

FIAP Winter 2017-2018 Newsletter

American Physical Society Forum on Industrial & Applied Physics

<i>FIAP Elections</i>	2
<i>FIAP at the March Meeting 2018</i> <i>Ichiro Takeuchi</i>	5
<i>New FIAP Fellows</i>	6
<i>Promoting Innovation and Entrepreneurship in Physics: The PIPELINE Program</i> <i>Crystal Bailey</i>	7

Note from the FIAP Newsletter Editor

Welcome to our 2017-2018 Winter edition of the FIAP Newsletter. While it has been a year since our last Newsletter, I hope to provide more information to the members of the FIAP in the future with more frequent issues of the Newsletter.

Derrick C. Mancini, Illinois Institute of Technology

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Comments and questions can be sent to fiap_newsletter@aps.org.

Opinions expressed represent the views of the individual authors and not the American Physical Society or author's employers.

FIAP Elections

The election for the FIAP Vice Chair and Members-at-Large was initiated on November 17th and closes on December 18th. You should have received an email message that contains instructions for voting, with a personalized link that you should follow to find your ballot. The message will be sent from the domain "directvote.net". Please ensure that this email domain is "white-listed" in your spam filters to avoid the message being sent to your spam folder.

When you receive the election notice from "directvote.net", please click on the link provided or cut and paste the link into your browser to log onto the election website.

Voting in the FIAP election is an important activity! Now that ballots have been sent to all FIAP members, please take a moment to vote among these excellent candidates:

Vice-Chair

E. Allen Adler, The Boeing Company (retired)
Michael Gordon, IBM
Matthew Thompson, TAE Technologies

Members-at-Large (vote for two)

Michael Burka, Fractyl Laboratories
Bruce Dunham, SLAC
Matt Richter, Vibe Imaging Analytics
David A. Whelan, U.C. San Diego

The ballot should have arrived around by November 17th via email from APS-FIAP Election Coordinator noreply@directvote.net. Please contact Steven Lambert (lambert@aps.org) if you have not received a ballot.

Biographies and statements from each candidate are included on the voting website, and are published below in alphabetical order:

Vice-Chair

E. Allen Adler

Biography

Dr. Allen Adler formerly the vice president of Enterprise Technology Strategy for The Boeing Company, retired March, 2017. He was responsible for leading the company's strategic planning for technology. Based on future business opportunities, the technology strategy identifies the critical technologies where The Boeing Company invests hundreds of millions of dollars in research and development funds. In addition to setting research priorities, the technology planning process also fosters enterprise-wide collaboration and replication of key technologies across the company's multiple global businesses. Dr. Adler was also the executive sponsor of the Boeing Technical Fellowship, a group comprising the company's most accomplished scientists and engineers who promote technical excellence and innovation, and represent Boeing's top research, development and manufacturing capabilities.

Before joining Boeing, he served at the Defense Advanced Research Projects Agency (DARPA) as director of the Tactical Technology Office. This DARPA office sponsored pioneering work in Systems of Systems and unmanned vehicles, and had responsibility

for the initial phases of the Future Combat Systems and Unmanned Combat Air Vehicle programs. Adler also once led the Advanced Technology group at Hughes Aircraft Company, Electron Dynamics Division.

Dr. Adler is a Fellow of the APS and a member of the AIAA. He has served on several advisory boards including the Defense Science Board, the Army Science Board, the Visiting Committee on Advanced Technology of the National Institute of Standards and Technology and the Board of Governors of Argonne National Laboratory.

He earned a bachelor's of science degree from the California Institute of Technology in 1973 and a doctorate from Princeton in 1978, both in physics. He and his family reside in Southern California.

Statement

There has always been an important relationship between scientific discoveries and advances in technology. Of course, scientific breakthroughs often lead to applications. On the other hand, advances in technology often result in better scientific instruments and also raise important fundamental questions. Progress in both "pure" and applied physics is facilitated by collaboration between physicists working on basic phenomena and those working on applications. Professional societies such as the APS and the IEEE have played an important role in fostering collaboration between pure and applied physicists, often helping to bridge the institutional gaps between industry, government laboratories and academe.

Three trends in science and technology drive the need for better collaboration and communication among physicists working in different institutions. First of all, the pace of progress is accelerating. Secondly, progress increasingly results from interdisciplinary collaboration. Finally, an increasing proportion of investment in technology is being made by companies. The FIAP gives the APS an important tool to take advantage of each of these trends.

