APSNEWS
A PUBLICATION OF THE AMERICAN PHYSICAL SOCIETY
WWW.APS.ORG/PUBLICATIONS/APSNEWS

February 2015 • Vol. 24, No. 2

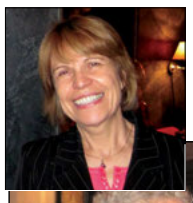
Iranian Court Rejects Kokabee Appeal
page 5

APS Reception Celebrates International Year of Light

As part of the International Year of Light and Light-based Technologies opening ceremony held January 19 and 20 in Paris, France, APS hosted an evening reception for APS Fellows living in the Paris area. APS President Sam Aronson, Vice President Laura Greene, and Executive Officer Kate Kirby welcomed over 50 guests who toasted APS participation in the year-long celebration of the cultural, educational, and scientific impact of light and related technologies. The reception was held in the City of Light in view of the Eiffel Tower.

The event was originally suggested by APS Vice President Laura Greene (second from left). APS Executive Officer Kate Kirby, APS President Sam Aronson and APS Board Member Anthony Johnson were also able to attend to support APS International Year of Light.

Photos by Becky Thompson



The event was planned with the help of APS Board Member Annick Suzor-Weiner of the University of Paris (at left).

Nobel Prize winner Bill Phillips (at right) with other guests

IYL 2015 Switches On in the City of Light

By Michael Lucibella

APS is a founding partner of the International Year of Light and Light-based Technologies (IYL 2015), a year-long, global outreach effort of more than 100 scientific societies to communicate the importance of light, optics, and photonics to the world. Along with the other U.S. founding partners, the Society is collaborating on light-themed events and programs throughout the year and beyond.

"The idea is to celebrate the scientific discoveries that have been made over the years in light," said Becky Thompson, head of outreach for APS. "We also want to inform people about the importance of light and light-based technologies in developing nations, and in education and research."

International Year of Light 2015

Established and organized globally by the United Nations Educational, Scientific and Cultural Organization (UNESCO), the IYL is sponsoring and pro-

LIGHT continued on page 4

See also the essay by Joseph Niemela, global coordinator at the IYL Secretariat, on p. 5.

Industrial Physicists Call on APS to Ramp Up Support

By Michael Lucibella

The Forum on Industrial and Applied Physics (FIAP) of the APS recently released a report calling for more support of industrial physics and physicists by both the Society and the science community as a whole. The report highlights the important role that industrial physics has played in driving the economy, and discusses issues of concern to the industrial physics community.

At its core, the report calls for APS to take a leadership role and increase its focus on meeting the needs of industrial physicists. It highlights recent studies showing that 70 percent of physics graduates work in non-academic careers, including jobs in industry, business, and government. However, the report states that teamwork, skill building, career guidance, and networking options are lacking in the field.

"The face of physics in the U.S. is very academic, but the reality is that the majority of physicists work in industry or national labs," said Steven Lambert, who began working at APS in 2013 as its first Industrial Physics Fellow, and who is the co-chair of the committee that wrote the report. "I would like physicists working in industry to read [report] and feel like they're part of a community that is talented, capable, and has a lot to offer."

The report calls for APS to make more services available to early and mid-career industrial physicists and increase its focus on industrial physics at its meetings. The report also highlights the need for the establishment of a mentoring clearinghouse for students and early career industrial physicists to meet potential mentors to help guide their careers.

In addition, it recommends that APS recruit more members from industry into leadership and committee positions and hold meetings specifically for industrial physicists. Presently, there are no general meetings held specifically for physicists in industry. "The American Physical Society is in a premier position to act as catalyst, leader and innovator in making things happen for industrial physics," the report reads.

According to the report, APS needs to work with the federal government and universities to help improve the landscape for industrial physicists as a whole. It included recommendations to create better advisory groups for government agencies to help them increase and streamline the number of federal investment programs, restructure ideas for how intellectual property rights are handled, and simplify visa restrictions for U.S.-trained foreign students to stay in the United States.

"It's going to take a concerted, long term, multi-prong effort to have an impact on the bureaucracy of the government," Lambert said.

INDUSTRIAL continued on page 6

APS Rolls Out National Mentoring Program

By Michael Lucibella

This month, APS announced the launch of the National Mentoring Community program, aimed at underrepresented minority undergraduate physics students. "The goal of the program is to increase the number of underrepresented minority students who earn their bachelor's degrees in physics," said Theodore Hodapp, APS Director of Education and Diversity. The program will train and match mentors with students, set up national meetings and travel funds for participants, and ultimately add scholarship funding as well.

Physics as a discipline has been slow among STEM fields to diversify. African Americans and Hispanics make up about 30 percent of the U.S. population, but earn only about 9 percent of the undergraduate physics degrees, and 7 percent of the Ph.D. degrees. "We're kind of at the bottom of the scale, so clearly there are some disincentives for students in pursuing their degrees," Hodapp said.

The new program is loosely based on the Math Alliance (mathalliance.org), where more than 350 mentors work with about 600 stu-

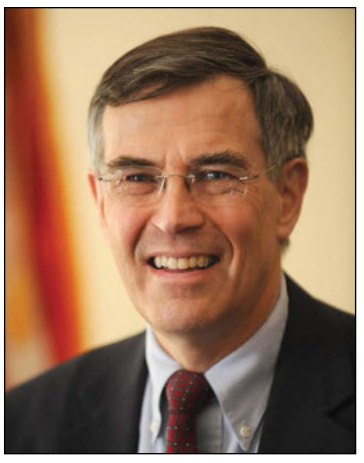
MENTORING continued on page 7

A Physicist Discusses His Congressional Service

In fall 2014, Rush Holt, one of only two physicists in Congress, announced he would not seek re-election. Formerly an assistant director of the Princeton Plasma Physics Laboratory, Holt has represented New Jersey's 12th district as a Democrat since 1999. He will become the CEO of the American Association for the Advancement of Science in mid-February, 2015. In an interview with Alaina Levine for *APS News*, he reflected on his experiences in Congress and what he is excited about for the future. The full version of this edited interview can be found at aps.org/apsnews

AGL: *I noticed in your final address to Congress you said that you always answered the phone as "Representative Rush Holt." What does it mean to you to have represented this constituency, particularly as a physicist?*

RH: Part of the genius of our Constitution that has been recognized and copied around the world is that a sustainable government begins with the concept of representation. Both from a political point of view and from an academic and intellectual point of view I realized that representation focused on each individual is essential to this job and that's why I've often said that "Representative" is both my formal title and also the job description, and that it has to be directed at each individual. Obviously with 750,000 people in this district, I can't know personally each individual or even each individual's concerns and hopes and fears, but they have to know that each of them is part of their government. It's a really important point.



Official U.S. House photo

Rush Holt

AGL*: You're going to be overseeing the largest general science society in the world, the AAAS. I wonder how that same concept of representing your constituency will manifest itself in your mind and what you do as the leader of AAAS.*

RH: My path has intersected with the AAAS many times over the decades, and I was an AAAS [Science & Technology Policy] Fellow in Congress in the 1980s. And I've spoken at AAAS annual meetings and been involved in

HOLT continued on page 6

Members in the Media

"Gaming had grown into a huge market. … There's a huge push for performance, meaning you can buy low-cost, high-performance hardware very easily. I could go out and buy 100 PlayStation 3 consoles at my neighborhood Best Buy, if I wanted."

***Gaurav Khanna**, University of Massachusetts, Dartmouth, on making a supercomputer out of dozens of videogame consoles,* The New York Times*, December 23, 2014.*

"Faculty don't like being told what to do, and there are people who push back and say they can figure it out on their own and they know what works for them. There's plenty of data that says they're mistaken."

***Noah Finkelstein**, University of Colorado, Boulder, on universities overhauling the way physics and other sciences are taught,* The New York Times*, December 26, 2014.*

"Doubling the energy will have a huge impact on the search for new particles at LHC. … The higher the energy, the heavier the particle one can possibly produce."

***Gabriella Sciolla**, Brandeis Universit,* FoxNews.com*, December 29, 2014.*

"By going to larger energies at the LHC, we increase the range of masses of potential dark matter particles that we can examine."

***Andrew Lankford**, University of California, Irvine,* FoxNews.com*, December 29, 2014.*

"One of the first things that you want to do when you discover a star system that's got some orbiting planets is you want to understand the characteristics of the star that the planets are orbiting around. But if you don't have the composition of the other stars correct, then mistakes will be made in inferring the properties of those other stars."

***James Bailey**, Sandia National Laboratory, on using the Z-Machine to understand the makeup of stars,* National Public Radio*, December 30, 2014.*

"That would really tear it up, and I'm guessing you would have a pretty big comet shower, potentially pretty disastrous."

