

Message from the Newsletter Editor



Greetings, and welcome to the inaugural Forum for Early Career Scientists (FECS) newsletter. As our bylaws state, “The objective of the Forum is to enhance the Society’s ability to meet the needs of early career scientists, to offer them support services, and to provide

them with an opportunity for increased inclusion and participation in the activities and decision-making of the physics community.” As an early career physicist, I understand the occasional uncertainty in pushing forward in one’s career as a scientist, but also the excitement in contributing to a active field and a vibrant community that comprises it. So in our newsletters, we aim to provide useful information and advice to scientists early in their careers, a welcoming community for all, and information about activities FECS has hosted or will host, at APS events or otherwise, to help accomplish these aims.

FECS is a brand new APS group made up of a diverse group of scientists ranging from students to industry scientists to academic scientists, and we have been quickly growing in numbers. We hope to be a great asset to aspiring scientists, and we hope you find this newsletter informative and useful. If you ever have suggestions or comments, you can reach me at kludwick@lagrange.edu.

Kevin Ludwick
Newsletter Editor

Kevin obtained his Ph.D. from the University of North Carolina at Chapel Hill. After a two-year postdoc at the University of Virginia, he became an assistant professor at LaGrange College in 2015. His research is in theoretical cosmology, pertaining to dark energy and dark matter models.

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Views and opinions expressed in articles are those of the author and are not necessarily shared by the editor or the APS/FECS.

Message from the Chair

Maria Longobardi, Chair



Dear FECS members,

It is an honor and pleasure to welcome you to this first issue of the FECS Newsletter, as this year's Chair of the Forum of Early Career Scientists.

We are proud to represent currently around 2000 members from all the world and our community is constantly growing in these last months.

We strongly believe that the early career stage is a critical period in the life of scientists. It is often a transitional moment between different fields of physics and non-academic career path decisions. Support services are necessary to promote networking and integration of these members into the larger international scientific community and we are trying to focus our efforts in this direction.

I want to underline here that one of the FECS' main purposes is to integrate early career members into the broad community of scientists working in academic and non-academic fields, including industry, national laboratories, related STEM fields, and non-STEM fields, both nationally and internationally.

The FECS have strong interdisciplinary and international character and we are currently developing joint activities with other APS Units to provide increased opportunity for inclusion with members of the physics community.

As an example, for the next years we are organizing shared sessions and receptions with other APS Units at the March and April Meetings.

FECS recognizes the importance of communication with its members. Don't forget to follow us on our Facebook group and to send us your feedback and ideas for next year's FECS activities.

I want to close with a special thanks to all the Executive Committee and, in particular, to the FECS Chair Elected Jason Gardner for their efforts during this first year.

I hope to see you numerous at our sessions and reception at the next APS meetings and let me thank each of you for being part of our FECS community!

Best wishes to all of you

Maria

Maria Longobardi earned her Ph.D. in Physics from the University of Salerno, Italy in 2010 in experimental condensed matter physics. She explored the local electronic and magnetic properties of several novel materials. In 2011, she moved to the University of Geneva, Switzerland where her studies focused on the 1D systems and 2D materials. She is currently a performing interdisciplinary studies on bio-nanomaterials. Maria is also a science communicator and freelance journalist. She has been active in the development of several international programs and outreach/educational activities. During the past years, she served the FGSA as International Student Affair Officer and Newsletter Editor (2011-2015) and the FIP as Member at Large and Newsletter Editor (2014-Current).

Message from Kate Kirby

APS Chief Executive Officer



It is a great pleasure to congratulate the APS community of Early Career Scientists on the formation of this new forum (FECS). You are the future of APS! Both your voice and your visibility within the Society are so important.

Our members are our greatest strength, and we value deeply your commitment to

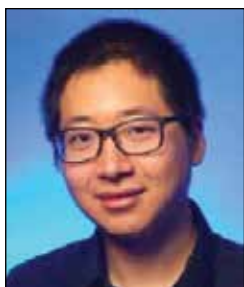
APS. Likewise, we are committed to supporting your success, as you take steps to enter the physics workforce. Let us know how we can serve you better! And I hope that you will find satisfying ways to continue to engage with the APS community throughout your career.

