Fever, the 2014 documentary about the Large Hadron Collider, for which he has won numerous awards, including Columbia University's duPont Award for Excellence in Journalism and the Communications Award from the National Academy of Sciences. He has also hosted science programs on the History and National Geographic channels.

Selection Committee: E. Dan Dahlberg, Chair; Yvan Bruynseraede; Diandra Leslie-Pelecky; Ivan Schuller

Dwight Nicholson Medal for Outreach

The Forum on Outreach and Engaging the Public assumes responsibility for this prize. This important APS prize consists of the Nicholson Medal and a certificate that includes the citation for which the recipient has been recognized.

The prize shall be awarded to a physicist who either through public lectures and public media, teaching, research, or science related activities has

1. successfully stimulated the interest and involvement of the general public on the progress in physics, or
2. created special opportunities that inspire the scientific development of students or junior colleagues, or has developed programs for students at any level that facilitated positive career choices in physics, or
3. demonstrated a particularly giving and caring relationship as a mentor to students or colleagues, or has succeeded in motivating interest in physics through inspiring educational works.

Full details are at: <http://www.aps.org/programs/honors/awards/nicholson.cfm>

Contributed by: E. Dan Dahlberg

Who

MPO
Dwight
Nicholson
Medal for
Outreach

2015 Fellows: Forum on Outreach & Engaging the Public



James Kakalios

For innovative efforts to engage the public in the excitement of physics through popular science books, general audience talks, and on-line videos that use examples taken from popular culture.

Shane Larson

For impacting science and society through the integration of public engagement and research, and for empowering generations of future scientists by his example.

Don Lincoln

For contributions to outreach and engaging the public in the physical sciences, particularly particle physics, with a broad range of communication vehicles and forums.

Daniel Steinberg

For developing, assessing, and disseminating new science education outreach programs targeted to pre-college students and to the general public, and for forging prototypical outreach partnerships locally and nationally.

Who

MPO



2016 FOEP Nominations for APS Fellows



What

APS Fellowship constitutes recognition by one's professional peers of exceptional contributions to the physics enterprise. Only a small fraction of the APS members reach the level of fellows and therefore this is an important recognition.

Who

Only APS members who are members of FOEP can be nominated for fellowship through FOEP. The deadline for Fellowship nominations is May 2, 2016. We strive to have a diverse group of nominees and encourage the nomination of members of all underrepresented groups.

Who

How

Nomination is done entirely on-line. Complete instructions for the nomination are available at: <http://www.aps.org/programs/honors/fellowships/nominations.cfm>.

How

The process consists of: providing the nominee's contact and professional information, uploading nomination letters documenting the accomplishments of the nominee and explain why he or she is deserving of recognition. Note that it is the responsibility of the nominators to provide a compact however complete nomination.

Evaluation

Nominations are evaluated by the FOEP nomination committee, reviewed by the full APS Fellowship Committee, and finally approved by the APS Council.

Subject

Outreach is a broad enterprise, spanning academia, industry and national laboratories, as well as freelance professionals such as writers, journalists and bloggers. Outreach activities are often overlooked and undervalued. Thus it is important to think about and propose people who have an exceptional track record in this area.

Why

Nominating someone for APS fellowship takes time; however, it is a great way to emphasize the importance of reaching out to and engaging with the public. At the personal level it is very satisfactory to get recognition of your peers.

Contributed by: Ivan K Schuller

FOEP Survey Results

Survey on Activities of FOEP Members

FOEP carried out a survey of its membership (and others) in autumn 2015. There were 343 responses from a membership of 1525. Of these 64 % held more senior positions (faculty, etc.) with the remaining 36% being students and postdocs.

An interesting question asked whether one's department/institution encouraged or discouraged outreach activities. 77% said they were encouraged or mildly encouraged. From the written comments, it appeared that discouragement may instead be self-inflicted out of concern about distraction from career advancement. The results were almost identical when only students and postdocs were considered.

Of these survey participants, 89% said they had participated in outreach activities within the last five years. 36% would consider giving a ten-minute contributed talk at an APS meeting, and another 36% said they might consider it. If there was a peer-reviewed scholarly journal with articles written by and for scientists, specifically focused on outreach, 26% would and 47% might be interested in submitting articles.