FIAP has found innovative ways of bringing together physicists from industry, government and academe. They have sponsored topical conferences that are designed to facilitate collaboration. FIAP events are also excellent opportunities for graduating physicists to meet potential industrial employers. FIAP should continue both supporting these productive efforts and looking for other ways to bring together industrial, academic and government physicists. If elected, I will be honored to help FIAP carry out this important mission.

Michael Gordon

Biography

Dr. Michael Gordon is Research Staff Member at the IBM TJ Watson Research Laboratory in Yorktown Heights NY. He served as a Member at Large for APS FIAP from 2013-2016, has been the chairperson of the awards committee for the last few years and has served as a member of the APS Historic Sites Committee from 2012-2014. Dr. Gordon was named an APS Fellow in 2016. In 2007 and again in 2017, he received an IBM Outstanding Technical Achievement Award. He is also a Senior Member of the IEEE.

Dr. Gordon earned his Ph.D. in Experimental Nuclear Physics in 1989 from SUNY Stony Brook and his B.S. degree in Engineering Physics from the University of Colorado at Boulder in 1982. Dr. Gordon's research interests are focused on applications of accelerator-based ions including materials analysis and single-event upsets in semiconductors, as well as commercializing quantum computing. He operates IBM's 3MV Tandem Van de Graaff accelerator laboratory where experiments performed with monoenergetic low energy protons were the first to show that direct ionization of protons can cause SEU's in 65 nm SOI devices.

He has 72 US Patents issued, and many patents pending, or in process. Dr. Gordon has coauthored about 70 technical articles on selected topics in Nuclear Physics, electron beam lithography, low-level alpha particle spectroscopy and single-event upsets.

Statement

I recently served on the FIAP Executive Committee for 3 years as a Member at Large and was the Chairperson of the FIAP Prize Committee for two years.

One of the duties of the Vice Chair is to organize our sessions for the March Meeting. I look forward to continuing the excellent work that the previous Vice Chairs have done. FIAP-sponsored Industry Day has been a great success and I plan on continuing this with a variety of timely sessions.

Another duty of the Vice Chair is to serve on the Nominating Committee for future members of the FIAP Executive Committee. If elected, I will solicit nominations from a larger, more diverse pool of candidates for APS FIAP Fellows and FIAP-sponsored awards.

Lastly, when I was a Member at Large, I hosted tables at the annual "Graduate Student Lunch with Experts" at the APS March meetings. The lunch was for the students to discuss their work and learn more about careers in the Industrial and Applied Physics fields. Many of the students had not met scientists outside of Academia, or visited labs outside of their Universities. I found this interesting and invited the students to visit our research lab, which several have since done. Connecting with the students is important to showcase some of the rewarding career choices available to Physicists.

Matthew Thompson

Biography

Matthew Thompson is Director of Physics at TAE Technologies, the world's largest privately-funded fusion energy development effort backed by \$500 million in private capital. He leads the 50 scientists and technical personnel of TAE's Physics Division in their work on experimental operations, pulsed power systems, high-power neutral beams, plasma diagnostics, data acquisition, analysis, and data science. Dr. Thompson transitioned to private industry ten years ago with his first Senior Scientist position at Tri Alpha Energy working on energy conversion and magnetic sensor technologies. Prior to becoming an industrial physicist, he worked at Lawrence Livermore National Laboratory on picosecond resolution electron diffraction, and at both SLAC and Fermilab on dielectric and plasma wakefield accelerators. Outside the lab, Dr. Thompson is heavily involved in the mentorship of young scientists, leadership activities of the American Physical Society, and science advocacy.

He holds a bachelor's degree with honors in physics from Stanford University, and both a MS and PhD in physics from the University of California, Los Angeles, where his graduate work focused on experimental plasma physics.