My warmest best wishes to you all,

Kate

The First Year: FECS Membership is Growing

Yunseong Nam, Member-at-Large and Raju Prasad Ghimire, Secretary/Treasurer



Yunseong Nam

In today's quickly changing scientific environment, there is one constant: We physicists continue to pursue our passion, and early career scientists in particular! Our forum, the Forum for Early Career Scientists, aims to enhance the APS's ability to meet the needs of early career scientists and provide them with bottomless opportunity.



Raju Prasad Ghimire

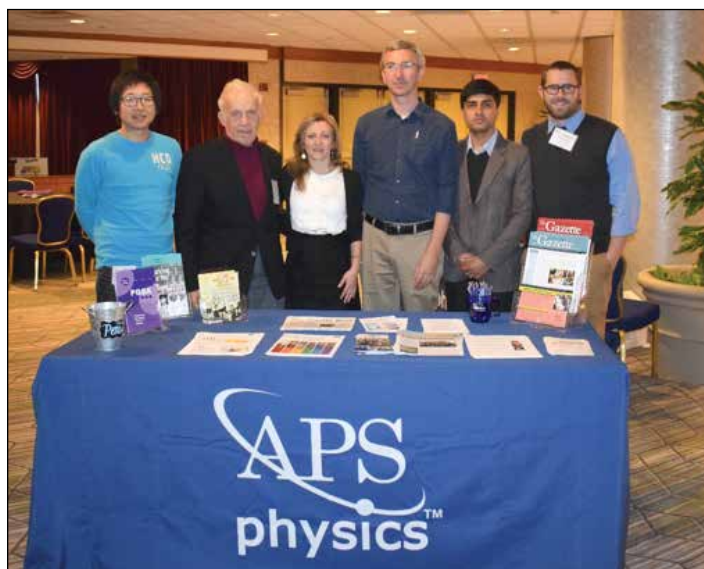
FECS executive committee members held their first informal meeting at the APS April Meeting in Washington, D.C. on January 27, 2017. During the meeting, many of our executive committee members shared the exciting news of the inception of our new forum with other APS members. The committee members also discussed

how to expand the reach of our Forum to many early career scientists, in close coordination with the APS.



From the left Raju Prasad Ghimire, Yunseong Nam, Greg Hamilton, Jason S Gardner and Maria Longobardi

on this newfound spirit among the FECS members, the committee continues to strive to fulfill the mission of the FECS, supporting our members by creating opportunities for increased inclusion and encouraging participation in various activities within the physics community.



From the left Yunseong Nam, Daniel Kleppner, Maria Longobardi, Jason S Gardner, Raju Prasad Ghimire and Greg Hamilton

Following the successful launch of our forum, many young, early career scientists continue to join FECS! Our membership figure has since grown rapidly. Building up

Yunseong Nam, Member-at-Large

Nam received his doctoral degree in physics from Wesleyan University in 2016 and is currently a postdoctoral associate in QuICS. His research focuses on streamlining and optimizing quantum circuitries, from a smallest possible single-qubit gate to a macroscopic circuit, such as Shor's algorithm. His current projects include investigating the error-resistance of a variety of architectures of quantum circuitries whose ideal, mathematical function is the same, determining which architectures to use in a practical, realistic setting when running a certain quantum code on a quantum computer.

Raju Prasad Ghimire, Secretary/Treasurer

Raju is an electrical engineering graduate student at South Dakota State University. Originally from Nepal, he holds a physics graduate degree from Tribhuvan University. His interests include materials engineering, and currently he is working on energy storage, renewable energy, and sensors.

Early career physicists: What's next?