***Adrian Melott**, University of Kansas, on what would happen if a star passed nearby our solar system,* NBCNews.com*, December 31, 2014.*

"We're planning to resume our search for gravitational waves with Advanced LIGO in late summer or early fall 2015. … Hopefully, we'll get some interesting results soon after!"

***David Reitze**, Caltech,* The Los Angeles Times*, December 31, 2014.*

"I was reading about a faculty member studying black holes with x-rays. It sounded so cool and exciting and amazing. I worked for him in a summer and fell in love with the idea of building new telescopes and studying these objects. There's an aspect of discovery that is wonderful. I got hooked on that."

***Fiona Harrison**, Caltech,* The Washington Post*, January 6, 2015.*

"[The report] confirms what I have often said — that the FBI's definitive conclusions about the accuracy of their scientific findings in the Amerithrax case are not, in fact, definitive. The United States needs a comprehensive, independent review of the Amerithrax investigation to ensure we have learned the lessons from this bio attack."

***Rush Holt**, former member of U.S. House of Representatives, on a report criticizing the FBI for its investigations into the 2001 anthrax attacks,* The New York Times*, December 11, 2014.*

"It will be the greatest color movie of all time."

***Zeljko Ivezic**, University of Washington, on the construction of the Large Synoptic Survey Telescope,* The Washington Post*, January 11, 2015.*

"[W]e live in what we assert is a free country. So people ought to be able to say whatever they want. And we have a system of governance where there are people in Congress who represent some slice of the electorate. So if someone feels that way about science, what that tells

MEMBERS continued on page 3

This Month in Physics History

February 11, 1939: Meitner/Frisch paper on nuclear fission

Women have made substantial progress in physics, accounting for 20% of all Ph.D.s awarded in 2012. Yet only two women have won the Nobel Prize in Physics since it was established in 1895: Marie Curie in 1903, and Maria Goeppert-Mayer in 1963. Among those most often cited as having been unfairly overlooked is Lise Meitner, whom Albert Einstein once called the "German Marie Curie."

Born in 1878, Elise (she later shortened her name to Lise) was the third of eight children born to a Jewish lawyer, Philipp Meitner, and his wife Hedwig. She studied physics privately, with the support of her parents, since public universities in Germany at the time did not admit women. That education nonetheless proved sufficient to pass the requisite examination in 1901, and in 1905 she became just the second woman to earn a doctoral degree from the University of Vienna.

German Post Office

Lise Meitner

Her best local job prospect was to work in a gas lamp factory, but this did not appeal to Meitner, and she moved to Berlin with her father's blessing (and funding), where she won the favor of Max Planck — notoriously reluctant to teach women — and eventually became his laboratory assistant. Here she began her longtime collaboration with chemist Otto Hahn; together they discovered several new isotopes. She moved with Hahn to the Kaiser Wilhelm Institute in 1912, initially working without pay. In 1917, the Institute granted Meitner her own physics lab. She briefly served as a nurse during World War I, but soon returned to her research in Berlin, although not without some pangs of guilt for not doing more for the war effort.

In 1923, Meitner pinpointed the cause of a strange emission of electrons from excited atoms, although the phenomenon is now known as the Auger effect, after French scientist Pierre Auger, who independently discovered it that same year. She became the first woman in Germany to hold a full professorship when she moved to the University of Berlin in 1926 to head a research program in nuclear physics.

It was an exciting time for physics, given the discovery of the neutron in the early 1930s, which launched a four-way international quest to create an element heavier than uranium in the laboratory. The competitors: Ernest Rutherford in England, Irene Joliot-Curie in France, Enrico Fermi in Italy, and Meitner and Hahn in Germany.

When Adolf Hitler rose to power in 1933, most Jewish scientists fled Germany, including Meitner's own nephew, Otto Frisch. Meitner, however, remained behind at the Institute for Chemistry until 1938, a decision she later regretted: "It was not only stupid, but also very wrong that I did not leave at once." Her Austrian citizenship provided some protection, but eventually Meitner, too, was forced to flee the country, with the help of Dutch physicists. She had just ten German marks to her name, along with a diamond ring given to her by Hahn, in case she needed to bribe the border guards.

Despite her own reluctance to leave Nazi Germany, Meitner was fiercely critical of the other prominent scientists who remained behind, including Hahn — to whom she wrote a blistering rebuke many years later, despite their lifelong professional collaboration and friendship — and Werner Heisenberg, who led the Nazi development effort for an atomic bomb. "Heisenberg and many millions with him should be forced to see these camps and the martyred people," she wrote.

Meitner found herself working with Niels Bohr in Stockholm, Sweden, continuing her collaboration with Hahn via mail. The two even managed to meet secretly in Copenhagen to plan a new series of experiments. Hahn successfully performed the experiments with Fritz Strassmann in Berlin, but he wrote to Meitner that he was mystified by the fact that bombarding the uranium target with neutrons actually produced lighter elements. "Perhaps you can come up with some sort of fantastic explanation," he wrote. Meitner and Frisch did just that, invoking a theory of nuclear fission that utilized the liquid drop model to explain how a uranium nucleus could split, with the reduction in nuclear mass appearing as the energy released.

They published their conclusions on February 11, 1939. However, when Hahn published his results in *Nature* in January 1939, he failed to list Meitner as a co-author — a controversial decision, especially since he never corrected the omission after the war ended. Hahn won the 1944 Nobel Prize in Chemistry for this work; Meitner's contribution went unrecognized. In 1997, *Physics Today* concluded that this omission constitutes "a rare instance in which personal negative opinions apparently led to the exclusion of a deserving scientist" in the awarding of the Nobel.

The discovery of nuclear fission (a term coined by Frisch), Meitner later recalled, "opened up a new era in human history" — one that would ultimately lead to a nuclear bomb. Meitner herself flatly refused to work on the Manhattan Project: "I will have nothing to do with a bomb."

Although the Nobel prize eluded her — she was nominated three times — Meitner received many other academic honors over the course of her long life, including several honorary doctorates and (ironically) the German Chemical Society's Otto Hahn Prize. An element (#109, meitnerium) is named after her, along with an asteroid and craters

MEITNER/FRISCH continued on page 3

APSNEWS

Series II, Vol. 24, No. 2
February 2015

Editor . . . . . **David Voss**
Staff Science Writer . . . . . **Michael Lucibella**
Art Director and Special Publications Manager. . . . . . **Kerry G. Johnson**
Design and Production. . . . . . **Nancy Bennett-Karasik**
Proofreader. . . . . . **Edward Lee**

APS News (ISSN: 1058-8132) is published 11X yearly, monthly, except the August/September issue, by the American Physical Society, One Physics Ellipse, College Park, MD 20740-3844, (301) 209-3200. It contains news of the Society and of its Divisions, Topical Groups, Sections, and Forums; advance information on meetings of the Society; and reports to the Society by its committees and task forces, as well as opinions.

Letters to the editor are welcomed from the membership. Letters must be signed and should include an address and daytime telephone number. The APS reserves the right to select and to edit for length or clarity. All correspondence regarding *APS News* should be directed to: Editor, APS News, One Physics Ellipse, College Park, MD 20740-3844, Email: letters@aps.org.

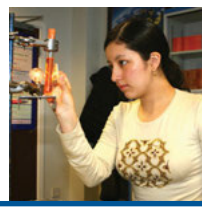
Subscriptions: *APS News* is an on-membership publication delivered by Periodical Mail Postage Paid at College Park, MD and at additional mailing offices.

For address changes, please send both the old and new addresses, and, if possible, include a mailing label from a recent issue. Changes can be emailed to membership@aps.org. **Postmaster:** Send address changes to APS News, Membership Department, American Physical Society, One Physics Ellipse, College Park, MD 20740-3844.

