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INSIDE

Guest Editorial: The Law of Human Performance and Broadening Participation in STEM

Diola Bagayoko, Ph.D.

Diola Bagayoko

There is no doubt about the current, national commitment and efforts to increase or broaden the participation of underrepresented groups in science, technology, engineering, and mathematics (STEM). These groups include women and Native, Hispanic, and African Americans. However, what may be missing is a systematic approach to these efforts that is grounded in research.

This article is aimed at utilizing the Law of Human Performance or of Practice (LHP) to explain the process of creating educational, research, and professional advancements. As such, we have used it to form the foundation of the systemic mentoring model of the Timbuktu Academy and of the Louis Stokes Louisiana Alliance for Minority Participation (www.ls-lamp.org). The synergistic collaboration between LS-LAMP and the pre-college outreach programs on 12 Louisiana campuses coupled with explicit guidance to graduate school constitute a vertically integrated approach to broadening the participation of minorities in STEM.

The power law of human performance states that the time (T) it takes an individual to perform a given, "simple" task decreases as the number of times (N) the individual practices (or repeats) the task increases. In mathematical terms, the law states that $T = A + B (N + E)^{-p}$ (Handbook of Perception and Human Performance, Volume II, Ed. by Kenneth R. Boof et al., 1986) where ***A***, ***B***, ***E*** and ***p*** are constants that vary with the task at hand and with the individual performing the task. ***A*** represents a physiological limit while ***p***, around 0.5, is the learning rate. The constants ***B*** and ***E*** embody prior experiences or dispositions that are unfavorable (B) or favorable (E) to the execution of the task in question. The Handbook discusses a publication by Newel and Rosenbloom where the above formula is applied to a "problem solving" task, which in my view, is not a simple task. Going one step further, my colleague, Ella L. Kelley, and I conducted thought experiments in which complex tasks were divided into finite sets of simple ones, to each of which the power law applies [Education Vol. 115, No. 1, 31, 1994]. We found that the generalization of the power law, the Law of Human Performance, applies to complex problems when they are broken down into simple tasks and applied in a specific order.

Applying the Law of Human Performance to the process of education, from pre-K to graduate school, and taking into account the hierarchical structure of knowledge in many fields, lead us to a clear understanding of the genesis of genius and of academic

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Professional Development Reads for Every Career Stage

Intro by Crystal Bailey, APS Careers Program Manager

Though people often associate the word "physicist" with academic research jobs, many physicists also find employment in other areas—finance, research and development, science policy, or high-level management. Regardless of where they find employment, success means not only tapping into physics expertise, but also the mastery of skills beyond what they learned while finishing their physics degrees: the ability to manage projects and people, communication skills, the ability to garner funding and other resources, and the ability to move their work forward in new directions.

As a discipline that faces a persistent underrepresentation of women and minorities, physics could benefit from providing training in these skills to students, since we know that good career preparation is strongly correlated with high retention rates among physics departments[1], and that the possibility of future employ-

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Publication Information
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APS News - Bridge Program Meeting

Bushraa Khatib, APS Bridge Program Coordinator

The APS Bridge Program held a gathering of bridge programs committed to increasing the number of underrepresented minority students who receive PhDs in physics. More than 60 people attended the conference, which took place June 27-29, 2013 at the American Center for Physics in College Park, MD. Attendees included representatives from APS, AAPT, AIP, bridge programs, and colleges and universities across the U.S.

The conference began on Thursday evening with a reception at the Marriott hotel in Greenbelt, followed by a brief introduction to the project by Theodore Hodapp, APS Director of Education and Diversity.

Peter Henderson, Senior Advisor to the President of University of Maryland, Baltimore County, delivered the opening plenary. Henderson discussed the National Academies Report "Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads." He addressed why broad participation matters and presented recommendations from the report. He also discussed UMBC's Meyerhoff Program – a program designed to increase diversity among future leaders in STEM.