Statement

My single focus in running for Vice Chair is to make participation in FIAP as valuable as possible to our present and future members. The APS's own statistics clearly show that well over 50% of the young men and women trained in physics ultimately find careers in private industry, yet FIAP members are only 13% of the total APS membership. I believe the root cause of this underrepresentation is a deficiency in both providing and communicating a compelling value proposition to physicists who have exited the academic and government laboratory communities. To increase that value proposition, I support the findings and recommendations of the 2014 National Issues in Industrial Physics workshop, which I participated in. In addition to maintaining strong and useful programs at our meetings and working to recruit new and diverse members, I feel some of the best recommendations to target in the future are encouraging industrial internships, fostering a culture of mentorship, supporting mid- and late-career networking and development, and advocating at the federal level for reforms in areas such as immigration policy, intellectual property rights, and access to national user facilities.

I have already taken significant action in the service of industrial physicists. At the 2014 workshop, I proposed the idea of an online mentorship matching site for industrial physics and later helped Steven Lambert, the APS Industrial Fellow, implement the concept in the form of the IMPact program (<https://impact.aps.org/>). In the first year of operation, IMPact attracted over 450 participants and made 90 mentoring relationship matches. This is exactly the sort of low-cost, high-payoff program I will seek to further as Vice Chair. I have formal APS leadership experience, previously serving a term as member-at-large on the Far West Section executive committee and recently joining the Committee on Careers & Professional Development. Finally, my professional activities outside the APS demonstrate commitment to a vibrant and successful industrial physics community. Of the last five scientists I have hired for my diagnostics group, three are either women or members of an underrepresented group. In addition, I have personally mentored over a dozen students on professional issues, made several career-oriented speaking appearances, and maintain a blog on career skills for industrial physicists (www.prosperousphysicist.com). I hope that I can continue to serve you as a chair line officer of FIAP. Thank you for your time and attention.

Members-at-Large

Michael Burka

Biography

Michael Burka leads a product development team at Fractyl Laboratories, a medical device manufacturer in Lexington, Massachusetts that is developing technology for the treatment of metabolic diseases. Following a Ph.D. in particle physics from the Johns Hopkins University and postdoctoral work at MIT on the LIGO project, Burka left academia for a career as a physicist in industry. In addition to medical devices, Burka has developed instrumentation for infrared spectroscopy, atmospheric research, and optical telecommunications, working in both large corporations and early

stage startups. He holds five patents for spectroscopic apparatus and methods and has numerous journal articles and conference presentations on infrared spectroscopy, medical imaging, semiconductor laser design, optomechanical packaging, and LIDAR investigation of the atmosphere. He serves on the organizing committee of the Boston-area chapter of the APS Local Link, has been a mentor in the APS IMPact and the SPS Adopt-a-Physicist programs, and has spoken at APS and other meetings to physics graduate students and postdocs about working as a physicist in industry.

Statement

AIP has estimated that as many PhD physicists work in industry as work in academe and government combined. We physicists in industry often do not have “physics” in our titles and job descriptions, and many of us don’t have the opportunity to attend APS meetings or to publish or lecture frequently, so we have a visibility problem and are disconnected from one another. FIAP helps to create opportunities for physicists in industry to interact with each other and with APS. Most importantly, FIAP facilitates contact between physicists in industry and physics students and postdocs who are making career decisions. The APS Local Link and the IMPact mentoring programs are positive developments. I think we should endeavor to strengthen them as well as to find other ways to better engage industry physicists in the APS community. These will be my objectives as a Member at Large on the FIAP executive committee.

¹Czujko & Anderson, *Common Careers of Physicists in the Private Sector*, AIP Statistical Research Center, June 2015.

Bruce Dunham

Biography

Bruce Dunham is currently the Deputy Accelerator Director at the SLAC National Accelerator Laboratory in Menlo Park, CA. Bruce received his Ph.D. in accelerator physics from the University of Illinois, Urbana/Champaign, followed by a post-doctoral appointment at Saclay, France. He then worked at Jefferson National Laboratory in Virginia, commissioning the 4 GeV nuclear physics superconducting accelerator and developing photoemission electron sources. Bruce switched to the industrial world, working on medical devices at General Electric Healthcare in Wisconsin, including x-ray tubes and CT scanners. After 8 years in industry, he developed high voltage, high-brightness electron sources for accelerator applications at Cornell University. Bruce has 25 US patents, numerous publications and has co-authored and contributed to several books.

Statement

I have a unique perspective on industrial and applied physics after having worked at national laboratories, a university and a large company. I have experienced first-hand how funding, project management and product development/R&D are handled on very different time-scales and budgets, and want to share those experience with young scientists just starting in their careers.

