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

Vol. 5 No. 2 September 2019

PHYSICS OUTREACH & ENGAGEMENT

Letter from the Chair

The summer of 2019 is now in the history books and professors are preparing for the return of students. My tenure as chair of FOEP is now more than half over and time is marching on in its inexorable way.

Time is at the forefront of my mind these days. It is perhaps the most valuable commodity of all – time and tides wait for no man, and all that. And the reason that time seems so important to me is I look around me and see a highly technological society inhabited by people who often don't fully appreciate the impact that pure science has had on their lives, ranging from vaccines, to the mastery of chemistry, to the modern marvel that is the cell phone. They need to know how much their day-to-day quality of life has been improved by scientific advances and every second they don't is time lost

You're reading the FOEP newsletter, which means that you are likely a physicist or at last an avid fan of physics, and you also probably are interested in doing science outreach. Maybe you do a bunch of outreach already. If so, great, keep it up. But maybe you're thinking about doing outreach, but haven't started. Maybe you're wondering what you can do, or maybe you're waiting for the right time. But the right time is now. Society needs passionate voices extolling the virtues of science and technology and, indeed, the use of the scientific method itself. Technological problems facing society will be solved by critical thought, empiricism, constant testing, and refinement of ideas.

So, what can you do? Speak. Loudly. Often. But also you need to speak effectively and persuasively. And perhaps that's where FOEP and APS can help. We can help you decide what sorts of outreach ideas would work for you and how to make your efforts succeed.

Are you comfortable in front of a small audience? Start a science night at a local pub or perhaps a weekend afternoon science chat at a local coffee house. Venues like that often welcome free entertainment. It takes a while to build an audience, but make it a monthly thing. Ask

Continued on page 2

VOL. 5 NO. 2 SEPTEMBER 2019

In this issue

Who

FO EP

Info

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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 $10 for every Forum membership over two.

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faculty members, graduate students, and others from all scientific disciplines to give a short public talk and then do a Q&A.

If you're handy or have a great demo lab, consider making a physics road show. Liquid nitrogen shows are a hit among kids, as are electrical demos. Nothing like a sparking van der Graaf generator for a shocking presentation! These work at schools and at public festivals. There are many current successful shows that you could reproduce and show to local audiences.

If you have a particular passion, say space exploration or cosmology or sound, put together a fun public lecture and have your university or school help you advertise it. FOEP Chair-elect professor Jim Kakalios has turned a passion for comic book superheroes into a book, well attended public lectures, an invitation to ComicCon, television appearances, as well as a myriad of articles in various popular magazines.

And if you like to write, the possibilities are endless. You can blog, although building a following can be a slow process. If you are good at making short physics demo videos, there is YouTube and Instagram. Twitter and Facebook and Snapchat are great ways to connect with audiences. And don't forget the time honored popular science book.

FOEP has the expertise to advise you on best practices for any of these approaches and more. And, if you attend the upcoming March or April meetings, we will have a series of invited lectures by experts in their fields. In 2019, we had talks by Sean Carroll on podcasts and Chad Orzel on social media. We had Alison Eck, social media editor for the website for the television show NOVA, and Ben Wiehe of the MIT museum talking about science festivals. The April meeting had professor Clifford Johnson of the University of Southern California, talking about his work with the Marvel movies. All of these people are willing to answer questions and provide guidance to aspiring science communicators. For those who cannot attend the APS general meetings, you can find resources and advice at this website.

If you're considering beginning to do science outreach, now is the time to start. Pick a thing you'll enjoy and do it. If you're not sure how, ask someone already doing it. The FOEP executive committee will help you find local organizations to join and mentors with which to speak. Science communication is important and if you are thinking that you don't have time, I'd like to leave you with one parting thought.

A year from now you will wish you had started today.

Don Lincoln

Don Lincoln
Fermilab

Letter from the Chair, continued

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.

APS physics | FOEP FORUM ON OUTREACH & ENGAGING THE PUBLIC

Spotlights on Outreach and Engaging the Public with the Creators of Funsize Physics

Questions and Answers with FOEP's Member-At-Large, Shireen Adenwalla and her colleague Jocelyn Bosley

Shireen Adenwalla & Jocelyn Bosley,
University of Nebraska - Lincoln

Q. How would you describe your outreach website, and why you think it is important for the researchers to describe their work? How do you help the researchers convey their work?