Crystal Bailey APS Careers Program Manager



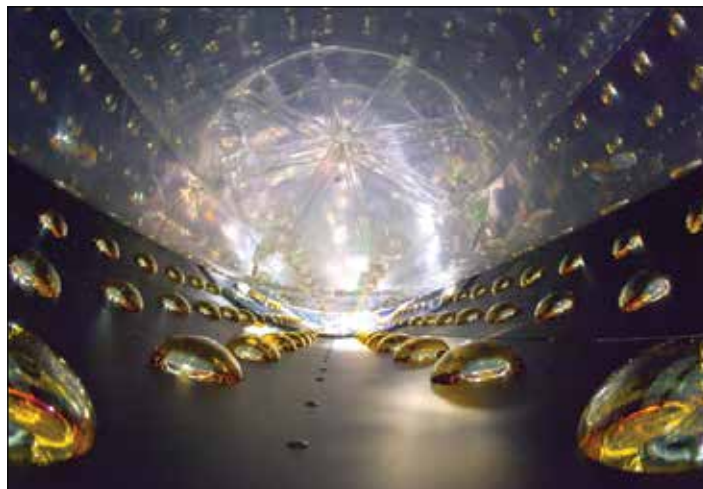
Crystal Bailey

Contrary to what many physics students (and many of their faculty mentors) believe, most physics graduates, whether bachelor's, master's, or PhD, will find permanent careers in the private sector rather than in academia. According to the AIP Statistical Research Center (SRC) Focus reports on employment

of physics graduates, 70% of the potentially permanent initial hires of PhDs are in the private sector [1]; the NSF Survey of Doctoral Recipients has put the percentage of PhDs working in the private sector at between 40% and 55% over the past three decades [2] (and while employment in 4 year colleges was often a close second, the majority of those jobs were temporary positions such as lectureships, and postdoctoral positions). Even at the bachelor's and master's degree levels, out of those graduates who go straight into the workforce after receiving their degrees, over half will be in the private sector [3, 4].

Furthermore, many of these graduates find these eventual careers in spite of, rather than because of, the career mentorship of a typical physics department. Generally speaking, there are few faculty members present in physics departments with prior experience working in industry (which is a stark contrast with other STEM disciplines like engineering, which frequently employs faculty with private sector experience). Furthermore, while many well-meaning physics faculty want to advise their graduates on how to pursue careers outside of academia, few have industrial colleagues in their professional network to whom they could turn to for advice on industry career mentorship.

For this reason, APS has been working hard to create resources and experiences which help to bridge this gap, so



Lawrence Berkeley National Lab

PHOTO: ROY KALTSCHMIDT, PHOTOGRAPHER

that more early career physicists can access the information they need to plan for a broad spectrum of careers.

The APS Online Professional Guidebook contains eight chapters that address the essential elements of a successful transition into the non-academic workforce; topics include Career Planning and Self-Assessment, Conducting Informational Interviews, Networking, Writing and Effective Resume, Interviewing and Negotiation, and more. Each chapter not only contains important advice and information, but also links to other resources on the website—such as 5-minute “webinette” clips from our top webinars on career preparation, online tutorials, links to employment and salary statistics information, and more.

In addition to the Professional Guidebook, the APS Careers website also offers an extensive library of career webinars. You can access our most popular webinar, “Putting Your Science to Work,” by celebrated career author and coach Peter Fiske with your APS Membership web ID. Another popular webinar, “Career Self-Advocacy: How I Got My Six Figure Salary in the Private Sector,” focuses on speaker Meghan Anzelc’s journey from being a high energy physics PhD student to a highly successful career in predictive modeling at some of the world’s top insurance companies. Another popular webinar, “Launching Your Career with an Industrial Postdoc,” focuses on how to find and apply for postdoctoral positions in private sector companies.

APS also offers several opportunities to connect directly with employers through our award winning APS Job Board, and on-site recruitment events at the APS March Meeting, Division of Plasma Physics (DPP) Meeting, and

now at meetings of the Division of Atomic, Molecular and Optical (DAMOP) Physics. These meetings routinely attract a large number of industry employers who are seeking new scientific talent. We also offer a host of workshops at APS Annual and Division Meetings on key professional development topics, such as communication and networking. Check the APS careers website for information about all upcoming professional events at APS Meetings.