Asked how they would like FOEP to serve them in their outreach efforts, the results were quite evenly divided among: a) Encourage support for outreach, b) Provide ideas for outreach, and c) Build community among those interested in outreach.

Concerning audiences for their outreach activities, respondents identified: students (6-12), general public, undergraduates, students (K-5), and teachers (6-12) as their top audiences. Somewhat further behind were women and minorities, where these activities were narrowly defined as being specifically designed for women or for minorities. Other significant audiences were: media, graduate students, families and faculty scientists.

Outreach activities covered an extremely broad range with public talks and/or public demos far ahead of others. These were followed by classroom presentations, lectures, science festivals, open houses, guided tours, websites, social media (incl. Blogs, Twitter, Facebook), summer institutes, ask-a-scientist programs, cafés scientifique, physics slams, videos/movies, and posters. Rounding up the outreach activities were: brochures, speakers bureaus, scout programs, books, masterclasses, virtual tours, and podcasts.

This was a very successful survey for FOEP.

Contributed by: Michael Barnett

FOEP Election Results

- The current FOEP Executive Committee members are

Chair: Yvan Bruynseraede

Chair-Elect: Itai Cohen

Vice Chair: Larry Gladney

Past Chair: Michael Barnett

Secretary/Treasurer: E. Dan Dahlberg

Members - at - Large: Alice Bean, Heide Doss, Jennifer Ross, Amber L. Stuver,

APS staff member: Becky Thompson

Assigned Council Representative: Gay Stewart

Editor of Newsletter: Heide Doss

FOEP Membership

Hi FOEPers,

My name is Jenny Ross, and I am a member-at-large of FOEP.

As you may know, FOEP was established only a few years ago by physicists excited about Outreach and Engaging the Public with our science. We already have a healthy start to becoming an important and stable forum at APS, but, to ensure stability, *we need more members!*

To get more members, I will be running a membership drive! Here are some of the things we are going to do:

1. **March Meeting** and **April Meeting** Tabling. To increase encouragement, we will be giving people a list of all the **free food events** at the meeting. BUT, you can't get the list unless you sign up for FOEP. Also, get a badge sticker to show your support of FOEP! If you want to help with the tabling, great! Send me an email: rossj@physics.umass.edu
2. Bring a friend to FOEP. Have a buddy who is active in outreach or public speaking about physics, who isn't with FOEP? Bring them to a session and to the table. Send them our newsletter (this). For every person you bring to FOEP, you will be entered into a raffle to win a **Pebble Time Smart Watch** (worth \$200).
3. We want to hear from you! Have a cool activity and a way to implement it? We want to see you give a talk at APS March or April meeting. These 10-minute talks *do not count* against your abstract submission for your science. It is an extra talk that you can give about your cool outreach. Look for our sorting session **"Outreach and Engaging the Public"** at both meetings (March and April). Your talks make APS meetings great! If we like your talk, we might call you for an interview to be profiled in our newsletter and on our website.

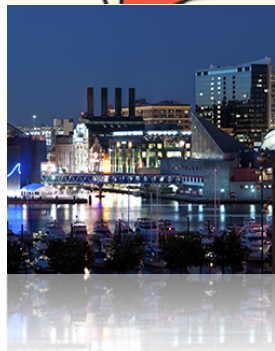
We hope to see you soon!

--Jenny Ross





FOEP at March Meeting 2016



The APS March 2016 meeting will be held March 14-18 in Baltimore, Maryland.

FOEP Invited Session, APS 2016 - Baltimore

Session ID: L34

Room: 337

Wednesday, March 16, 2016 at 11:15AM - 2:15PM

- ▶ *How to interact with Congress about science* by Raymond L. Orbach
- ▶ *How to organize a World Renowned Science Festival* by Marc Schulman
- ▶ *How to write a scientist based biography for the public* by Joel Shurkin
- ▶ *How Physics World reaches out in a digital age* by Matin Durrani
- ▶ *Physics in a Brewery* by Jérémie Palacci



What: Staged reading of the new science play *No No Nobel* by the playwright and science historian David Cassidy

When: The APS March meeting in Baltimore on Wednesday March 16 at 8 PM.