Coden: ANWSEN ISSN: 1058-8132

Education Corner

APS educational programs and publications



Upcoming National TA Workshop — February 13 Nomination Deadline

Graduate Teaching Assistants (GTAs) play a pivotal role in the teaching mission of research universities. However, best practices for preparing/supporting GTAs are not widely known or implemented in many departments. The workshop, "Mobilizing the Forgotten Army: Preparing TAs for Leadership in STEM Education" offers the opportunity for a small group of departmental teams to interact together with colleagues who have expertise in supporting GTAs in physics and chemistry. The workshop, which will be held May 27 - 29, 2015 on the campus of the Georgia Institute of Technology in Atlanta, GA, is designed for departmental teams consisting of one "mentor/master" TA and one faculty member. Lodging, meals, and registration for a team (one per department, up to about 15 teams) will be covered through a grant from the Research Corporation for Science Advancement. The online nomination form and additional information can be found here: www.physics.utah.edu/~jgerton/CSC_TA_Workshop/apply-now.html

Bridge Program Applications Now Open

The mission of the APS Bridge Program (APS-BP) is to strengthen physics in the United States by increasing the number of underrepresented minority students who receive doctoral degrees in physics. The program accepts applications from senior undergraduate physics majors who want to strengthen their applications and improve their chances for success in a graduate program in physics. Underrepresented minorities, including African American, Hispanic American, and Native American U.S. citizens or permanent residents, are encouraged to apply. The application deadline is March 20, 2015. For more information, visit http://apsbridgeprogram.org/about/students.cfm

2015 Physics Department Chairs Conference

APS and the American Association of Physics Teachers are pleased to announce that the 2015 Physics Department Chairs Conference will be held June 5 - 7, 2015, at the American Center for Physics in College Park, MD. Registration opens in February. Visit this site for more details: www.aps.org/programs/education/conferences/chairs/

MEITNER/FRISCH continued from page 2

on the moon and Venus.

Meitner never returned to Germany. She continued to travel and lecture regularly even after retiring to England in 1960. But her health was declining: she suffered a heart attack and accompanying atherosclerosis, exacerbated by a series of small strokes and a fall that broke her hip. She died on October 27, 1968 at 89, and was buried near her younger brother, Walter, in Bramley, Hampshire. Her epitaph, composed by Frisch, simply reads: "Lise Meitner: a physicist who never lost her humanity."

References:

O. R. Frisch, "Physical Evidence for the Division of Heavy Nuclei Under Neutron Bombardment," *Nature* **143**, 276 (1939).

L. Meitner and O. R. Frisch, "Disintegration of Uranium by Neutrons: A New Type of Nuclear Reaction," *Nature* **143**, 239 (1939).

MEMBERS continued from page 2

me is that they're capturing the sentiment of people in their electorate."

***Neil deGrasse Tyson**, American Museum of Natural History, on Sen. James Inhofe (R-Okla.) taking over as chair of the Senate Environment and Public Works Committee,* The Boston Globe*, January 13, 2015.*

APS Goeppert-Mayer Award goes to Aficionado of Cold Atoms

By Michael Lucibella

This year, the APS Maria Goeppert-Mayer Award was presented to Gretchen Campbell of the National Institute of Standards and Technology (NIST). The award recognizes outstanding achievement by a woman physicist in the early years of her career. The award is named after German-American physicist Maria Goeppert-Mayer, the second woman to win a Nobel Prize in Physics (after Marie Curie).

In addition to a certificate honoring her achievement, Campbell will receive a $2,500 stipend plus $4,000 in travel funds for giving lectures at up to four U.S. universities and at an APS meeting.

Campbell is a Fellow at the Joint Quantum Institute (JQI), a collaboration between NIST and the University of Maryland. She is an atomic, molecular, and optical physicist who specializes in Bose-Einstein condensates (BECs). "I'm definitely an experimentalist and I really love ultracold experiments. They are tabletop [experiments] but you get to do all kinds of things with them," Campbell said. "It's a pretty neat system that's behaving in a quantum way but it's a pretty big system."

In particular, she pioneered work that uses a ring-shaped condensate to better understand superfluidity and superconductivity in BECs. "In many ways it behaves similar to a superconductor," Campbell said.

Campbell hails originally from western New York State and first became interested in physics while in high school. "I was very much a kind of animal person as a kid," she said. "From a very young age I was pretty convinced I was going to be a vet."

NIST

Gretchen Campbell

It was during her freshmen physics class that she was drawn to the reasoning of physics as opposed to the rote memorization she encountered in biology. She was also encouraged by teachers who shared with her their own enthusiasm for science.

"Both the instructor and the lab instructor were really dynamic," Campbell said.

"I found it challenging in a way that I didn't find other classes. … I really enjoyed the challenge and the problem-solving aspects of it."

She majored in physics at Wellesley College then attended the Massachusetts Institute of Technology for her Ph.D. There she did her first experiments with BECs in optical lattices. Afterwards, she won a National Research Council postdoctoral fellowship to work at JILA in Boulder, Colorado. In 2009, she joined the JQI.

The sodium BEC rings she's been studying are essentially superfluid "atom circuits." Campbell has been working on her current experiment to study the analog of how currents of atoms flow in these systems, much like electric currents in superconductors. The hope is to understand how to make the first practical "atomtronic" devices. Also, she hopes to use some of the prize money to develop a second experiment.

She added also that she was excited to win and looked forward to traveling to other institutions to talk about her work. "It's definitely an honor and it's very exciting to win an award, especially considering the people who've won it in the past," Campbell said.

Bridge-builder to Hispanic Community Wins Bouchet Award

By Michael Lucibella

This year, Jorge Lopez of the University of Texas at El Paso received the APS Edward A. Bouchet Award. The award honors the work of underrepresented minorities in physics by identifying and recognizing a distinguished minority physicist who has made significant contributions to the field of physics. Lopez will receive a stipend of $3,500 plus travel support to attend an APS meeting to deliver a presentation about his work.

Lopez has been a long-time nuclear physics researcher and has pioneered work in heavy-ion collision dynamics and nuclear fragmentation. In addition, he has worked tirelessly to build bridges to Latin America and connect with the Hispanic community in general.

Jorge Lopez remembers first getting hooked on science at a young age. "I did a lot of small science experiments when I was in elementary school," Lopez said. "I just lost the fear of science." It didn't take long before Lopez realized that this was something he would want to spend the rest of his life working on. "I was in middle school when I decided to be a physicist," he said.

It was a decision he knew was right for him, even if his guidance councilor wasn't keen on the idea. "He advised me not to," Lopez said. He added that the councilor told him that there would be few jobs and it would be difficult to find work in the sciences, but Lopez would not be dissuaded.

After he graduated from high school, he enrolled at the University of Texas at El Paso for his bachelor's and master's in physics. For his Ph.D., he worked in nuclear fragmentation and plasma physics at Texas A&M.

He took a postdoctoral position in nuclear physics at the Niels Bohr Institute. He liked it not only because of its reputation, but also because they were actually working on some of the nuclear fragmentation models he had helped develop. "That was kind of the perfect place for me," Lopez recalled.

While in Copenhagen, his love for nuclear physics blossomed. He was captivated by how particles move between the realms of quantum and classical mechanics. "You have a quantum system that you can explore with classical mechanics, and that is what I find fascinating," he said.

Jorge Lopez

After that he took a second postdoctoral position at Lawrence Berkeley National Laboratory. At the end of his stay at there, his alma mater offered him a full-time position, which he promptly took. "There's nothing like family, so we immediately took the offer and came back in 1990, and have been here ever since," Lopez said.

Once he returned to Texas, in addition to his research, he started to work more on mentoring the next generation of physics students. "Now as a professor, I see that many of my students pick their careers based on their deficiencies rather than their interests," Lopez said. "This is why over the years, I have gotten involved with fixing that problem."

He saw students shy away from pursuing a science career because they perceived themselves as inherently bad at science, rather than just beginners at it. He started mentoring undergraduates and graduate students, and helped guide 60 students through to earn physics degrees.

In addition, Lopez worked to help develop the physics community in Mexico. He is active in the Mexican Academy of Sciences, which accredits physics programs in the country, and he is currently the president of the Radiation Physics Division of the Mexican Physics Society. He also helped develop hands-on materials to bring students into physics. "One of the things that I have done is that I have gone to the high schools on both sides of the border and attract [students] to the field," he said.

Lopez is no stranger to the Bouchet Award. "I was chair of the [APS] Committee on Minorities when we managed to get the funds to get the award established," he said. "I've seen this award since its beginnings. "

He added that he was honored and humbled to receive the award after his years of work. "I'm very happy to receive it," he said. "All of this gives me some confirmation that what I've been working on is valid."

He said he is hoping to use the funds to help host a meeting on the physics of radiation and wants to highlight the work and lives of scientists from both sides of the border.

Letters

Members may submit letters to letters@aps.org. APS reserves the right to select letters and edit for length and clarity.