The APS Local Links and IMPact Programs provide excellent opportunities for networking and mentorship outside of the framework of APS scientific meetings. APS Local Links brings together physicists from all sectors at the local level, to meet on an informal basis every six weeks or so to build relationships and learn about opportunities. Many industry employers utilize Local Links gatherings as an opportunity to recruit recent graduates, or those close to graduating. The APS Industry Mentoring for Physicists (IMPact) Program creates an opportunity for graduate or early career physicists to connect with mentors in Industry for individual guidance on how to pursue careers in industry.

APS plans to continue developing new and impactful professional development resources, which we hope to promote through publications like the FECS Newsletter. Please look for announcements about upcoming career related events in future editions – and of course, if there

are any resources we don't yet offer that you would like to see, don't hesitate to contact me at bailey@aps.org.

1. AIP Statistical Research Center, *Focus on Physics Doctorates Initial Employment*, March 2016.
2. NSF Survey of Doctoral Recipients and Integrated Survey Data, 1971 – 2010.
3. AIP Statistical Research Center, *Focus on Physics Bachelor's Initial Employment*, April 2017.
4. AIP Statistical Research Center, *Focus on Physics and Astronomy Master's One Year After Degree*, December 2015.

Dr. Crystal Bailey is the Careers Program Manager at APS in College Park, MD. Crystal works on several projects which are geared towards marketing physics and physics career information to high school students, undergraduates, graduate students and physics professionals.

Before coming to the APS, Dr. Bailey did research in nuclear physics at Indiana University, Bloomington in the area of few-body systems. In 2008 she received the Konopinski Award for Outstanding Graduate Teaching from the IU Physics Department. She graduated with her PhD from IU in 2009.

FECS and the March for Science

Sara Clements FECS Member at Large



Sara Clements

Beginning as a response to the separation of policy and science in the United States, the voices of scientists became too loud to ignore. From this, a march was organized that we could express our belief in the importance of science-informed policy. The March for Science, originally set for Washington D.C., sprouted satellite marches across

the world in support of this event. Many attendees aimed to advocate for better funding for research, but there was great diversity in those that came and their reason for being there. Some came for the environment, some came for education, some even came just to see Bill Nye speak, but everyone ultimately came to support the sciences.

We are proud to say that FECS was there to represent our community as well as support the community at large. We



March for Science in Geneva, Switzerland

PHOTO: MARIA LONGOBARDI

showed up in D.C., we showed up in Geneva, we showed up in Boston, and in Sydney. For those that were unable



March for Science in Washington

PHOTO: SARA CLEMENTS

to attend, the feeling was electric. Being surrounded by so many scientists and science enthusiasts expressing camaraderie and sharing some hilarious signs, braving the rain in D.C. to march in soggy shoes, sharing photos from around the world via social media while rallying and marching, was a beautiful thing to be a part of.

The March in D.C. included teach-in tents with science demonstrations that people lined up for and packed in to. There was live music, including (in my biased opinion) probably the best performance of 'She Blinded Me with Science' that Thomas Dolby has put on. People danced in the mud during the musical interludes as if it were a Woodstock festival. The speeches were inspiring, funny, poignant. The diversity of speakers was truly one of the highlights, from CEO Rush Holt of the American Association for the Advancement of Science (AAAS) to Astronaut Leland Melvin. We heard from Dr. Caroline Solomon, a Biology Professor at Gallaudet (a premier university for the Deaf and hard of hearing community), and we heard from Megan Smith, former



March for Science in Boston

PHOTO: MOHAMMAD SOLTANIEH-HA

U.S. Chief Technology Officer. This is just a small sample of the wonderful speakers present at this event, and I encourage anyone who has not yet heard of them to review their speeches online. The rally was a huge success in large part due to these inspiring presenters as well as the outpouring of support from across the world.

Our work influencing policy is far from over. But if the March has shown us anything, it is that we will band together in our efforts to ensure we are heard!