Where: At the APS Conference Hotel, exact room location will be listed in the APS Bulletin

Who: The reading will be performed by the Baltimore Improv Group www.bigimprov.org

Sponsors: The Forum on the History of Physics and the Forum on Outreach and Engaging the Public

Produced by: Brian Schwartz, Brooklyn College and the Graduate Center of the City University of New York

Synopsis:

In Biology, what discovery is considered the most important breakthrough of the 20th century?

In Chemistry, what pattern development enabled chemists and physicists to understand the nature of and ultimately the atomic physics of the elements?

In Physics, what experiment and theory in nuclear physics led to the most important journalistic story of the 20th century?

In Cosmology, what theory was developed that enabled the understanding of the now named Big Bang theory and the evolution of the universe?

In Science Education, what graduate student made a most important observation and ultimate the identification of a remnant of a supernova explosion?

Attend the staged reading of the play *No No Nobel* and find out what unifies all the above questions.

A talkback with the playwright David Cassidy and the director, Mike Harris will follow the performance.

FOEP at April Meeting 2016



APS April 2016 meeting will be held April 16-19 in Salt Lake City, Utah.

FOEP Invited Session, APS 2016 - Salt Lake City

Session ID: J5

Room: Ballroom D

Sunday, April 17, 2016 at 10:45AM - 12:33PM

- ▶ *The origin of our universe: from quantum to cosmos* by Thomas Hertog
- ▶ *CERN's approach to public outreach* by Rolf Landua
- ▶ *Engaging the public on climate change issues* by Alice L. Bean



Check out FOEP's membership table at both the March and April meetings.

- Find out how to get free food.
- Get entered into a raffle to win a Pebble Time Smart Watch

AND BEST OF ALL:

- Become a FOEP member!

Details are on page 8.



Spotlights on Outreach and Engaging the Public

ARTIFICE at the University of Chicago

Graduate students, technology, and the neighborhood

*Reprinted with permission from the University of Chicago,
Originally published on 18 Aug 2015*

By Mary Abowd

Pete Dahlberg stands before a classroom of eager elementary school students. He's poured liquid nitrogen into a deep steel pot, and the resulting steamy vapor makes this PhD student in Biophysical Sciences appear a wizard wielding a magic brew.

Dahlberg's magician status derives from his participation in **Artifice**, a nonprofit organization dedicated to STEM education and staffed largely by University of Chicago doctoral students in the Graduate Program in Biophysical Sciences.

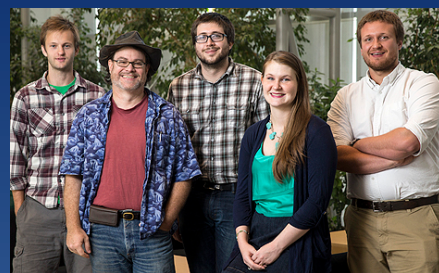
They teach at the organization's headquarters, a community tech center in the Woodlawn neighborhood [of Chicago] where local youth learn to create websites, make video games, build robots, and repair computers.

But they also take their mission into local schools. On this day, students at William H. Ray Elementary School in Hyde Park surround Dahlberg. He invites them to add cream and sugar; then he stirs, sprinkling in science questions while the concoction thickens.

"Who knows the freezing point of water?" Dahlberg asks. The students peer into the pot; they can see that liquid nitrogen, at minus 321 degrees Fahrenheit, is much, much colder—cold enough to freeze cream and sugar practically on the spot. A few more seconds of stirring and poof! Dahlberg is serving up ice cream.

"We try to make the learning tactile and the technology fun and accessible," says Dahlberg, who co-taught the 20-week, after-school course with fellow doctoral student Will McFadden. (The two also taught a course at the University of Chicago Charter School Woodlawn campus.)

Additionally, students in the course learned how to build home security systems and constructed and programmed "battle bots" (small robots equipped with razors and a balloon that turn, spin, and skirmish to see which bot's balloon pops first). "The focus is not so much on how electrons are moving through the wires," Dahlberg adds, "but more on, 'wow, I can make an alarm go off or make something move.' "



Artifice founders Adam Hammond, James Crooks and Ashley Lane (center) stand with graduate students Will McFadden (far left) and Pete Dahlberg (far right). The group is the driving force behind the nonprofit's STEM education efforts in the Woodlawn neighborhood [of Chicago]. (Photo by Andrew Nelles)