Funsize Physics (https://funsizephysics.com) aims to provide a forum for researchers to publicize their exciting science and outreach activities, extending the impact of these activities beyond the usual constituencies of like-minded scientists. While the majority of online science content consists of single-author science blogs and science news sites, our Funsize Research page features descriptions of cutting-edge condensed matter research written *by the researchers themselves* for a broad audience. Our Funsize Classroom section serves as a repository for best practices for outreach activities, allowing K-12 teachers and students as well as at-home experimentalists to engage in DIY activities developed and tested by our contributors. We are also in the process of developing a new, third section of the website called Funsize Fundamentals, which will provide a primer on foundational concepts in condensed matter physics, such as magnetism, superconductivity, and band structure.
The website is colorful and attractive, and it provides easy access for users to create their own content. One of our priorities is a low entry bar, making it easy for a non-web-savvy person to create content extremely quickly. When we receive a contribution, we provide feedback and suggest edits to the author, and we help them find related web material—videos, pictures, stories—to illustrate concepts in compelling ways. Our goal is to help researchers amplify their message by making it meaningful to a broad audience, without sacrificing scientific accuracy. Most researchers are excited to reach a broader audience, and the presence of Google Analytics lets contributors see how many hits, reads, likes their posts acquire.

Jocelyn Bosley & Shireen Adenwalla
University of Nebraska - Lincoln

Our goal is to help researchers amplify their message by making it meaningful to a broad audience, without sacrificing scientific accuracy.

Q. What advice would you give to someone writing up their research for a general audience?

We have a set of specific Dos and Don'ts on the website, but in general we ask contributors to imagine explaining their research to a curious and intelligent middle- or high-schooler. While our target audience is considerably broader than that, this is something most researchers can relate to, and it provides a good litmus test to gauge the scope and level of their writing. We endeavor to make all content on the site understandable, appealing, and meaningful to a bright and curious middle-to-high-schooler. To instill interest and enthusiasm among this age group, we use colorful, dynamic graphics and we encourage a conversational tone. In one focus group, students liked the fact that the titles used cool words and made connections to things they know about (e.g. Legos, waffles). And we've found the same qualities that make the site appealing to young students also attract science enthusiasts of all ages, as well as the science-curious public.

Q. Is the audience of your website primarily from the US or do you have a global impact?

Our core focus is to highlight NSF-funded researchers, so most of our contributors work in the U.S. or have collaborators here. The audience for the site is global, and our site analytics indicate we are indeed reaching a worldwide audience.

Q. What is your favorite thing about the work you do?

Working with researchers to prepare and refine their posts is tremendously rewarding. Because contributing to Funsize Physics is an easy way to fulfill the broader impacts requirements of grants—and we encourage researchers to use it in this capacity—not all of our contributors are experienced in outreach. Very often, they are initially a bit unsure about how to share their work with non-scientists, and some are even skeptical that it can be done without compromising the accuracy of the content. When they receive our suggested edits to their post, many experience an "aha" moment – "Oh, *that's* how you do it!" We work with our contributors to ensure everything is exactly as they want it before their post is published, and we're adamant about making the research meaningful to non-scientists without sacrificing accuracy. At the end of the process, many of

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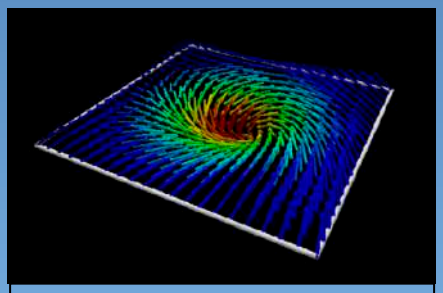