The First Chain Reaction

I always enjoy reading the *APS News* column entitled "This Month in Physics History" and I value its pedagogical content. This was the case again for the last issue (December 2014), which was dedicated to the first electricity generated by atomic power. However, this article contains a misleading statement, namely that "Zinn was on hand for the first nuclear chain reaction on December 2, 1942..." I believe that many readers, perhaps most of them, will think that this chain reaction was the first one ever produced. In fact, the first experimental evidence of a nuclear chain reaction was obtained by H. Halban, F. Joliot, L. Kowarski and F. Perrin and was published in *Le Journal de Physique et le Radium* in 1939. The abstract of this paper reads "The experiments described in this note provide the number of neutrons produced in a 50-cm diameter sphere of wet uranium oxide exposed to a source of primary photo-neutrons. The value of this number allows us to conclude that the neutrons produced are of secondary, tertiary, etc. origin, providing evidence that, in such a system, convergent chain reactions are taking place." This work and some complementary ones done by the same team were acknowledged by a citation presented to the four authors by the Atomic Energy Commission of the United States on June 11, 1968. To be accurate, the sentence should have read "Zinn was on hand for the first self-sustained nuclear reaction...."

Jacques Haïssinski
Bures-sur-Yvette, France

Dennis Sciama and *The Theory of Everything*

The Theory of Everything (*APS News*, December 2014) is a well-acted film, (a Stephen Hawking bio, for those who may have managed not to hear about it) which portrays scientists in a more realistic light than most films do. It is based on a memoir written by his first wife, and highlights her role in the struggle with his disability. It does, however, severely minimize and distort the role of Dennis Sciama, Hawking's doctoral supervisor. Dennis is portrayed as a cartoon character, at first a kind of authoritarian gatekeeper who gradually develops affection for Stephen as he begins to regard him as a colleague. It is understandable that his role would not be portrayed realistically by people who were not involved in research.

Dennis was much more than that portrayal suggests; he was a superb mentor who brought out the best from his students. He cleverly never directly tried to motivate them, but rather responded masterfully and encouragingly when they moved forward. As was relayed to me, after Stephen's diagnosis and some time in depression, Sciama said to him something like "Well, you're not dead yet. So, are you ready to work on that problem I suggested?" The rest is history. I believe the history could not have been the same without constant interaction and feedback typical of Dennis. In the film he merely sits and waits for the equations to appear. In real life, Dennis was all about conversation and encouragement about the ideas. I wish that his legacy would have been strengthened by the film.

Adrian L. Melott
Lawrence, Kansas

APS Reaches New Membership Record

APS hit a new annual membership record at the beginning of 2015, with students and early career members making up much of the increase. After completing its count, APS Membership announced that the Society reached 51,523 total members, up 945 over last year. This continues a general upward trend over the last five years.

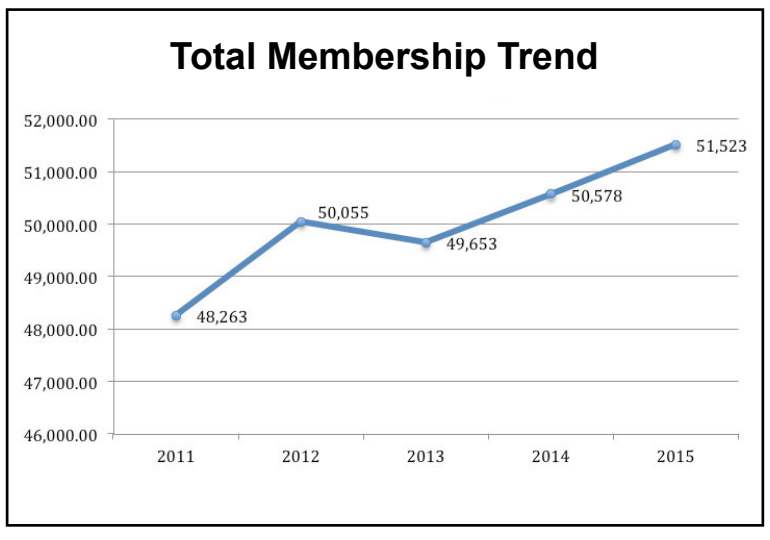
Trish Lettieri, the membership director of APS, credited much of the increase to efforts to recruit and retain more students and early career physicists. "The number of paying students went up by more than 1000," she said. "We're retaining more students by offering them more that's relevant to them."

She added that efforts, like the new Local Links networking groups and an increased focus on student events at meetings, seem to be working. "We're paying more attention to our students and early career members and helping them more at this stage in their career," Lettieri said. "I think there are interesting events and activities for them at our meetings."

Recent changes to the membership dues structure seem also to have helped retain early career members. They can now get up to five years at the discounted rate, instead of just three years. "I think that may have helped us hold onto some of our early career members because it added two years of eligibility at that lower fee," Lettieri said.

The raw numbers did show a moderate decline in the number of regular memberships, but this is likely the result of more early career members staying in their category because of the extension, rather than advancing to the regular member level. "The regular member category did go down more than usual," Lettieri said. "But most likely that is due to the reshuffling of the membership categories and more early career members not transitioning over yet."

Lettieri added also that, over the next few years, she expects to see the number of regular members increase as students and early career members stay on and then become regular members.



LIGHT continued from page 1

moting thousands of events across the globe from scientific conferences and talks to art installations and festivals. Other U.S. founding partners include the Optical Society of America, SPIE, the American Institute of Physics, and the IEEE Photonics Society.

"It's about outreach and making people aware how light-based technologies are used on a day-to-day basis," said Dalma Novak, president of the IEEE Photonics Society. "This is a unique opportunity to [communicate] the global perspective as well."

The year-long effort officially kicked off at the UNESCO headquarters in Paris on January 19, 2015. The two-day event brought together diplomats, politicians, Nobel laureates, CEOs, and science and industry leaders. Already more than 400 events from around the world have been listed on the IYL's main website, including more than 50 in the United States, with more added all the time.

"All these ... events will touch on the wider aspects of the year," said John Dudley, the steering committee chair of IYL and head of the optoelectronics and photonics research group at the University of Franche-Comte. "One important aspect of the International Year is to raise awareness among our own community of the bigger picture of optical science."

APS is spearheading a number of programs and activities for both its members and the general public. The Society is making ten seminal research papers about light and light technologies free to download for anyone (physics.aps.org/IYL). In addition, sessions focused on light will be held at its various scientific meetings and its outreach efforts will be similarly light-themed and branded under the IYL umbrella.

Thompson added, "We're also working with NSF and the other U.S. founding partners to put on an event in the fall. In the morning, an educational science fair makerspace, where participants can see and try out new technologies for all kinds of projects; in the evening, technical talks will highlight the frontiers of light technology." The event's details are still being worked out but should be finalized soon.

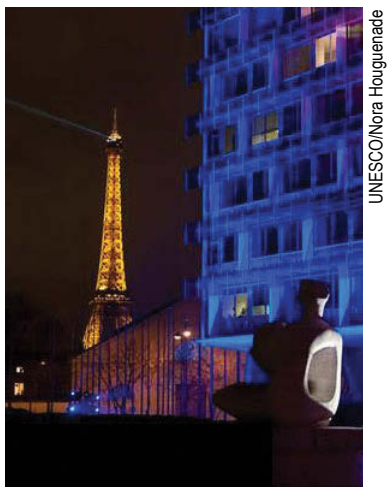
Other societies are also working to raise awareness about light and light technology. SPIE, an international society of optics and photonics, recently announced the winners of a photography contest it held last year to get the word out about the IYL. In addition, this year

UNESCO/Nora Houguenade

One of several IYL art installations featuring the use of light at UNESCO headquarters.

SPIE is sponsoring a number of educational kits for science teachers to learn about light sciences at several education conferences. They're also supporting a number of the installations at the Paris opening ceremony and exhibits around the world.

"We've put together two separate sets of display panels and exhibits," said Krisinda Plenkovich, SPIE's director of education and community services. The ready-made displays featuring information on light and light technologies will be available for any organization or event to purchase and set up. One set of displays will be targeted at the tech community and carry more technical information than the one aimed at a broader audience. "For the general public the things are microscopes, lasers, and rainbows to talk about diffraction … [and] more general topics."



UNESCO/Nora Houguenade

UNESCO headquarters and the Eiffel Tower in Paris.

IEEE is likewise helping to sponsor the Paris event and will be highlighting some of the humanitarian aspects of light technology. It is partnering with SolarAid, a nonprofit organization that distributes solar lamps in the developing world in hopes of eliminating the kerosene lamp by 2020. They are also partnering with the Stevens Institute of Technology to fund a model solar house for the Solar Decathlon competition, which highlights energy-efficient design.

APS is also highlighting some of light's humanitarian applications. It is partnering with organizations like Liter of Light and Foldscope to promote simple and low-cost technologies that can be used to better the lives of people around the world. This effort is to help spread some of these techniques and technologies, as well as to promote their importance to researchers in the United States. "I hope they take away a better understanding of the importance to developing nations of light-based technologies that we take for granted," Thompson said.