We look forward to welcoming you all in future efforts and invite you to check out our Facebook page where you can see photos from our members at the various marches, as well as other news and events from the group.



March for Science in Sydney, Australia

PHOTO: JASON S. GARDNER

A graduate of the University of Texas in Austin with a B.S. in Physics, Sara now lives in Brooklyn, NY working remotely as a Data Analyst at United Healthcare for a team based in LA. At UT she worked with a research group studying the technique of Raman spectroscopy. A longtime proponent of supporting women in STEM, she has volunteered as a mentor for grade school girls with an interest in science and mathematics. Since leaving school she has picked up skills in computer science and analysis and hopes to continue to pursue that further with an advanced degree in data science.

The Basics of Neutron Scattering

Jason S. Gardner (National Synchrotron Radiation Research Center, Taiwan), Chair-Elect

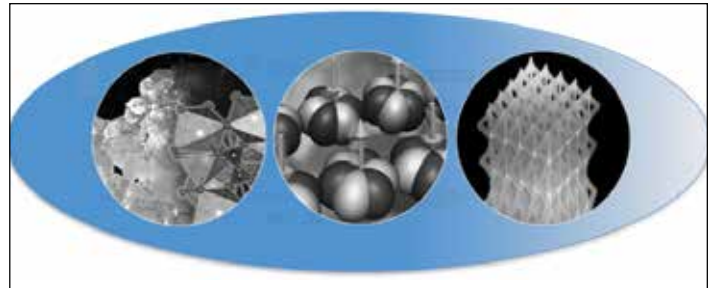


Jason S. Gardner

Early career scientists, or any scientist willing and eager to develop new tools for their academic/research progression should consider the possibilities at large scale facilities. These billion dollar labs provide state of the art research for all researchers through a peer review process and in some instances

will even pay the traveling expenses to perform the research. In this article I will highlights some of the unique opportunities in neutron scattering.

Neutrons are subatomic particles with no net electric charge, unlike other particles such as protons and electrons, which have an intrinsic electric charge. While the latter interactions are dictated by Coulomb forces involving strong charge repulsion or attraction, charge-free neutrons can move through matter undeterred by these factors. This translates to neutrons generally possessing the ability to penetrate deeper into matter than other subatomic particles, providing information about the bulk characteristics of that matter that cannot be gained from the scattering of other subatomic particles with



Complex materials research at the forefront of research today and in the minds of FECS members.

shorter penetration depths. This opens up a whole variety of possible physics knowledge that can be acquired from studying neutron-matter interactions including the physics of buried interfaces, the properties of materials within other materials and the dynamics of active units within a biologically relevant system. In general neutron-based measurements contribute to a broad spectrum of activities including in engineering, materials development, polymer dynamics, chemical technology, medicine, and physics.

There are currently around 30 active neutron research facilities scattered around the globe [<http://www.neutron.anl.gov/facilities.html>], each one containing the means to generate enough neutrons for experimental research



Map of the bigger neutron research centers. Red are sources that produce their neutrons by Spallation, yellow by fission.

in an appropriate time period. These neutrons are usually produced by reactors or by a process known as spallation or through a nuclear process like the p-n reaction in Be.

Other than its charge neutrality, the neutron has several other characteristics that makes it ideal for condensed matter science and sets it apart from other probes like photons or electrons. Below I outline the important ones.

WAVELENGTHS – Neutrons behave like microscopic particles, propagate as waves which can set other particles into motion, losing or gaining energy and momentum in the process. Their associated wavelength ranges from ≈ 0.01 nm to ≈ 2.5 nm, making structures as small as atoms and as large as biological cells visible.

ENERGIES – Neutron energies are measured in millielectronvolts which is the same magnitude as atomic motions. Spectrometers can measure the difference in neutron energy from as small as nanoelectronvolts and as large as electronvolts. This allows scientists measure the dynamics of proteins folding, melting glasses and diffusing atoms like hydrogen in advanced materials.