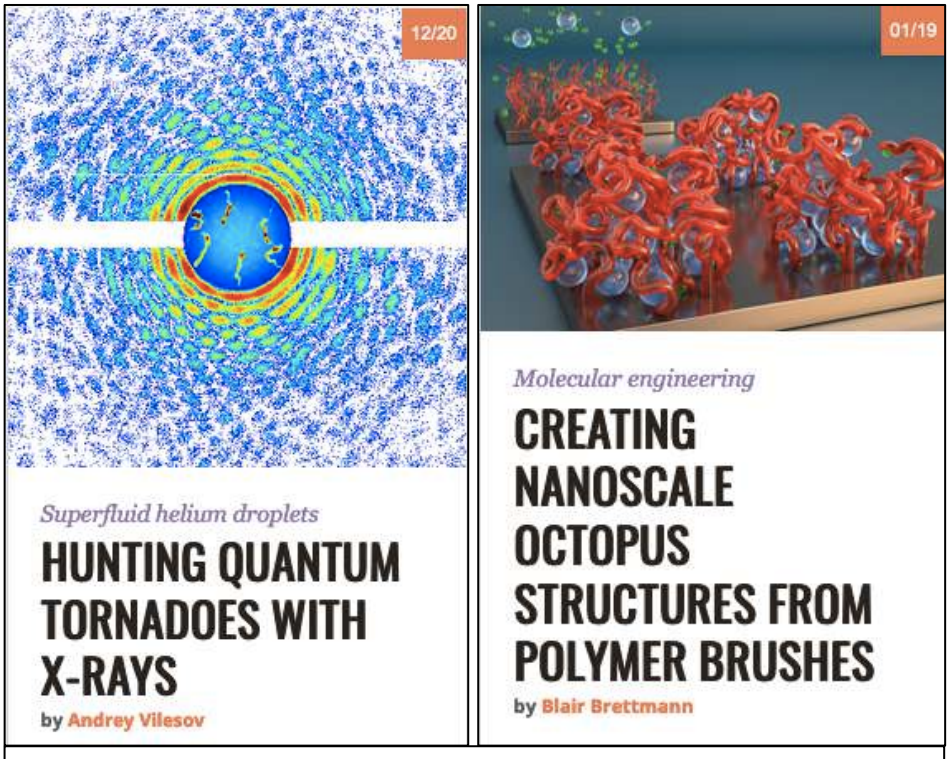
Post from Funsize Physics: Picture of a skyrmion from *Spins and Skyrmions*, by Alexey Kovalev

our contributors tell us the experience not only helped them develop a better sense of how to explain their research to a broad audience, on Funsize Physics and elsewhere, but they had a lot of fun doing it!

Q. What do you find most exciting about outreach? Most rewarding? Most difficult? Most important?

We are excited that so many researchers around the globe, particularly younger ones, are eager to share their research and outreach activities with the world. Some of the most rewarding aspects of this project are the positive comments we receive from both contributors and readers. At the moment, our biggest challenge is sustaining the stream of new posts. Everyone is busy, and setting aside time for a first draft can be difficult. In the future, we aim to connect to the broader public through cross-referencing with other science blogs and websites with established followings. To get attention from well-known blogs and websites, however, it is important that we develop content which is of *current and immediate* interest. We are especially interested in expanding the Funsize Classroom section, enabling researchers to learn from prior outreach work and share their successful activities with one another. Our ultimate goal is to make Funsize Physics a known source of cutting-edge science content which reflects the most recent developments in the discipline, and which is also presented in a form that is *compelling and meaningful* to the public.

"Some of the most rewarding aspects of this project are the positive comments we receive from both contributors and readers."



Images from the Funsize Physics website.

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 Medal is sponsored by the friends of Dwight Nicholson, and through a generous gift from Professor Herb Berk, the Medal will be awarded with a stipend of $2,000. Up to $1,500 will be available for the recipient's travel expenses to the meeting at which the Medal is presented.

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

Nomination deadline is usually the first business day in June 1.

Contributed by: E. Dan Dahlberg

Know someone who would be deserving of the Nicholson award or worthy of being an APS Fellow? Don't wait!!! Start the nomination process now.

FOEP
FORUM ON OUTREACH & ENGAGING THE PUBLIC

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 usually in May. We strive to have a diverse group of nominees and encourage the nomination of members of all underrepresented groups.

How

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

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 submitted for approval to 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 at the March and April Meetings 2019

FOEP at the 2019 March Meeting.