The year's theme of light was chosen because of its importance to a wide range of technologies and scientific fields. "We're not doing this just to promote physics; light science is so crosscutting it touches on biology and chemistry as well," Dudley said. "2015 is an interesting choice of years, it's a conjunction of different anniversaries."

He added that 1000 years ago Ibn al-Haytham formulated the first theories on optics, 200 years ago Augustin-Jean Fresnel applied the wave theory of light to optics, 150 years ago James Clerk Maxwell developed the theory of electromagnetic waves, 100 years ago Einstein developed his theory of general relativity, and 50 years ago Penzias and Wilson discovered the cosmic microwave background radiation. "Because of those anniversaries, it's a great reason to celebrate light and light technology," Thompson said.

To learn more about IYL, visit www.light2015.org

Washington Dispatch

Updates from the APS Office of Public Affairs

POLICY UPDATE

FY15 CRomnibus passes, Science funding mostly increased

The Fiscal Year 2015 (FY15) Appropriations Act passed the House 219-206 (10 abstaining) and passed the Senate 56-40 (4 abstaining) at the close of the 113th Congress. It was signed by President Obama and became public law on December 16, 2014. The bill, termed a CRomnibus, is part Continuing Resolution (CR) for the Department of Homeland Security combined with 11 bills packed into an "omnibus" that provides funding and guidance to all other agencies. In general, science fared well.

The bill funded the National Science Foundation (NSF) at $7.34B in FY15 (+2.4% relative to FY14) with Research and Related Activities at $5.93B (+2.1%) and Education and Human Resources at $866M (+2.3%).

The bill left the Department of Energy (DOE) Office of Science funding unchanged relative to FY14 at $5.07B. There were significant differences in how the bill treated Office of Science sub accounts: Advanced Scientific Computing Research rose to $541M (+13.2%), Biological and Environmental Research decreased to $592M (-3.0%), Basic Energy Sciences increased slightly to $1.73B (+1.1%), Fusion Energy Sciences declined substantially to $467M (-7.7%), High Energy Physics also declined to $766M (-3.9%), and Nuclear Physics rose appreciably to $595M (+4.6%).

DOE Energy Efficiency and Renewable Energy [$1.92B (+1.0%)], DOE Advanced Research Projects Agency [$280M (0.0%)], and the National Nuclear Security Administration [$11.41B (+1.8%)] all remained fairly static.

The bill funded the National Institute of Standards and Technology at $864M (+1.6%) with Scientific and Technical Research and Services at $676M (+3.8%), Industrial Technology Services at $138M (-3.4%), and Construction of Research Facilities at $50M (-10.2%).

The National Institutes of Health remained fairly flat at $30.1B (+0.5%).

The Department of Defense Basic Research, also known as 6.1, rose to $2.28B (+5.1%) whereas DOD Applied Research, known as 6.2, fell slightly to $4.61B (-0.9%).

The Obama administration's Office of Science and Technology Policy received flat funding relative to FY14, at $5.5M.

Appropriations for the National Aeronautics and Space Administration (NASA) increased to $18.0B (+2.1%) with NASA Science funded at $5.24B (+1.8%).

With FY15 in the books, and Republicans now controlling both chambers, it is more likely that Congress will return to regular order and pass all 12 appropriations bills for FY16.

Upcoming Legislation

There will be a few major pieces of legislation of interest to the science community in the 114th Congress. In education, Sen. Lamar Alexander (R-Tenn.), the new chair of the Health, Education, Labor, and Pensions Committee, has made authorization of the Elementary and Secondary Education Act (ESEA) a priority, with the Higher Education Act (HEA) to follow. The first draft version of ESEA, recently made public, retains science testing, along with math and English testing. Markup of the draft is expected in early February. While the future looks bright for ESEA and HEA, re-authorization of America COMPETES looks much bleaker. COMPETES is likely to be split into two bills as it was last year; FIRST for NSF and NIST and EINSTEIN for DOE. Rep. Lamar Smith (R-TX), chairman of the House Science Committee, does not appear to be backing down on controversial policy provisions that previously stalled COMPETES re-authorization, specifically policy provisions pertaining to NSF. Hill staffers expect those policy provisions to be non-starters for House and Senate members who support NSF.

WASHINGTON OFFICE ACTIVITIES

ISSUE:MEDIA UPDATE

In his January 6 *Roll Call* column, Director of Public Affairs Michael S. Lubell suggests a research bank to help stabilize science funding and ameliorate shortfalls. Read the column: bit.ly/1xOa5UI.

A January 5 *Wall Street Journal* article chronicles the uphill battle science advocates face as the number of congressional representatives with science backgrounds dwindles. *Note: Article is behind a paywall.*

DISPATCH continued on page 7

Iranian Appeals Court Rejects Release of Imprisoned Physicist

By Michael Lucibella

AAAS

Omid Kokabee

In a surprising setback to efforts to free imprisoned Iranian physicist Omid Kokabee, an appeals court in Iran rejected the recommendations of its Supreme Court and upheld his 10-year prison sentence. Human rights activists had been hoping that he might be released early following the Supreme Court's decision in October to vacate his initial sentence and have the lower revolutionary court retry him.

"The lower court upheld all of the charges without giving any explanation," said Eugene Chudnovsky, a board member of the Committee of Concerned Scientists.

It's unclear whether Kokabee will be able to appeal his current conviction. A spokesperson for the Iranian judicial system indicated that the Supreme Court could opt to revisit the case again and issue a final decision. However, Kokabee's lawyer, Saeed Khalili, said in an interview with the International Campaign for Human Rights in Iran that the appeals process may apply only to harsher sentences and possibly not to Kokabee.

"Even the lawyer is not sure if there are legal grounds to go back to the Supreme Court," Chudnovsky said. He added that Kokabee's lawyer is likely planning on appealing in any case, but it is unclear whether the Supreme Court will hear his case or what the outcome will be.

Kokabee, an Iranian citizen, was studying at the University of Texas, Austin, when he was arrested at the Tehran airport in January 2011. After spending 15 months in prison waiting for a trial, including more than a month in solitary confinement, he was convicted by Iran's Revolutionary Court of "communicating with a hostile government" and receiving "illegitimate funds" in the form of his college loans. He was sentenced to ten years in prison without ever talking to his lawyer or being allowed testimony in his defense.

Kokabee said in an open letter that the reason for his detention is his steadfast refusal to help Iran's military. In 2014, Kokabee received the APS Sakharov Prize for his unwillingness "to work on projects that he deemed harmful to humanity, in the face of extreme physical and psychological pressure."

His health has been deteriorating recently. As the result of his harsh treatment in prison, his family reported that he has developed

KOKABEE continued on page 7

International News

...from the APS Office of International Affairs

The International Year of Light Begins

By Joseph Niemela

As proclaimed by the United Nations General Assembly during its 68th Session, 2015 is the International Year of Light and Light-based Technologies (IYL 2015).

There is a wonderful generality in the word "light" that opens up IYL 2015 to a much larger stage and a more diverse group of actors. "Light" has brought together not only research scientists and engineers, but also lighting designers and architects, light artists, philosophers, historians, poets, song writers, and many more. And that is indeed one of the keys to this or any International Year: We are talking to people we might not normally talk to, and we are using the fact that the UN is behind it as an invitation to freely mingle, to make new and lasting connections, to reach out to the public, to school kids, and to the policy makers.

In proclaiming 2015 as the IYL, the UN recognized the importance of enhancing global awareness of advances in light technologies and the need for a renewed focus on science education. This is vital if we are to address critical challenges in sustainable development and the health, well-being, and general quality of life of citizens in all countries of the world through applications to medicine, information and communications, and energy. Improving quality of life is also wonderfully broad in its manifestation, and while technology brings possibilities for life-enhancing products, philosophers and poets help us develop and use them wisely. Musicians, artists, dancers, and others provide the expression of the human spirit that is just as important, and which an improved state of well-being allows us to appreciate more fully. Many of these groups naturally and correctly assumed that this was *their* Year: The Year of Light *Art*, the Year of Light*ing*, the Year of *En*lightenment… .

Joseph Niemela

International Year of Light 2015

Considering lighting: The development of the blue light-emitting diode enabled energy-efficient sources of white light, with immediate and profound benefits for mankind. This work won the 2014 Nobel Prize in Physics for Isamu Akasaki, Hiroshi Amano, and Shuji Nakamura. There are already many affordable solutions for life-enhancement through good lighting and design. This applies to our enclosed spaces at home, office, and in our schools, but also to our streets and parks. In the developing world, where it is not hard to find villages without electricity, this advance in light technology takes on increased importance and relevance: Kerosene lamps are often used in tightly enclosed spaces, and this carries with it severe health risks. Efficient solid-state lighting, combined with low-cost solar collectors, can make a huge difference, allowing students to safely continue their studies when the sun goes down. And that means we do not miss the opportunity to find another brilliant mind just because he or she cannot do homework.