SCATTERING POWER – Those probes that scatter form electrons, have a higher scattering power of the heavier elements making light elements almost invisible in complex systems. Neutrons however scatter from the nucleus the scattering power varies quite randomly through the periodic table. More importantly, the scattering power is isotope specific making substitution possible. In soft matter studies hydrogen is ubiquitous, and can be distinguished from the chemically equivalent deuterium atom, making neutron scattering a very powerful techniques in protein crystallography and modern pharmacology.

MAGNETISM – The neutron behaves like a little bar

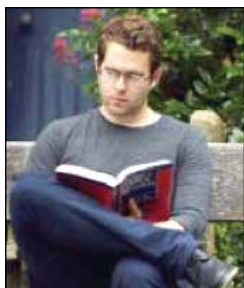
magnet and all the scattering techniques can be used for the magnetic subsystems within a compound. The structure and dynamics of classical and quantum magnets from the nuclei and free electrons can be investigated.

These four characteristics of the neutron make it very powerful and useful in most if not all areas of science research today. Compared to photon and electron sources, neutron sources and beam lines are scarce. Novel instrumentation has helped us study more complex systems than those possible with the simple tools developed by the Nobel Laureates, Cliff Shull and Bertram Brockhouse. Neutron Imaging, prompts gamma analysis, computer simulations and polarization analysis of the neutron beams are the tools today's young investigators will be using to probe samples as diverse as ancient pottery shards to jet engines, quantum spin liquids to lake water pollutants and stresses in highway trusses to ion conductivity in modern batteries.

After obtaining his Ph.D. at Warwick University in the UK, Jason worked for several national laboratories in North America before moving to Sydney, Australia in 2013. From Sydney, he manages a group of five people performing neutron scattering at ANSTO, Australia, and around the world. He is currently the Neutron Group Leader at the National Synchrotron Radiation Research Center, Taiwan. His scientific interests are primarily in frustrated magnets, but he's also performed research in many areas of condensed matter over thirty years of research. He has published over 120 papers and in 2008 was made a fellow of the Institute of Physics (UK). Jason is also a member-at-large of the APS Forum on International Physics.

FECS Congressional Visit 2017

Greg Hamilton, Webmaster



Greg Hamilton

prior to the 2017 April Meeting, members of the FECS executive committee along with close to fifty other APS members converged on Capitol Hill to engage and inform Congress men and women on major science related issues under the Trump administration. The Congressional Visit Day (CVD), held in late January just after the presidential inauguration, provided an opportunity for

“Continuing to inform Congress on science related issue and advocating for science budgeting and funding is of paramount importance to APS and, by extension, FECS.”

scientists across the country (and a few international colleagues) to personally reach legislators and their staff on topics like budget increases for the NSF and DOE, appropriation of funds for STEM education, clean energy jobs, and how to effectively address the helium shortage.

Most importantly, APS members shared personal stories about their research and the impact funding had on scientific progress and innovation. Yunseong Nam, one of our Members-at-Large and part of the group that met with the Maryland and Virginia congressional offices, explained his research in quantum information and how federal funding played a key role in its field's advancement. He noted that, much like the "race to the moon", the race for quantum computing necessitates critical funding and both national and international support. He gave Congress more reason to support increased funding by describing to legislators the impact of quantum information on drug development, cybersecurity, and multiple other fields. Numerous congressional offices requested more information and statistics from APS regarding the funding requests and for "dear colleague" letter drafts to be circulated.

Continuing to inform Congress on science related issue and advocating for science budgeting and funding is of paramount importance to APS and, by extension,

FECS. Many of our US-based members are in fields or occupations that can be directly affected by Congressional policies, and such policies can often indirectly impact our international FECS members as well. FECS intends to continue the dialogue with legislators that began in January, highlighting the issues that acutely affect early career scientists and informing Congress on the goals that FECS and APS wish to achieve in the coming future.

Greg is an undergraduate at the University of Richmond, VA, studying physics and math. He has worked on atomic force microscopy image correction at Richmond for three years. He attended the University of Oxford for a year abroad and worked on the SNO+ collaboration. He has applied to graduate school and hopes to concentrate in condensed matter theory and experiment.