The Contributed talks at the FOEP sponsored session at the March APS meeting described creative efforts to communicate the excitement of physics research, along with how to think like a scientist to the general public. The session was titled: From FunSize Physics to Escaping Labs: Adventures in Public Engagement and featured ten talks describing innovative approaches to communicating physics research and the scientific method to the general public. Talks ranged from reviews of the APS mini-grant program, that provides seed funding for new outreach ventures; to a report on a website (www.funsizephysics.com) that promotes exciting new research in condensed matter physics; to a talk by Prof. Paul Kwiat of the University of Illinois-Urbana on the development of his physics-based escape room (a traveling version was installed at the Boston Convention Center – as described elsewhere in this newsletter); to the engaging videos produced by the National High Magnetic Field Laboratory about the development of new materials. All of the APS FOEP Contributed talks are considered non-technical talks, and thus do not count against your technical science presentation at the same APS meeting. The FOEP Executive Committee strongly encourages all to volunteer to speak as well as attend these sessions. Creative ideas can only disseminate if we share our stories.

Contributed by: James Kakalios

FOEP Business Meeting/Happy Hour at APS March Meeting

It doesn't take a PhD to determine that bars and restaurants are hotbeds of public engagement. FOEP and the APS Public Engagement department took advantage of this timeless fact by hosting a FOEP business meeting and Happy Hour. Held at Coppersmith South Boston, March meeting attendees interested in outreach joined FOEP members and APS staff for a night of food, drink, and lively conversation. Stories were shared of outreach activities and connections were made to enhance them. The event often serves as the (in)formal presentation of APS Outreach fellowships, so look out for the fun next year in Denver!

Contributed by: James Roche

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FOEP at the March and April Meetings 2019

FOEP's contributed session at the 2019 April meeting

FOEP's April Meeting session featured two talks on policymaking, one from AIP intern Nathan Foster on his experiences covering Congress, the other from Justin Vasel and Fernanda Psihas on the systematic lobbying of Congress coordinated by the high-energy physics community. We also had two talks on using technology to engage students with particle physics: first in the form of a pattern-matching game where students combine quarks to make baryons, presented by Huey-Wen Lin; second in the form of cloud-based notebooks for working with simplified data from the CMS collaboration, presented by Daniel Whinnery of Siena College. Micha Kilburn discussed the wide range of nuclear physics programming associated with the 150th anniversary of the periodic table. The session closed with a presentation from Kathleen Hinko about a project to put together a systematic survey of the landscape of informal education efforts carried out by national labs and educational institutions.

Contributed by: Chad Orzel

Keep an eye on the lookout for our great FOEP sponsored workshops on finding your scientific voice and possible future writing for the media workshops

Double your exposure by giving an outreach talk in addition to your science talk!

The Forum for Outreach and Engaging the Public will have contributed talk sessions at the March and April meetings. *Importantly, these talks do not count against you, so you can still submit a scientific presentation.* We look forward to hearing about your work!

Spectra the Laser Superhero at San Diego Comic-Con

by: James Roche

On the 50th anniversary of Comic-Con International in San Diego, the APS outreach team also hit a major milestone: 10 years of taking Spectra to the con. Comic book enthusiasts of all ages stopped by the PhysicsCentral booth to pick up the latest copy of Spectra: The Original Laser Superhero, learn about LEDs, and marvel over the inner workings of plasma balls. The newest offering from the Spectra series, Spectra's Energetic Escape, follows Lucy Hene, alias Spectra, and her friends as they use physics concepts to win concert tickets—and foil the plans of the nefarious Nolan R. Gibbs. Over four days at the Con, the PhysicsCentral team handed out over a ton of comics to families, teachers, and physics fans.

Two Days at San Diego Comic-Con 2019

Reprinted with permission from Clifford V. Johnson's blog: http://asymptotia.com

It might surprise you to know just how much science gets into the mix at Comic-Con. This never makes it to the news of course - instead its all stories about people dressing up in costumes, and of course features about big movie and TV announcements. Somewhere inside this legendary pop culture maelstrom there's something for nearly everyone, and that includes science. Which is as it should be. Here's a look at two days I spent there.