LaShon Patterson, 19, a sophomore at Kennedy-King College, works with Ray Elementary School students, 11-year-olds Jeice Harris, center, and Henry Samra. (Photo by Robert Kozloff)



James Crooks, a PhD student in Biophysical Sciences, works with 12-year-old Darnell Smith at Artifice. (Photo by Jean Lachat)

From a pilot to a nonprofit

Artifice began two years ago as the vision of doctoral student James Crooks, a computer programmer and physicist, and Ashley Lane, AB'11, who was familiar with STEM initiatives through her work with nonprofits serving at-risk youth. "I saw projects that weren't going to change anyone's trajectory," Lane says, "projects where the outcome was making a T-shirt."

She and Crooks approached Adam Hammond, PhD'01, director of curriculum in the Graduate Program in Biophysical Sciences. The three imagined a neighborhood center for youth that could empower them to find jobs in an expanding technology sector or simply to use technology to help attain other goals. "Back then this was all just speculation, a what-if," Crooks says. "We never intended to start a nonprofit."

But once they put the word out, the community responded quickly. The UChicago Office of Civic Engagement, through its Community Programs Accelerator, helped Artifice find space and eventually helped them forge a partnership with Woodlawn East Community and Neighbors, which provides a storefront at 6460 S. Stony Island Ave. Other UChicago departments donated used computers, and a TV segment that aired on [the local public television station] WTTW-Channel 11 helped secure office furniture and other resources. By December 2013, a two-week pilot program was launched with students from Hyde Park Career Academy, yielding the center's first wave of young techies.

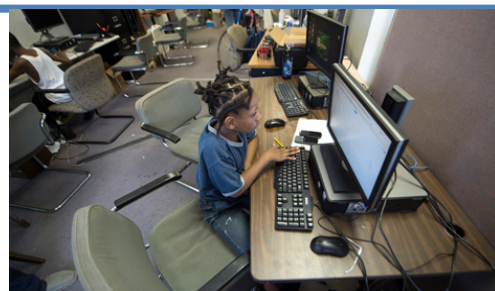
Crooks says he and his co-founders knew two years ago they were onto something good when the pilot ended and the students were hungry for more. "The overwhelming feedback we got from the teens was that they didn't want it to end; they wanted more instruction," he says.

Constructing and deconstructing

Now on weeknights between 3:30 and 6 p.m. and Saturdays from 11 a.m. to 3 p.m., the center's side door is propped open, and neighborhood kids ages 10 and up drop in for classes or free exploration at any of the center's 12 computers.

Hammond, Dahlberg, Crooks, and a host of other graduate students, and some undergraduates, rotate teaching classes, tutoring, and simply being present to help kids, and even some adults, with whatever interests they bring in the door.

On any given day, Artifice has a makerspace vibe. "You might see kids making their own electromagnets, taking apart a 1990s Mac, or playing Minecraft," says Hammond. "I might say to the kids, 'I want all of the resistors out of this motherboard,'" he adds. "The 'take-this-apart' approach is a great way to learn."



Nine-year-old Shipharh Carney is absorbed in her task at the Artifice technology center in Woodlawn. The center provides youth with technical instruction so they can learn a variety of skills such as building websites and learning programming code. (Photo by Robert Kozloff)



These donated electronics are tools instructors use to teach neighborhood students. Adam Hammond, PhD'01, director of curriculum in the Graduate Program in Biophysical Sciences, says kids can learn by taking them apart to understand how they're built. (Photo by Robert Kozloff)

DaQuohn Owney, who dropped into Artifice on the first day it opened, didn't expect to like it. "I'm a writer," he explains, "and I want to be an actor." But technology caught fire with Owney, a senior at Hyde Park Career Academy, who now is able to maneuver among three different coding systems—HTML, CSS, and JavaScript—and has become skilled enough to work as an assistant teacher, mentoring younger participants.

Reciprocal benefits

In a sense, Artifice owes its ongoing work to the National Science Foundation's highly competitive Research Traineeship Program. The program funds top doctoral students in the sciences who demonstrate not only intellectual merit but also a strong commitment to community engagement—what the foundation calls "broader impact."

As NSF research fellows, Crooks, Dahlberg, and Ryan Mork devote several hours a week to Artifice, in addition to the rigorous research agendas they pursue in their respective labs.