Dark skies awareness — promoting the absence of *unwanted* light — is also part of IYL 2015, as it was for the Year of Astronomy, and is not as contradictory as it sounds. Think of the use of pauses — the absence of *unwanted* sound — in a musical score and you will have the idea. Indeed, it's

IYL continued on page 6

HOLT continued from page 1

AAAS policy discussions and so forth. What makes AAAS the most important scientific organization in the country is that it is fundamentally a membership organization. It publishes *Science* magazine, so it's a publishing company. It holds policy conferences, so it has some elements of being a think tank, but first and foremost it was created a century and a half ago as a membership organization and that's what makes it so important.

AGL: *In society right now, what roles do science associations, in particular AAAS and APS, play?*

RH: The APS, through the Office of Public Affairs, has done some important things to affect policy. Societies like APS, in publishing journals and holding meetings, advance science that way, but they also have a role to advance science the way it is structured and practiced and funded in the country. So APS has a large role. The AAAS, because it is an umbrella that covers all disciplines, has a very large role to look after the health of science. And if you look at AAAS and APS, when they were founded, it was not just for members to get together and talk, but they set up journals because they understood that communication was an essential ingredient of science. It's not enough to come up with good, empirically testable hypotheses. If you don't communicate it, you're not a scientist.

AGL: *In your farewell address, you mentioned the need to re-establish the Congressional Office of Technology Assessment, and that you were disappointed that you weren't able to continue your efforts to reestablish that office. I wondered if technology assessment and technology transfer is something you are interested in working on in your role with AAAS?*

RH: The Office of Technology Assessment was an important and very valuable organization that served to advise Congress. It lasted for almost 25 years and gave good information and guidance to Congress. And in a stupid, uninformed effort to reform Congress, it was abolished, and Congress and the country are the lesser because of it. Congress needs it more than ever now, to look at the implications of science and technology in our society. This is everything from healthcare to national defense to agriculture and fisheries to communication and civil liberties. You name it. In all of those, there are aspects that are informed by science and technology. And Congress needs advice that's based on that. I won't say there's no scientific advice available to Congress, because of course there is. But this was a stand-alone organization that existed specifically for the purpose of advising Congress and Congress has lost that and needs it.

AGL: *Can you share some of your proudest accomplishments as a Congressman, as a Representative of your district? What are you especially excited about that you were able to accomplish while in the House?*

RH: I'm still trying to assess what I've accomplished and what I've failed to accomplish, but you can find things in large areas, like science research, environmental protection and land conservation, education in science and foreign languages, mental health, veterans' care and so forth. And then what might be more important, and it's kind of hard to calculate this, is all of the little things that add up: service to constituents, and speaking out on issues that aren't really legislation but affect the fairness, justice, and opportunities in our society.

AGL: *Can you give me an example of that?*

RH: Visiting classrooms to talk with students about the role of science in their lives. That doesn't find its way into a list of enacted legislation, and no one classroom visit certainly rises to the level of being a major accomplishment ... , but I get the sense that it begins to add up. One of the greatest needs of our country I think is to overcome the surge, in recent decades, of cynicism about our ability to govern ourselves, and we have to overcome that cynicism, because people who don't believe they can govern themselves, can't. … It may turn out that helping people understand that we all have more to do to preserve the idea of a self-governing nation might turn out to be more important.

AGL: *How has your physics background come in handy in Congress, and, a related question, what was the greatest gift that physics gave you as a Representative?*

RH: I deliberately didn't serve on committees that were explicitly science, and that's because I felt the need to have people who think like scientists in all parts of policy making. To give one example: voting. That's done in a committee in Congress that scientists never even think about. And yet when changes were made a decade and a half ago to move this country toward unverifiable, unauditable voting systems with inaccessible electronic memories, computer scientists immediately saw the problems: bugs in the system, hacking of the system, public uncertainty of whether their vote was recorded properly the way they wanted … these were real serious problems .... These electronic voting machines looked neater and cleaner, but computer scientists realized they weren't better, and that's an example where thinking like a scientist uncovered problems that weren't obvious and it's why we need, throughout our policy making, people who think like scientists. You could go on in area after area after area, where having people who have been trained to frame questions so they can be answered empirically would help, would lead to better decisions.

AGL: *I imagine you would recommend that physicists and other scientists consider elected office. Would that be fair to say?*

RH: I'd like to see more people thinking like scientists in Congress, and it doesn't mean you have to be a scientist, but the way we've structured our education system and our society, generally speaking, people who are not professional scientists, choose not to think like scientists, even though they could. And again, by "thinking like a scientist," I mean framing questions so they can be answered empirically and verifiably. So until we get to the point where most educated people in this country are comfortable thinking about science and capable of thinking like a scientist, we will need in our legislatures more actual scientists. We have a long way to go before non-scientists are comfortable thinking about science and show themselves capable of thinking like scientists, so until that golden age, we need more scientists.

AGL: *How did you cognitively deal with the clash of scientific culture and science with the gray areas of politics? How would you encourage other physicists and scientists who want to run for elected office to handle that clash?*

RH: They are not incompatible. There are certainly times when science shows that some policy choices are impossible or not realistic. For example, the odds are that continuing to spew out greenhouse gases will harm us and, for anybody who studies the science, the odds are that the current practice is unsustainable and so we ought to note that. I often tell students if you think of our government as a mechanism for balancing competing interests, it makes a lot more sense and it becomes not only easier to understand, but easier to respect.

AGL: *What can physicists do to make their voice heard, both in government and in professional associations, like AAAS and APS?*

RH: Don't hesitate to speak out. Think hard about communicating, especially with people who probably don't think about what you're talking about very often. So you have to continually think about and refine the way you talk, the way you explain, and the way you advocate. And form coalitions with other interested people. Every now and then you'll find some really interesting coalitions between scientists and non-scientists who care about one thing or another for very different reasons, but still seek the same policy outcome. Be involved. Work in collaboration with other interested people, and be persistent. Very few things of importance in our governmental history have been achieved quickly.

AGL: *How has being in Congress made you a better scientist, a better physicist?*

RH: Oh, I'm not sure I am a better scientist. I've kind of lost ground in science. Speaking about what is important in science, I mean important in the long term, how it affects human welfare, thinking about how humans accomplish progress, certainly has helped me to understand a lot of things that I either didn't understand before or never even thought about before. But as far as making me a better scientist, no, probably not. If I could, if my mind was nimble enough to go back to doing science, maybe, because of the perspective I've gained, I would be a better scientist.

AGL: *Would you say, and I say this with all due respect because I am one myself, that you are a nerd?*

RH: Vern Ehlers, another physicist who served in Congress, frequently said to youngsters that they should understand that either they are nerds or they will be working for one. Which is a cute saying and there's some truth in it. I certainly am pleased that people think of me as a scientist and I would like to be worthy of carrying that mantle.

IYL continued from page 5

not enough to know that there is an orbiting telescope that can see and make measurements of the faintest stars — as humans we need to enjoy them from here on Earth. That is also part of our quality of life.

One of the more fascinating learning experiences for me personally in preparing for IYL 2015 has been to talk with industrial partners and with lighting engineers to learn more about human-centric lighting, which is bringing continuing advances in terms of "good light." What this means is tuning the spectral composition of artificial light to provide enhancement of productivity, enhanced illumination and protection of artworks, general wellness, and much more. We need to direct this innovation responsibly, but the potential is enormous. In fact, we can expect an ever-increasing process of innovation. But innovation requires not only an invention, but also a market, which comes from a well-informed public of potential users who will move the process of innovation forward, making sure that we can afford the technologies that truly enhance our lives (and avoid those that harm it).

But let's not look only to the future: One of the anniversaries that IYL 2015 is celebrating is 1000 years of Islamic optics, starting with the book of optics written by Ibn al-Haytham during the so-called golden age of Islamic science. Compared to the dark ages that followed, it was a time of great enlightenment and something positive to celebrate and to promote this year, even more so given recent events which have been unfolding around the world. Raising awareness of the past in this sense means raising hopes for the future. Looking toward a better future is why we are building a Synchrotron in the Middle East (SESAME).

There are a number of other important anniversaries that are more familiar to APS readership—from wave optics to fiber optics—that can be found on the IYL website at light2015.org, along with much more information. Have a look and then talk to someone you don't usually talk to.