Sculpture of a creature from a Guillermo del Toro movie. Credit: C.V. Johnson

Day 1 – Friday

I finalized my schedule rather late, and so wasn't sure of my hotel needs until it was far too late to find two nights in a decent hotel within walking distance of the San Diego Convention Center — well, not for prices that would fit with a typical scientist's budget. So, I'm staying in a motel that's about 20 minutes away from the venue if I jump into a Lyft.

My first meeting is over brunch at the Broken Yolk at 10:30am, with my fellow panellists for the panel at noon, "Entertaining Science: The Real, Fake, and Sometimes Ridiculous Ways Science Is Used in Film and TV". They are Donna J. Nelson, chemist and science advisor for the TV show Breaking Bad (she has a book about it), Rebecca Thompson, Physicist and author of a new book about the science of Game of Thrones, and our moderator Rick Loverd, the director of the Science and Entertainment Exchange, an organization set up by the National Academy of Sciences. I'm on the panel also as an author (I wrote and drew a non-fiction graphic novel about science called *The Dialogues*). My book isn't connected to a TV show, but I've worked on many TV shows and movies as a science advisor, and so this rounds out the panel. All our books are from MIT press, which is not a coincidence – they organised this panel. Joining us at brunch is also Jessica Pellien, who works at the Press. We are meeting to make sure that everybody knows each other before the panel, and to get a sense of what the flow of ideas might be, without going into any detail so as not to kill spontaneity. Time flies as we talk about pretty much everything else but the panel - a few minutes was enough to assure all that we've got the inter-personal chemistry and the material to make it fly - and at 11:35 we're standing on the sidewalk outside the restaurant realising that we should be calling a taxi or Lyft to make sure we get to the venue in time for the noon start!

Credit: MIT Press

We make it, with 10 minutes to spare, and the panel goes well. We have a packed double hotel ballroom (The Marriott Marquis next to the convention center), and the audience is full of enthusiasm. It's a wide-ranging conversation expertly steered by Rick, covering a range of topics. There are details like the nature of metallurgy and forging swords, the nature of depicting chemistry of drug manufacture on TV without also becoming a how-to manual, and the fact that gravity makes time flow very differently for people on a planet's surface as compared those in orbit. I also talk about what I think are two of the most important aspects of being a science advisor: encouraging storytellers to show more of

the process of doing science, and to encourage them to show a wider variety of types of people who do science. There are procedural issues about what it is like being an advisor on set of a show or movie, how one interacts with writers and directors, the difference between science advising for TV vs movies, and of course the big question: why some scientists spend time doing this sort of thing at all. I'll return to this issue at the end. (Some highlights are on video here: https://www.youtube.com/watch?v=m3rExVCIMPI)

After the panel there are one-on-one questions from audience members who approach afterwards, including requests to take photos and sign things. After this, I meet with Rick, Rebecca, and some writers and producer friends and acquaintances and listen to talk about the industry for a while, over drinks and snacks in one of the hotel's restaurants. Here, I learned from Rebecca that the excellent low-key Wonder Woman jacket she's wearing was obtained at last year's Con and the makers have a booth here this year. I wander the main exhibition hall in the convention center a little bit, picking up one of those jackets for my wife's birthday present (it's the last one they have!), and just soaking up the atmosphere. There's costumes to see, of course, and movie/TV stuff everywhere, but there's also books, and yes, comics and comics' artists displaying their wares and skills.

I enjoy wandering the exhibition hall. It's full of life, yes, but nowhere have I seen the overcrowding and accompanying unpleasantness that people always seem to report, either on the news, or from personal stories. It's busy, but there's room to move around. If you don't have your heart set on being at some very particular popular event, you can just avoid the long lines for those, and enjoy all the other things there are to do and see. People are pleasant to each other, complimenting each other on costumes, taking selfies together, and so on. There's no leering or belittling, and everyone seems in good temper. There are all kinds of people of different persuasions, coming together to celebrate fantasy, fiction, dreams of the future, the past, the world as it might have been, and still might be. It's simply wonderful to see. It strikes me that nobody seems to point out that this event, and cons like it all around the world, are quietly becoming among the most successful celebrations of diversity, inclusiveness, and self-expression anywhere.