"The National Science Foundation wants to give money to people who aren't just going to be successful scientists but scientists with a capital 'S' and an exclamation point—the public figures, those who are going to really make a difference and have a broader impact in society," says Hammond, who devotes several hours to Artifice each week.

As a successful nonprofit, Artifice also provides an edge in the increasingly competitive landscape of federal grants. "This project is valuable, and it's a good thing to be doing," says Tobin Sosnick, director of the Graduate Program and chair of Biochemistry and Molecular Biology. "We also reap a huge reward in that it helps distinguish our students and tips [grant awards] in their favor."

Owney has discovered the advantages of his newfound skills by transferring his coding knowledge to his own interests. "I like to try new things, and if I like something, I want to know all about it," he says. His ambition to learn provided him with the tools to create a website, a resource for actors containing style tips, a blog, and celebrity news.

It's precisely the kind of outcome Artifice's co-founders had hoped to inspire. "One of our goals is to help kids figure out how to use technology to do what they want to do," Crooks says, "to use it as a tool in whatever path they choose."

"The National Science Foundation wants to give money to people who aren't just going to be successful scientists but scientists with a capital 'S' and an exclamation point—the public figures, those who are going to really make a difference and have a broader impact in society," says Hammond

"One of our goals is to help kids figure out how to use technology to do what they want to do," Crooks says, "to use it as a tool in whatever path they choose."

Presenting Physics to Regular People

By Sidney Perkowitz

how
to

I've written seven science books and many articles, and presented physics in the media, all aimed at general audiences. My first book editor said "simplify the writing, not the science," and I think it is possible to get physics concepts across without dumbing them down. After covering quantum weirdness, football concussions, interstellar travel, physics in the movies, and more, I've come up with guidelines for writing and presenting to the general public. They may help you too. Here they are:

1. What you leave out is as important as what you put in. You can get the science right without describing *all* the science, if you present the concept without bogging down in the details that only physicists love. If your audience gets the main idea, you've succeeded! For an article about quantum physics, I defined Planck's constant h as the small quantity that sets the scale of the quantum world but never mentioned $\hbar = h/2\pi$. Though $\hbar$ is more common in quantum equations, the detail of dividing h by 2π does not expand understanding,

2. People, please. The difference between an interesting article or talk, and a story that is truly engaging, is people. If you put in something about the personality or scientific approach of a famous physicist, or add your own experiences, you're on your way. For a piece about lasers, I described how the invisible infrared beam from a CO₂ laser in my lab burned through a favorite shirt and then into me, and how careful I became around lasers after that!

3. Relate physics to the real world, daily life and pop or high culture. Some of my most popular efforts have connected physics to cooking, science fiction, music, and the visual arts. These areas link to people's existing knowledge and interests, providing a path into the physics. You can make connections even for abstract ideas. Writing about the speed of light, I pointed out that stock market traders encounter Einstein's limit because it constrains how fast they can trade and therefore make money. To give a feeling for Bell's theorem and the strangeness of quantum entanglement, I explained them in terms of beating the odds of picking pairs of black and white socks from dresser drawers thousands of miles apart.

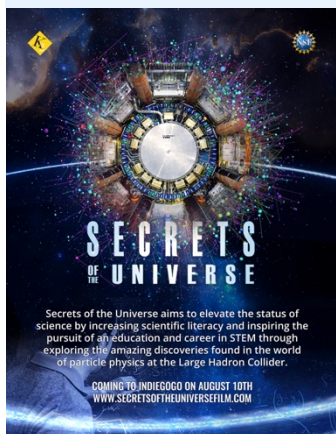
4. No jargon, please. Your goal is to make what you write or say completely lucid. Use clear and simple language without technical terms, physics jargon or acronyms that can be bumps in the road to understanding. If these are unavoidable, define them in simple terms the first time they appear.

5. Math and quantities. Steven Hawking said that every equation added loses more of the audience so use a graph or table instead. Also, to present large or small quantities, comparisons can work better than powers of ten, especially with a strong visual image. In a book about human vision, I showed the extreme density of the tiny light-sensing cones packed into the retina by calculating, and then writing, that it scales up to many hundreds of people tightly jammed together on a tennis court.

Outreach is important for physics. If my tips help your own efforts, that's a good thing for our profession and for science.