Physics students are always in demand in non-academic settings, as physicists have the broad array of skills that companies need to develop new and innovative products. Relatively flat funding for government sponsored R&D in the last few years makes it more important

for FIAP to introduce students to the many opportunities available in industry and through entrepreneurship. This is critical in order to continue attracting a steady stream of good students into physics through the ups and downs of the economy.

If elected as a member-at-large in FIAP, I plan to encourage graduate and undergraduate students to explore jobs in industry which can make very fulfilling careers. This can be accomplished through mentorship and internship programs, focused career workshops at conferences, connections to small companies working on the latest technologies, and by promoting undergraduate courses focused on the skills needed for industry.

Matt Richter

Biography

Matt Richter received his BA in Physics from UCSD and his PhD in Applied Physics from Stanford University. Always working in industry, he has focused on development of instrumentation for real time process control using a wide range of technologies: optical spectroscopies from the UV to the Mid-IR; Atomic Force and Scanning Tunneling microscopies; image based analysis for semiconductor fault detection and grain analysis; and multivariate analysis techniques for improved process control and fault detection in the Semiconductor and Agricultural sectors. Currently, Matt is the Director of Analytics, Applications and Business Development at Vibe Imaging Analytics.

Statement

My name is Matt Richter and this is not my first go round with the APS.

After receiving my PhD from Stanford in 1993, I spent most of my early career working in very small (three people) to small (35 or so) companies before I landed at MKS Instruments. My involvement in small companies combined with my presence on the APS Academic Council as a Member-At-Large is why I was asked to be part of the original founding crew of FIAP. Since then, I’ve founded my own company (that sadly I closed in 2013) and currently work in the agricultural sector bringing quantitative measurement to an industrial sector that still measures many things by hand!

When I helped launch FIAP way back when, the main issues that we were trying to address were to increase the profile of physicists working in the private sector in the APS, as well as help market physics and physicists to industry and the private sector.

Both these issues still need work. But in the past few years, new urgent issues have arisen: the fight against junk science, willful ignorance and the reduction of investment in the sciences, both basic and applied.

Traditionally, physics has, for better or worse, tended to shy away from self-promotion, marketing of the field to the public at large, and political activity of any type.

If elected, I will use my position to further not only the promotion of industrial and applied physics within the APS, but also put effort into increasing participation in the greater public debate from physicist so as fight the tide of junk science, increase the public understanding of the complex issues facing us all, and increase data driven decisions.

David A. Whelan

Biography

David A. Whelan joined the faculty of the Jacobs School of Engineering at UC San Diego in 2017. He earned his B.A. in Physics (1977) from UC San Diego and his Ph.D. (1983) and MS (1978) in physics from UCLA where he studied Tokamak Fusion Reactors, Type III Radio Solar Bursts and Nonlinear Energy Flow in electron-beam plasma systems. Whelan's 34-year career in the aerospace industry included science and engineering research positions and eventually executive R&D management as Vice President and Chief Scientist of the Boeing Defense and Space Systems. He also served in government as the Office Director for two of the Defense Advanced Research Projects Agency systems offices. While at DARPA, Whelan created many legacy joint programs with the Air Force, Navy and the Army, most notably, the Discoverer II Space Radar Program, the Army's Future Combat System and the Unmanned Combat Air Vehicle.

Dr. Whelan's earlier career included working at the Hughes Aircraft Company as Program Manager and Chief Scientist for the B-2 Bomber Air-to-Air Radar Imaging Program, and as a Physicist for the DOE's Lawrence Livermore National Laboratory (LLNL) studying X-ray lasers and Advanced Nuclear Weapons. He started his career at Northrop where he was one of the key designers of the B-2A Stealth Bomber and contributed to the YF-23 Advanced Tactical Fighter. He has numerous publications on electromagnetic radiation, laser plasma phenomena and defense systems. He holds over 50 patents on navigation systems, radar systems, antenna, and low-observable technology.

Dr. Whelan was elected to the National Academy of Engineering in 2007 for his development and application of Air-Air Radar Imaging. He is currently a serving member of the Defense Science Board for Office of Secretary of Defense, the NRC Division of Engineering and Physical Sciences Board, and the Air Force Studies Board of the National Research Council. He is a Fellow of the American Physical Society and Senior Member of the IEEE, and Fellow of the AIAA. Whelan was honored for his government service and received the Secretary of Defense Medal for Outstanding Civil Service in 2001, the Secretary of Defense Medal for Outstanding Public Service in 1998, and the Department of the Air Force Medal for Exemplary Civilian Service in 2008.