But I digress. Later on, I run into my friend the writer Cecil Castellucci, who was on her way to a big press conference and panel with some of the DC top brass. They've recently announced a bit of exciting news that she's had to keep secret for some time: She's going to be writing Batgirl! This is great news, as her work on various DC titles over the last few years has been a great example of how transformative it can be to introduce new voices and points of view into the creative process. We chat for a minute, break while she gives some of her books to an enthusiastic fan that approached her, and then she flits off to do her thing. (https://www.comicsbeat.com/sdcc19-cecil-castelluccibatgirl- interview/)

One of the people who came up at the end of my panel was the bestselling author Blake Crouch. I'd not met him in person before, but I had been science advisor on two of his books, so it was great to see him. At 5:00, I go to a panel entitled "How Our Present Impacts Today's Speculative Fiction" which he is on along with three other writers. It is pleasant to just be an audience member for a while, and I listen to them discussing how they craft their books, do their research, and tell their stories. Blake is a big science fan, and he talks about how he reads science news stories, and journals, learns of discoveries and ideas, and then sits and thinks about how it can be the basis of a narrative, a cautionary tale, or just a fun adventure. He even mentions how he's called up a scientist to get guidance on how to shape the science content, mentioning me by name, which was a bit of a surprise.

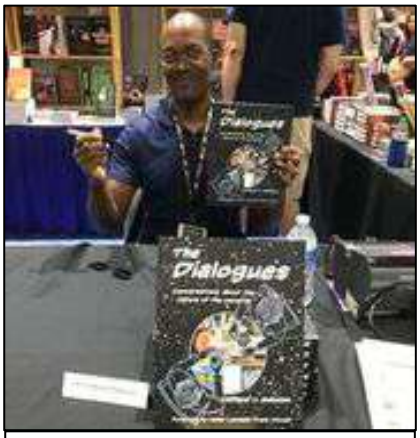
Credit: C.V. Johnson

Credit: C.V. Johnson

After that, I wander outside for a bit, watching more costumed people, families, and people old and young enjoying the festivities. After sitting down by the waterfront for a while I wander into the Gaslamp Quarter across from the Convention Center and go to an event I know least about in advance. It's a reception followed by a dinner and I was invited to go to it by Steve Broback, the organiser of a panel I was asked to be on some weeks before. At the time, it did not fit my schedule and so I'd declined. It's another organization (Dent the Future) bringing people together to discuss ideas, mostly based on science and technology, and so I was invited to join the social gathering even though I could not do the panel. Cocktails and (later dinner) was with a fascinating group with people like genetic genealogist Barbara Rae-Venter, former CIA agents, cyber defence experts (for a panel on Espionage technology) and Biologists and technologists including Poppy Crum, Shane Campbell-Staton, Nathan Lents, and record-holding free diver Mandy-Rae Krack (for a panel about how modern science is making people more "super"). Oh, and the guest of honour is actor LeVar Burton, a big science fan and literacy advocate, who turns out to be a delight to listen to holding forth on various subjects.

Day 2 - Saturday

A Lyft from the motel puts me at the Convention Center again. My first stop is back at the main exhibit hall since I myself will be an exhibit, in a sense. I've got a book signing session at Mysterious Galaxy books, signing my non-fiction graphic book (*The Dialogues: Conversations About the Nature of the Universe*), while sitting alongside Donna J. Nelson who is signing her book (*The Science of Breaking Bad*). Pretty soon into the 45 minute session I realize that sitting there with a pile of books looking hopeful and smiling shyly at whoever accidentally catches your eye is not the way to shift much of the product. But English reserve means that initially I'm not able to just tell people to come over and look at this book I made. So I start catching people's attention by talking about Donna's book, calling out openers like "Sir! You like Breaking Bad, right?", or just "Science, over here!". This actually starts a bit of a buzz, and my inner carnival barker comes out some more over the session, and many books are sold and signed, and even a few science questions are asked and answered.



Credit: C.V. Johnson


Credit: C.V. Johnson

I wander the floor again, taking in all sorts of new things I'd not seen the day before (including vast amounts of LEGOs left out for people to build with, artists sketching characters on the spot, displays of remarkable sculptures of creatures from Guillermo del Toro movies). I scan the schedule looking to see if there are any more panels I want to sit in on, and thinking about where to go and have lunch. And then a thought occurs to me: I could do a useful bit of preparation for the big panel I'll be on this evening, all about the physics of time travel and Marvel's Avengers: Endgame, which I'd not seen since its opening week - I could go see the movie again!