Sidney Perkowitz

Outreach News & Resources



There's a new IMAX film coming out called "*Secrets of the Universe*." The film, based on experiments at the Large Hadron Collider (LHC), highlights the current excitement in the field of particle physics, and how recent experiments help us understand our universe.

<http://secretsoftheuniversefilm.com>

The film's facebook page:

<https://www.facebook.com/secretsoftheuniversefilm>

APS Physics Central has an "Outreach Guide!"

The guide provides ideas, opportunities, and information on how to conduct various types of outreach. Check it out!

<http://www.aps.org/programs/outreach/guide/>

AIP Physics Today Notes Two Outstanding Education and Outreach Examples

In an article from February 2015, Physics Today describes two examples of physics education and physics outreach. You can find the article at the following website:

<http://scitation.aip.org/content/aip/magazine/physicstoday/news/10.1063/PT.5.2024>

The Institute of Physics has a website devoted to Public Engagement

This website provides ideas for outreach activities, how to run an event, evaluation of an event or activity, as well as sign ups for events (in the UK).

<http://www.iop.org/activity/outreach/>

The Alan Alda Center for Communicating Science

Has many resources, and classes you can sign up for at Stony Brook University. There is a "Workshops on the Road" program that visits other locations. Check out their website for ideas and information.

<http://www.centerforcommunicatingscience.org/alan-alda/>

Web Sites that Engage and Inform the Public

info

The ATLAS experiment at CERN has approached outreach and engaging the public in many different ways.

This link is to their home page: <http://atlas.ch>

For grades 2-8 educational outreach: <http://www.quarked.org/about/outreach.html>

Or their student/teacher link: <http://www.atlas.ch/students-teachers.html>

For general public outreach: <https://atlasphysathome.web.cern.ch>

Check out the latest edition of Smart Puppy!

<http://www.ucsd.tv/smart-puppy/>

Exploratorium – A science museum in San Francisco, CA that has local and global outreach projects

<http://www.exploratorium.edu>

IOP Physics.org

<http://www.physics.org>

Minute Physics

<https://www.youtube.com/playlist?list=PL908547EAA7E4AE74>

APS Physics Central:

Physics in Action, Physics in Pictures, Physics +, Physics@Home, and more

<http://www.physicscentral.com>

OSA's Optics for Kids website:

Activities, Celebrities, Timelines, and more

<http://www.optics4kids.org/home/>

International Year of Light 2015:

Why light matters, Learn about light, Hands on involvement, and more

<http://www.light2015.org/Home.html>

Florida State University Magnet Lab:

Interactive Tutorials, Timelines, Pioneers, and more

<http://www.magnet.fsu.edu/education/>



Let FOEP Post Your Outreach Links

Does your outreach program have a website? We could list it in our newsletter. Please email your url to foepAPSnewsletter@gmail.com, and include description of site. Some examples are:

- Presentations for the general public
- Science museums
- Summer camps and programs
- Demonstrations
- K-8 outreach
- K-12 outreach

- High school and college outreach
- Physics recruiting for high school and college
- Online videos
- Contests
- Science fairs and festivals
- Ask a physicist
- Science cafés
- Other (please describe)

Contributed by: B. Parks

Lost without Relativity

Global Positioning Satellites (GPS) require both special and general relativity to give accurate results.

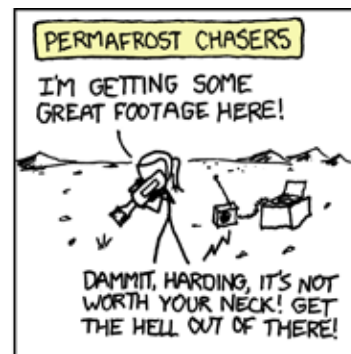
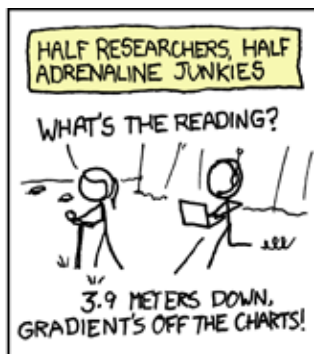
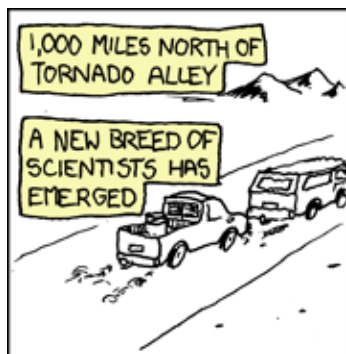
Special Relativity states that moving clocks run slower than stationary clocks. GPSs travel twice around Earth per day at a speed of about 8,700 miles per hour (14,000 km/h) with respect to Earth. This causes the clocks on the satellites to run slower by about 7.2 millionths of a second per day.