Statement

Over my 30+ year career in science and engineering, I have had the pleasure of working for all sectors of the research and engineering profession. From my academic education in Plasma Physics at UCLA, to the DoE Nuclear Weapons Laboratory LLNL, to the commercial and defense industries at Northrop, Hughes and the Boeing Company and finally having the honor to help lead our Nations Defense research and innovation engine at DARPA. From this experience base I will bring a balanced perspective on how to best to address the challenges facing the FIAP community and by networking across all these sectors to find innovative and high impact solutions to meet our Nations Challenges by leveraging the talent and resources of the FIAP members. If elected to serve as a Member-at-large on the FIAP Executive Committee I will provide insights, energy and leadership to improve the life-long development of scientists and engineers and seek to help bridge the gap between the National Security community needs for researchers, talent and ideas and our FIAP professionals.

FIAP at the March Meeting 2018

A note from Program Chair, Ichiro Takeuchi, on FIAP sessions at March Meeting 2018 in Los Angeles.

At the APS March Meeting in 2018, FIAP will again host many stimulating invited symposia. These include a joint symposium with GMED (Topical Group on Medical Physics) on the theme of **Physics Changing Medicine** on Tuesday March 6th at 2:30PM and a joint symposium with FPS (Forum on Physics and Society) on **Advancing Innovation for Industry and Society** to be chaired by David Seiler (NIST) on Tuesday March 6th at 11:15PM. The distinguished speakers for the FIAP-FPS symposium include Ken Gabriel, formerly of DARPA and Google, and now the President and CEO of the Charles Draper Lab.

Wednesday March 7th is FIAP's **Industry Day** with a theme of **Big Data and Physics - Bits to Knowledge**. The target audience are students, early career scientists, and industry people plus academics who are interested in what's happening in industry and Big Data. New applications, services, and products are emerging as Big Data grows in importance. Software and systems are being deployed that can digest enormous datasets and extract meaningful insights. Industry Day features sessions on **Data Science as the Driving Force for Modern Industrial Physics** to be chaired by Maria Longobardi from FECS (Forum on Early Career Scientists)

and the FIAP-AIP session on **Put Big Data in Your Physics Toolbox** to be chaired by FIAP's Steven Lambert. Among the presenters are speakers from Netflix, Uber and Google, who will discuss how Big Data is impacting their work, and help us see how it might affect our daily lives as well as physics research. Back by popular demand, the midday session for the Industry Day will be the symposium on **Physics that Changed the World** to be chaired by Eli Yablonovitch (UC Berkeley).

FIAP will wrap up its invited symposia on Thursday March 8th with the annual **Physicists as Entrepreneurs** session at 11:15AM, and the joint FIAP-GIMS (Topical Group on Instrument & Measurement Science) Awards session at 2:30PM where winners of the **George E. Pake Prize, Distinguished Lectureship on Applications of Physics Award, and Keithley Awards** will deliver their invited talks. The Awards session will be followed by a reception.

Additionally, FIAP is organizing focus sessions with a number of invited speakers. The FIAP focus sessions include Integer and Fractional Quantum Hall Effects and Related Topics and Moore's Law: More and Beyond.

FIAP will also sponsor sessions specifically designed for students and early career physicists to learn about careers in the private sec-

tor. On Monday at noon FIAP and APS Careers will host a special lunchtime session (pizza included!) in which representatives from industry will briefly describe their career path and answer questions about physics careers in the private sector. Topics will include research opportunities for physicists in industry, strategies for successfully pursuing industrial jobs, and advice on how to thrive in this exciting and challenging work environment. Students can also sign up for the Graduate Student Lunch with the Experts on Tuesday. Round table discussions over lunch with an industrial physicist provides an opportunity to ask questions in a more relaxed

setting. There will also be a Careers Fair where your company can connect with students interested in working in your field.

Join your colleagues in Los Angeles for Industry Day or for the entire week. There's always interesting talks, new people to meet, and new equipment and techniques to learn about in the equipment exhibit. See you there!