Some quick fire googling reveals that the movie theatre in the Fashion Valley mall 20 minutes away that is going to show it in 35 minutes. The mall also has food options. So with the aid of a swift Lyft ride, I'm soon sitting with a tasty sandwich in front of a giant screen with a buzz of excitement all over again as the movie starts. Just as I remembered from my first viewing, it's an impressively crafted narrative, fun and funny, while also dark and moving. I make a mental note to personally congratulate Christopher Markus (one of the co-writers) on that when I see him in 45 minutes, since he'll be on the panel with me.

Lyft and some swift footwork get me to the green room at the convention center where I find all my co-panellists: Christopher, and several physicists from UC San Diego (Eric Michelsen, Kim Griest, and Elizabeth Simmons), and Steven Snyder the director of San Diego's Fleet Science Center, the organization behind this panel: "Time Travel in the Quantum Realm". After introductions are done, the main bit of news is that it is about to be officially announced that Endgame has just broken the record ($2.79 billion) for the all-time highest box-office takings of a movie. Of course, my immediate joke is that my having bought a ticket for it just a few hours earlier was what put it over the top. It does not occur to me until later that there's something rather nice about having been a science advisor for a movie that has reached so very many people. Andrea Decker, the person from Fleet who set up the panel, makes sure that we move to the venue without incident, and settle.

Credit: Ruben H. Fleet Science Center

The panel, under the guidance of our moderator, was a huge success, with a massive and enthusiastic audience, and great conversations between the various panellists. Christopher Markus, the writer, started out talking about the process of planning and writing the movie (back in the fall of 2015), and various narrative challenges they had. He then talked about how they landed on the idea of using time travel. They then decided to consult experts on the science of space and time, and that's where I came in (in fact, they got in touch with the scientists they spoke to through the Science and Entertainment Exchange, that organization I mentioned earlier). Next up, I described the process of brainstorming with the people in the room (writers Chris Markus and Stephen McFeely, one of the directors, Anthony Russo, and various producers) about different modes of time travel as used in other narratives, and as sometimes explored and mused on by scientists. Of course, all such conversations start with the core fact: that time travel into the past is fraught with difficulty and isn't even close to a reality as far as we know. It may well be completely forbidden by the laws of physics. Given that, my job as a science advisor is to be in service to the story, so I was giving them advice and ideas from the real science of the universe that could help give this fictional scenario an air of authenticity, by at least being inspired by real science, in order to enhance the tale. Their job was to sift through all that advice in order to help build their movie. (In fact, in that session we talked about a lot more than just the science, but also the idea of taking the opportunity to show different kinds of scientist, show problem solving, etc.) The various other panellists, with different kinds of expertise, gave their take on time travel, and how it impacts with the kind of science they are excited about, whether it be subatomic physics, relativistic physics, or combinations of the two. The ensuing discussion was excellent, and fun to be part of, and the audience seemed to enjoy it too, with lot of great questions later on. There's video of it here if you're interested: (https://www.youtube.com/ watch?v=k0uxux4VDxk)

Panel over, we're approached by several enthusiastic people with follow-up questions. I do my best to answer my share. Most of them are about the science (some people were intrigued by my statement that you can time travel into the future, using time dilation, so I explain that), but several are about career choices as well, and so I happily answer those too. Then I ran for my Amtrak train, leaving for LA in 30 minutes. It is a stressful business getting a swift response from a taxi or Lyft from that area of San Diego during Saturday night at Comic Con, but I make it, with a few minutes to spare.