Finally, it is interesting to note that the motto of the University of California, Berkeley is "fiat lux," which is usually translated from Latin to English as "let there be light." Here we accept all definitions: Light as knowledge, light as communication, light science, light as art, light bringing a better world through socially responsible innovation, and lights out so we can all appreciate the splendor of a star-filled sky.

Joseph J. Niemela is a member of the permanent scientific staff at the Abdus Salam International Center for Theoretical Physics in Trieste, Italy, where he conducts research in fluid dynamics and low-temperature physics, and coordinates activities in optics and lasers and science education, in addition to coordinating the IYL 2015 Global Secretariat.

INDUSTRIAL continued from page 1

The report builds on the October 2014 FIAP Workshop on National Issues in Industrial Physics, which identified and prioritized issues important to U.S. industrial physics. Over two days, participants met to share their experiences working as industrial physicists and to discuss what kind of support would help advance their careers

"Our goal for the workshop was to identify specific needs and specific actions to address those needs for each group. The workshop report is structured in this way," said John Rumble, of R&R Data Services, chair of FIAP and co-chair of the report and workshop committee with Lambert. "We anticipate that FIAP and APS working together will take action on as many recommendations as possible."

Lambert added that the committee wanted to hear firsthand from the industrial scientists who would benefit from the additional support. "The intent of this workshop was to get input from physicists engaged in industry," Lambert said. He added that the workshop brought together researchers from a variety of backgrounds, disciplines, and stages in their careers. "We really tried to have a broad cross section."

Ultimately, the organizers hope to create a more cohesive and visible community for physicists working in industry. "The industrial physics community needs to organize itself as such," Rumble said. "Only by working together collectively will they be able to address the issues as outlined in this report. The challenge is for APS and FIAP working together to create this community."

The full report can be read at the FIAP website at www.aps.org/units/fiap/meetings/upload/workshop14.pdf

ANNOUNCEMENTS

MENTORING continued from page 1

dents in mathematics. First, APS staff will set up a national network of established scientists and educators, who will serve as mentors and work directly with students to offer academic and career advice. "We're going to be recruiting mentors across the country to mentor underrepresented students," Hodapp said. "Eventually what we'll do is produce mentor training for those who want to mentor better."A matching process will connect these mentors and students. The goal is to ultimately sign up a few hundred students into the APS program. (Each year about 650 underrepresented minority students graduate in the U.S. with physics degrees.)

To get underway, the program will match about 50 mentors with interested students at different institutions. Once the National Mentoring Community website is set up, likely in February, other interested students and potential mentors will be able to sign up for the program and be matched online.

"It has many places that can expand," Hodapp said. "Eventually we hope to provide a needs-based scholarship fund for the students [as a replacement for the APS minority scholarships]." He added also that the program staff is already planning a conference for about 75 to 150 participants, to be held October 9-10, 2015, with travel funding available.

For more information, visit nationalmentoringcommunity.org

KOKABEE continued from page 5

a number of serious health problems including heart palpitations, kidney stones, stomach pain, and loss of teeth. Despite his worsening health, he has received almost no medical care, even though the prison doctor recommended a medical furlough for him. Activists had hoped that he might be released for medical reasons after his retrial.

"Unfortunately it seems like they're just digging in their heels," said Elise Auerbach, the Iran country specialist for Amnesty International.

In October 2014, the Supreme Court of Iran vacated Kokabee's sentence of "communicating with a hostile government" by finding that while the United States and Iran have strained diplomatic relations with each other, they are not technically in a state of war and therefore not a "hostile" government.

Divining the intentions of the Iranian justice system is difficult. Politics often drive decisions and the proceedings are opaque. "The procedures in the revolutionary courts in Iran fail to adhere to international standards for fair trials," Auerbach said. "There were so many problems with his conviction, and any conviction in the revolutionary courts. It's just not based on evidence."

Auerbach added also that it was unusual to see a decision overturned by the Supreme Court, then overturned again by a lower court. "It's like one slap in the face countered by another slap in the face. And for such a thing to happen in such a public way is, I would say, quite unprecedented," Auerbach said. "When it's out in the open like this, it's really quite extraordinary."

Because politics plays such a big role in the Iranian courts, activists say it is possible to influence the decisions of the court from outside the system. "We just really need a public outcry and I think we have our work cut out to generate the activism it's going to take to counteract these hard liners," Auerbach said. "It will be an uphill battle though."

Chudnovsky, however, is less optimistic. "No one knows where this is going or whether there will be any light at the end of the tunnel," he said.

DISPATCH continued from page 5

ISSUE: Panel on Public Affairs

The draft Statement on Earth's Changing Climate is being reviewed by the APS Board of Directors to determine whether it is ready to be sent to the APS membership for their comments. Information about the process can be found on the following webpage: aps.org/policy/statements/climate-review.cfm

The POPA Physics & the Public Subcommittee continues its work on a survey on overcoming obstacles to recruiting teachers in the physical sciences. The Subcommittee is also overseeing two proposed APS Statements: a revision of the current APS Statement on Civic Engagement of Scientists (APS Statement 08.1) and a new statement on the Status of Women in Physics. Both are due for discussion at the next APS Board of Directors meeting.

The POPA National Security Subcommittee will present a proposal for a study, to be held in partnership with the Ploughshares Fund, on the non-weapons science being conducted at the nation's defense laboratories. The subcommittee will also revisit the idea for an international workshop on reducing tactical nuclear weapons stockpiles.

The POPA Energy & Environment Subcommittee will present a proposal for a study examining ways to address the long-term challenges of helium supply and pricing. To address nearer-term challenges, the APS Office of Public Affairs is testing a "helium brokerage" pilot program to help APS members manage helium supply delays and price spikes.

POPA's new leaders and members include: William Barletta (Chair), Julia Phillips (Chair Elect), Frances Houle (Vice Chair), Robert Jaffe (Past Chair), Laura Greene (APS Vice President), Mac Beasley (Physics Policy Committee Chair), Simon Bare, Evalyn Gates, Maggie Linak, Toni Taylor, Sara Case, and Dave Ginley.

To access a template for study proposals, along with a suggestion box for future POPA studies (APS members only), go to member login at aps.org/policy/reports/popa-reports/suggestions/

The Back Page

The Physics of Physics Colloquia

By James Kakalios

Over the years, I have attended many physics colloquia that were too difficult to follow—I've rarely heard one that was too simple. It is a sad truth, but expertise in physics research does not automatically make one an expert at communicating physics. Too often one leaves a colloquium more turned off than excited following a presentation on a cutting-edge breakthrough. This is a missed opportunity for both the speaker and the audience, but it need not be this way.

I don't claim to be an expert in giving physics talks. Rather, I am writing this essay because I recently rediscovered a paper I first saw as a graduate student titled *Suggestions for Giving Talks*, by someone who is an expert in giving physics talks: Robert Geroch of the University of Chicago. Geroch, a theorist specializing in the general theory of relativity, is renowned for the clarity and vibrancy of his lectures, and his rules for "how to give a physics talk" are simple and practical. There may indeed be an "art" to giving a good physics talk, but Geroch approached the subject as a "science."

I summarize Geroch's protocols here, with my own two cents thrown in. Quotes from Geroch's *Suggestions* are italicized; the full text of his essay (and I highly recommend that you read it all) can be found online at arxiv.org/pdf/gr-qc/9703019.pdf.

Step One: Choose your Subject and Title

The early, preparatory stage in the organization of a colloquium, where one sets the level of difficulty and amount of information to be imparted, is the rocky shoal on which many a talk has foundered. Before you begin creating any PowerPoint slides, you should ask: What is the key, take-away point that you want to impress on everyone when they leave your talk? If the next day they describe your talk and what they learned, what do you wish them to say? Ideally this will form the Conclusion of your talk.

The next step is to think of a title. ... Ideally one wants a title which indicates what the subject is, what the level of discussion will be, and which is lively and friendly without being too cute. Questions and assertions often make good titles. Of course, one should use no word in the title with which one does not expect one's audience to be familiar. Thus, for an audience of relativists, "Linearized Fields in a Kerr Background Metric" sounds technical, "Perturbations of the Kerr Solution" sounds dull, and "Black Holes are Stable" sounds good.

Step Two: The Flow of the Talk

All talks begin, naturally enough, with an Introduction, which should take up no less than one fifth of the time available for the talk. According to Geroch, this is where you should *emphasize the types of problems under attack, why they are being attacked, the methods one uses ... Why does one think about this subject at all? Why is it interesting? What has it contributed to our understanding of Nature? What is the present state of the subject?*

The next step is to reveal the plan of the talk. ... Divide the various things you want to say into three or four messages. (Three is perhaps slightly better than four, and either is much better that any other number.) A message might consist, for example, of some important point together with supporting arguments and examples, or a collection of remarks which share some common property. Each of these messages will, eventually, become a short talk in its own right.