Ichiro Takeuchi
Vice Chair FIAP Executive Committee

New FIAP Fellows

Please join us in congratulating the newly elected APS Fellows nominated by FIAP, also listed at this link: <http://www.aps.org/units/fiap/fellowship/index.cfm>

Akinwande, Deji **University of Texas at Austin**

Citation: For contributions to the physical study and development of scalable uniform monolayer graphene synthesis on wafer-scale substrates, and the realization of GHz flexible and wearable two-dimensional devices, circuits and systems.

Bauer, Matthias **Applied Materials**

Citation: For contributions to low temperature epitaxy of group IV alloys, in situ-doping with degenerate doping levels, highly strained alloys and novel techniques to achieve selectivity such as cyclic deposition and etch.

Gnade, Bruce E **Southern Methodist University**

Citation: For contributions to the development of electronic materials and device technologies that span microelectronics, display technologies, and large area sensors.

Gutierrez, Carlos J **Sandia National Laboratories**

Citation: For contributions to the understanding of magnetic thin film physics, the development of innovative materials physics education programs, and for research and development leadership in transitioning fundamental materials un-

derstanding into a broad range of energy and other national security applications.

Ma, Zhenqiang **University of Wisconsin – Madison**

Citation: For seminal contribution to the development of flexible high speed devices, microwave device technology, optoelectronics, and the innovation in the area of biodegradable environmentally benign devices.

Oden, Patrick I **Texas Instruments**

Citation: For contributions to the commercial success of digital micromirror micro-electro-mechanical systems-based displays through co-invention of a highly flexible and scalable pixel architecture based on a new understanding of mirror dynamics, shape, and force interactions via novel integration of metrology techniques.

Talin, Albert A **Sandia National Laboratories**

Citation: For the discovery of new electronic transport phenomena, materials, and devices.

Zhang, Yong **University of North Carolina – Charlotte**

Citation: For outstanding contributions to the fundamental understanding, characterization, and applications of semiconductor hetero-structures and isoelectronic impurities in semiconductors.

Promoting Innovation and Entrepreneurship in Physics: The PIPELINE Program

A 2015 report released by the APS Forum on Industrial and Applied Physics identified several national issues for Industrial Physics ([link](#)). One of these was preparing and supporting the industrial physicist – in particular, preparing physics students as likely members of the future industrial physics workforce. Narrow career guidance, deficits in core technical competencies that are developed by hands-on experimentation, and deficits in work skills such as communication, teamwork, and an appreciation of the importance of cross-disciplinary collaboration, were specifically listed as challenges in this area.

APS is proud to announce a new program, called PIPELINE, which seeks to integrate experiences into the standard undergraduate physics degree which will explicitly prepare students for careers in industrial and entrepreneurial settings. These include relating physics content to real-world applications, teaching students to communicate to an audience, building more cross-disciplinary research collaboration, familiarizing students with basic business concepts, and capitalizing on physicists' habit of innovation to create new technical solutions to important global problems. These ideas are becoming widely referred to as physics innovation and entrepreneurship (or "PIE") education, and have seen a groundswell of interest in recent years among the physics education community.

APS collaborated with six academic institutions and won a three-year grant from the National Science Foundation. The academic partners (Loyola University Maryland, Rochester Institute of Tech-

nology, The College of William and Mary, The George Washington University, the University of Colorado Denver, and Wright State University) will develop and disseminate new curricular and co-curricular approaches to teaching PIE, informed by physics faculty who have already built successful physics entrepreneurship programs – as well as advisors from industry. The project will also develop research tools which will monitor institutional change around the adoption of these practices, and provide resources to help faculty overcome obstacles to widespread adoption of PIE practices. To learn more about the specific approaches being implemented in PIPELINE – or to learn more about other PIE related developments in the community – please visit the PIE website at <http://www.aps.org/programs/education/innovation/pipeline>

By supporting the widespread adoption of these practices, we can improve student learning and career outcomes, and elevate the profile of private sector and entrepreneurial paths as a legitimate career trajectory among physics faculty and students. Undergraduate PIE education will also enhance the skills of those who go on to finish a graduate degree in physics. Some of the developed PIE practices could even be adapted for use in graduate coursework. These efforts align with FIAP's recommendations for a better prepared future scientific workforce, and we hope to engage with the FIAP community in the development of PIE moving forward.

Crystal Bailey
APS Careers Program Manager