You might ask what the point of all of this is. Is it just an elaborate bit of fun for me, or is there some deeper purpose being served? As you might guess, I think that there's a very important mission being served here, and I actually think that progress is being made too! I often describe my work as "putting science back into the culture, where it belongs". The idea is that we need, as a culture to stop treating science as something for nerds, enthusiasts, or special interest groups, and open it up to everyone. Helping with that is part of my duty to our democracy, since science is part of every key decision people make about their lives. So this means making sure that everyone is comfortable with partaking in science of various sorts - showing that they don't need some sort of special brain in order to take part in it, or to understand it. Science is for everyone, but we'll never achieve that goal without fighting the stereotypes in the media about science being difficult and only for geniuses, about scientists being weird. We also need to show how fun and engaging the process of science can be, how curiosity, discovery, and scientific thinking are accessible to all of us. And to inspire with some of the fascinating ideas it can lead to. How do we do all that? Well, if we don't use media and entertainment tools like movies and TV in this mission (where people spend most of their time looking) then we're fighting a losing battle. And to do it, we need to be partners with story-tellers. (By the way, the aforementioned Science and Entertainment Exchange was set up in 2008 by the National Academy of Science with the same reasoning in mind, and it has been a game-changer in recent years, helping make thousands of fruitful connections between people working in arts and entertainment and those working in science and engineering. Link: http://www.scienceandentertainmentexchange.org)

This is why it is a big deal that Avengers: Endgame took in over $2.79 billion. This is a movie that has science at its core - scientist characters using science to solve a problem - while also being the culmination of an impressive sequence of 22 Marvel films (the science even allows us to revisit and re-imagine those films during the narrative). Yes, there's made-up science, but there's a lot of nods to real science too, inspiring people to find out more. Finally, scientists were involved in getting it (and many other Marvel films) made, even if only in a small way at times. This all adds up to a lot, since showing that using good science advice in story-telling can pay off in a big way is an important message for the people who make these expensive projects. So we need each other: We can help tell better, new, and more engaging stories, and they help get science, and better portrayals of scientists, in front of massive audiences. This partnership will result in more opportunities to help embed science into all aspects of our culture, and, yes I'm going to say it: Help make the world a better place.

Outreach Info & Resources

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! https://www.aps.org/programs/outreach/guide/
And within this guide you'll find information about:

Outreach Ideas
- Physics on the Road
- Public Lectures - One Time
- Public Lectures - Series
- Open Houses
- Science Cafes
- Demo Shows (on campus)
- Working with a Museum

Outreach Tips
- Public Relations
- Working with Children and Schools

Demos List, Experts

The Institute of Physics has a website devoted to Public Engagmeent:
http://www.iop.org/activity/outreach/index.html
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).

Find out about IOP's 3 minute wonder challenge:
http://www.iop.org/activity/3-minute-wonder/page_60438.html

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/

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

Web Sites that Engage and Inform the Public

info

Fun Size Physics: https://funsizephysics.com/

Seeker: https://www.youtube.com/channel/UCzWQYUVCpZqtN93H8RR44Qw

Minute Physics: https://www.youtube.com/user/minutephysics

Veritasium: https://www.youtube.com/watch?v=c6wuh0NRG1s

Mathologer: https://www.youtube.com/watch?v=YuIIjLr6vUA

Kurzgesagt – In a Nutshell
https://www.youtube.com/channel/UCsXVk37bltHxD1rDPwtNM8Q

Smarter Every Day: https://www.youtube.com/user/destinws2

Vihart: https://www.youtube.com/user/Vihart

Physics Tutorials: https://www.physicsclassroom.com/Physics-Tutorial

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/

IOP Physics.org: http://www.physics.org

NASA Outreach Resources
http://science.nasa.gov/researchers/education-public-outreach/

Expanding your Horizons Network
http://www.eyhn.org/aboutmain

International Particle Physics Outreach Group
http://ippog.org/resources/types/activities

Let FOEP Post Your Outreach Links

Do you have a favorite web site, web article, and or video you like, or perhaps your own outreach website? Send it to us for consideration of inclusion on this page so everyone can enjoy it. Send ideas to: FOEPAPSnewsletter@gmail.com

Funding Information

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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."
https://www.spsnational.org/awards/marsh-white

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/education/education-outreach-resources/education-outreach-grants

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

Alfred P. Sloan Foundation
The Alfred P. Sloan Foundation offers grants toward promoting science and science understanding to the general public.
https://sloan.org/grants/apply

IOP Institute of Physics
Public Engagement Grants – open to all but only for projects that take place within the UK and Ireland
https://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

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

Vol. 5 No. 2 September 2019

PHYSICS OUTREACH & ENGAGEMENT

Executive Committee

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