Yunseong Nam, Maria Longobardi and Raju Prasad Ghimire at the Congressional Visit 2017

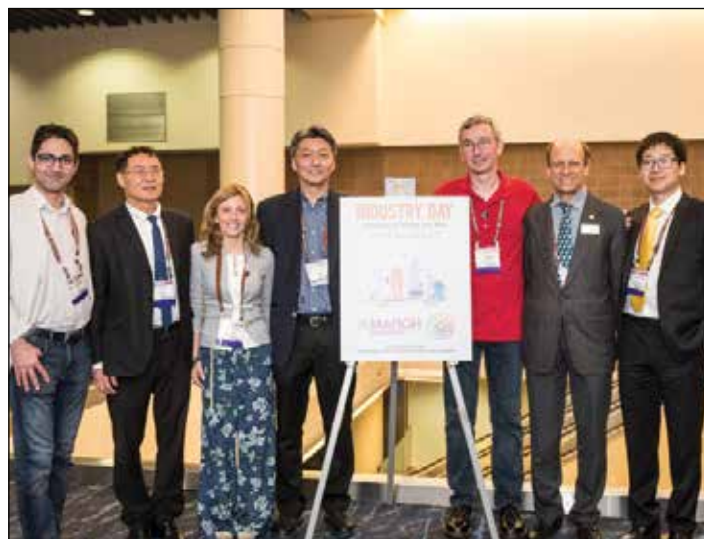
FECS/FIAP March Meeting 2017 Reception

Mohammad Soltanieh-ha, Member-at-Large



Mohammad Soltanieh-ha

FECS and FIAP, Forum on Industrial & Applied Physics, held a joint reception on the fourth day of the 2017 March Meeting in New Orleans. The reception was well attended by members of both forums as well as many new comers. This provided a great opportunity for all the APS members across different sectors to gather, socialize, and share ideas. Particularly, the presence of the members of industry at this event contributed a great deal towards one of the main goals of FECS: connecting academic and industrial physicists. Newly designed FECS free goodies were distributed and in the end as many as 70 new FECS members signed up. Stay tuned for the 2018 March Meeting FECS reception!

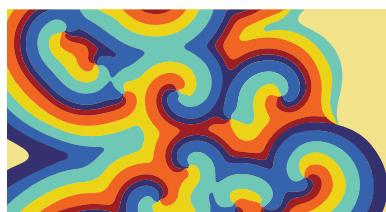


FECS/FIAP Reception. From the left Mohammad Soltanieh-ha, Matt Kim (FIAP) , Maria Longobardi, Ichiro Takeuchi (FIAP), Jason S Gardner, Steve Lambert (FIAP), Yunseong Nam



FECS/FIAP Reception. From the left Mohammad Soltanieh-ha, Yunseong Nam, Jason S Gardner, Maria Longobardi








Mohammad received his Ph.D. in physics from Northeastern University in 2015. He studied one-dimensional electronic systems using numerical techniques. Upon graduation, he began working for the enterprise software company, Infor, as a data scientist. Mohammad has been active with other groups within APS; he is a member of the Committee on Membership and an organizer of Boston Local Link.



MARCH
MEETING**2018**


MARCH 5-9
LOS ANGELES, CA

FECS 2017 Executive Committee on the Forum for Early Career Scientists

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	Member-at-Large: Sara Clements <i>United Healthcare, California</i>
	Member-at-Large: Yunseong Nam <i>University of Maryland-College Park</i>
	Member-at-Large: Mark Owkes <i>Montana State University</i>
	Member-at-Large: Mohammad Soltanieh-Ha <i>Infor, US</i>

Newsletter Editor: *Kevin Ludwick*

Webmaster: *Greg Hamilton*



NEW APS FORUM

EARLY CAREER
SCIENTISTS
(FECS)

SUPPORT

OPPORTUNITIES

EARLY CAREER

PARTICIPATION

Join us!
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Visit <http://www.aps.org/units/fecs>
or ask at the Membership Booth
at the APS meetings

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