Here Geroch makes an important point — a physics colloquium is not an article in a physics journal. While they share the same goal — to describe a research accomplishment — the way they optimally do so differs greatly. Rarely is the audience well served when the colloquium is organized like an article in *Physical Review*, with an Introduction, Sample Preparation, Experimental Results, Discussion, and Conclusion. A better approach is to identify the key take-away messages for each portion of your talk. The outline of the talk in the Introduction lays out the various topics that you will address. Your outline slide can be redisplayed between each section throughout the talk, with the upcoming message highlighted. Recasting your research into these distinct "messages" is the hardest part of organizing your presentation.

Step Three: The Talk itself

So, you've decided on a subject, a title, and the three or four key points that you hope to communicate to the audience. All that remains is the small detail of the actual talk. Any information you present should be absolutely necessary to convey the "message" that you hope to deliver in any given portion of your presentation. You should [omit] the details and specifics that are not crucial to the story you are telling (even though they require the vast majority of your time in the lab). You can, and probably should acknowledge these omissions — for example, "Of course, this is an over-simplification of the material growth process." This simplification should extend to any equations and data presented as well.

Figures are easier to understand than words. Words are easier to understand than equations. Say it with a figure ... if at all possible. (It's surprising how many ideas can be reduced to or illustrated by a figure.)

Geroch suggests that figures contain only the essential information, and that they be given a title, which could be the take-away message from the graph (e.g., "Conductivity Increases with Nanocrystal Concentration"). Spell out with words what is being plotted on the various axes, rather than relying on the audience to remember what the symbol "w"' or "H" represents. Always take a minute to walk the audience through the figure. ("Here I plot the log of the conductivity against inverse temperature, so that a simple Arrhenius behavior would yield a straight line...") You have been staring at these data and plots for years, but many in the audience have not. If you jump into the interesting aspects of the plot, some of your audience will be distracted, focusing instead on the basics of what is being plotted against what, and will not be fully listening to your discussion. Taking the time to describe the axes forces you to slow down enough so that the audience can follow, and will also likely lead to a reduction in the total number of figures in your talk.

The last resort for expressing an idea is through an equation. In my opinion, equations should be thought of as tools for making a point, not as data to be stored by the audience for their future use. (How many times have you actually used in your own work a detailed equation copied from a lecture?) ... Every symbol appearing should be defined, and if necessary, discussed. All this takes time, so it's a good idea to set aside several minutes to treat a single equation. ... If a talk has more than five non-trivial equations in it, it's beginning to get equation-heavy.

Geroch's line about how often you use an equation presented in a colloquium in your own research holds doubly (in my opinion) for data presented in table form. Moreover, even when presenting routine conditions under which your samples were prepared, you can just as easily and clearly provide this information as bullet points in a slide as in a table.

Finally, Geroch provides suggestions for the actual mechanics of public speaking, including the handling of questions. If a question comes up during the talk, he recommends that, after the question has been addressed, one return to a previous slide or point, and work your way back to the stage when the question was asked. He also makes an important point about specificity:

Be explicit whenever you can find a way to do so. .... One can sometimes introduce an artificial explicitness. Thus, in a discussion, "the ten-gram mass" and "the five-gram mass" are better labels that "this mass" and "that mass," or than "m_1" and "m_2".

Do not allow your audience to get bored. If they look bored, try to drum up some enthusiasm. You might, for example, stop what you're doing and repeat, loudly, what your plan is, where you are in that plan, and why this is a problem of interest.

I have never forgotten a talk I attended when I was a graduate student at the University of Chicago by Jack Cowan, who implemented a similar strategy, though in a rather meta-fashion. At the mid-point in his seminar, Cowan stated that this was the stage in his talk where he typically stopped and told a joke. We all laughed, and then he continued, noting that now he did not have to!

It is almost always a disaster to run over on one's time. (The audience becomes bored and anxious to leave. Not only do they not learn anything after your time was up, but they tend to lose the thread of what went on before.) If you see that your time is up before you're finished, I would suggest that you stop there, and summarize in a few sentences.

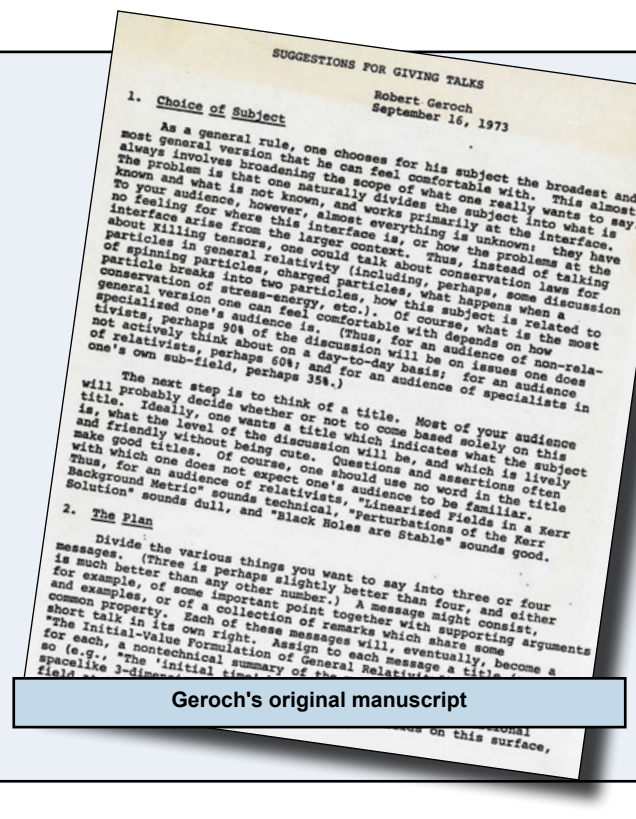
Rather than over-stay my own welcome, I will follow Geroch's advice and stop here. I am grateful that chance allowed me to rediscover Geroch's *Suggestions*, and I have started the hard work of revising my talks to incorporate these suggestions. There is a great deal of interest of late in improving science communication, and we can all begin by improving our communication with each other.

James Kakalios is the Taylor Distinguished Professor in the School of Physics and Astronomy at the University of Minnesota, and the author of The Physics of Superheroes *and* The Amazing Story of Quantum Mechanics*, both published by Gotham Books.*

Photo supplied by Author

James Kakalios

Robert Geroch



SUGGESTIONS FOR GIVING TALKS

Robert Geroch
September 16, 1973

1. Choice of Subject

As a general rule, one chooses for his subject the broadest and most general version that he can feel comfortable with. This almost always involves broadening the scope of what one really wants to say. The problem is that one naturally divides the subject into what is known and what is not known, and works primarily at the interface. To your audience, however, almost everything is unknown; they have no feeling for where this interface is, or how the problems at the interface arise from the larger context. Thus, instead of talking about Killing tensors, one could talk about conservation laws for particles in general relativity (including, perhaps, some discussion of spinning particles, charged particles, perhaps, some discussion particle breaks into two particles, what happens when a conservation of stress-energy, etc.). Of course, what is the most general version one can feel comfortable with depends on how specialized one's audience is. (Thus, for an audience of non-relativists, perhaps 90% of the discussion will be on issues one does not actively think about on a day-to-day basis; for an audience of relativists, perhaps 60%; and for an audience of specialists in one's own sub-field, perhaps 35%.)

The next step is to think of a title. Most of your audience will probably decide whether or not to come based solely on this title. Ideally, one wants a title which indicates what the subject is, what the level of the discussion will be, and which is lively and friendly without being cute. Questions and assertions often make good titles. Of course, one should use no word in the title with which one does not expect one's audience to be familiar. Thus, for an audience of relativists, "Linearized Fields in a Kerr Background Metric" sounds technical, "Perturbations of the Kerr Solution" sounds dull, and "Black Holes are Stable" sounds good.

2. The Plan

Divide the various things you want to say into three or four messages. (Three is perhaps slightly better than four, and either is much better than any other number.) A message might consist, for example, of some important point together with supporting arguments and examples, or of a collection of remarks which share some common property. Each of these messages will, eventually, become a short talk in its own right. Assign to each message a title, so (e.g., "The Initial-Value Formulation of General Relativity" "The Initial-Value Formulation of General Relativity" "A nontechnical summary of the Initial-Value Formulation of General Relativity" "The 'initial value' constraints on this surface, spacelike 3-dimensional

Geroch's original manuscript