General Relativity states that the closer an object is to a massive object (like Earth), the slower it will run. GPSs are about 12,550 miles (20,200 km) above Earth's surface where gravity is about one fourth as strong. This causes the satellite's clock to run about 45.8 millionths of a second faster per day.

From both relativistic effects, GPS clocks run about 38.6 millionths of a second faster per day than clocks on Earth. Without correcting for this time difference the GPS systems would be off by about 8.8 yards (8.1 m) in as little as a minute and about 7.2 miles (11.6 km) in a day!

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<https://sites.google.com/site/heidedoss/science-on-cards>



By xkcd. link: Permanent link to this comic: <http://xkcd.com/402/>

Questions and Ideas



Want to get more involved?

Email someone on the executive committee. Contact info can be found on the last page of this newsletter or online at:

The Forum on Outreach and Engaging the Public at

<http://www.aps.org/units/foep/governance/officers/index.cfm>

Newsworthy Items?

Have an idea for something to include in the Newsletter: An outreach activity, an idea for an article, best practices, what does and doesn't work, or something else? Please send your ideas to the newsletter editor at

FOEPAPSnewsletter@gmail.com

Funding Information



APS grants for public outreach and informing the public

APS annually awards several grants up to \$10,000 to help APS members develop new physics outreach activities. Programs can be for traditional K-12 audiences or projects for engaging the public.

<http://www.aps.org/programs/outreach/grants/>

Marsh W. White Awards are made to Society of Physics Students Chapters "to support projects designed to promote interest in physics among students and the general public."

<http://www.spsnational.org/programs/awards/white.htm>

SPIE education and outreach grants for photonics and optics

As part of its education outreach mission, SPIE provides support for optics and photonics related education outreach projects.

<http://spie.org/x36692.xml>

AAPT - American Association of Physics Teachers

Bauder Fund Grants for Physics Outreach Programs

Can provide funds to obtain and or build and support traveling exhibits of apparatus.

<http://www.aapt.org/Programs/grants/bauderfund.cfm>

OSA Outreach Grants

International Year of Light Youth Education Outreach Grant (up to \$500). International Year of Light activities including Day of Optics, classroom demonstrations, etc. Eligibility: two per year per chapter/section

http://www.osa.org/en-us/membership_education/grants_recognitions_special_services/grants_fellowships/activity_grant/

APS New York State Section Outreach Grants

The purpose of this program is to support projects that increase public understanding and appreciation of physics particularly for K-12 students. The outreach committee will support projects up to a maximum of \$1,000 with some additional funds available for personal expenses.

<http://www.aps.org/units/nyss/outreach/index.cfm>

IOP Institute of Physics

Public Engagement Grants – open to all but only for projects that take place within the UK and Ireland

http://www.iop.org/about/grants/outreach/page_38843.html

EPS European Physical Society

Two grants that can fall into the outreach category are the EPS grant for Regional Physical Society Meetings that include items outside their usual grant categories, and EPS Award for Pre-University International Physics Competitions.

http://www.eps.org/?page=support_grants

Many institutions have their own internal outreach funding programs.

Contributed by: H.M. Doss



PHYSICS OUTREACH & ENGAGEMENT

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Physics Outreach & Engagement is a non-peer-reviewed newsletter of the Forum on Outreach and Engaging the Public, a forum of the American Physical Society. It provides information and news related to the Forum and provides a medium for Forum members to exchange ideas. Opinions expressed are those of the authors alone and do not necessarily reflect the views of the APS or of the Forum. If you would like to submit an article, commentary, letter, review, or contact us about another issue, please email the editor, FOEPAPSnewsletter@gmail.com

The Forum on Outreach and Engaging the Public can be found on the web at <http://www.aps.org/units/foep/index.cfm>