The meeting was the first opportunity that newly selected APS Bridge Fellows had to meet each other and site leaders from their respective bridge sites. The APS Bridge Program was able to facilitate the placement of at least 14 students into physics bridge programs or directly into graduate programs. Seven students were named Bridge Fellows at the newly selected APS Bridge sites University of South Florida and the Ohio State University. Each site was also able to admit one student directly into their graduate programs.

Students that applied to APS-BP were considered by other graduate programs, with sixteen offers of admission made to ten students. Five of these students accepted offers, and at press time, five students have offers pending, leaving the potential of APS assisting up to 19 students into physics graduate programs during the first year of the bridge program. Students will begin classes, research, and other programmatic activities this summer.

"The conference was a great opportunity for collaborations, especially for students to network with each other and faculty as they begin their bridge programs," said Brian Beckford, APS Bridge Program Manager.

Newly selected bridge fellows also had the opportunity to meet bridge students from existing bridge programs at MIT, Columbia, Michigan, and Fisk-Vanderbilt, who participated in a panel reflecting on their bridge experiences. Students candidly shared their experiences in a bridge program, with the GRE, and defining moments, among other topics.

William Sedlacek, University of Maryland, started off Friday morning's events with a talk on "What more do I need besides grades, test scores, and the right courses?" Sedlacek described the GRE as an insufficient predictor of graduate school success, and advocated for using noncognitive variables in measuring prospective graduate students. These variables include demonstrating leadership, having long-range goals, taking advantage of support networks, and being involved in the community, among others.

Leaders from bridge programs from around the country presented the nuts and bolts of their programs during a session on bridge program logistics. Summer Ash, Assistant Director of Columbia University's Bridge to the PhD Program, described Columbia University's two-year non-degree program in which students are hired as research assistants as they prepare for graduate school in the natural sciences. Çagliyan Kurdak presented on the University of Michigan Applied Physics Imes-Moore Fellows Program. This program emphasizes program flexibility and personalized mentoring in preparing students to complete doctoral degrees in applied physics at the University of Michigan. Keivan Stassun highlighted that the Fisk-Vanderbilt bridge program looks for basic content preparation and "grit" in students accepted into its two-year master's program designed to lead to a PhD from one of several top universities including Vanderbilt.

The conference also featured sessions on research on mentoring, building community, generating administrative and faculty support, being a successful mentee, research/evaluation questions on increasing diversity, and admissions criteria and their correlation with success.

Valerie Purdie-Vaughns of Columbia University wrapped up the evening with a plenary addressing stereotype threat – the well-documented effect of scoring below ability in high-stakes measures when someone sees themselves through the lens of a negative stereotype. She presented values-affirmation as a way of reducing stereotype threat by reminding people of sources of their self-worth.

Mandana Sassanfar presented on the B3 Biology and Biotechnology Bridge (B-cubed) Program at MIT. This program is a two-year, non-degree program that partners with industry to provide students with research training in industry as well as rigorous academic preparation at MIT.

Philip Kutzko, University of Iowa, presented on the National Alliance for Doctoral Studies in the Mathematical Sciences, a program that has similar goals as the Bridge program, except in the mathematical sciences. The program seeks to increase the number of students from "families, regions and ethnic backgrounds that have had little prior contact with the profession and culture of the mathematical sciences" who enroll in doctoral programs, earn doctoral degrees, and enter the workforce. The Alliance has built a sizable community of faculty mentors, math sciences students, and math sciences departments committed to promoting a diverse workforce.

The APS Bridge Program is funded by a grant from the National Science Foundation. The project anticipates holding another meeting featuring the role of Master's degrees in improving diversity next June. ■

Guest Editorial *continued from page 1*

achievement gaps. A spectacular case in point is that of the mathematics achievement gap between male and female high school students, as shown in standardized test scores. The recalcitrant gap disappears around 1999-2000, following a few years where male and female students were taking the same courses. Another stunning case relates to the American College Test (ACT) gaps between White Americans and African Americans during the 20 years preceding 1994. Contrary to suggestions in some books intimating intellectual quotient (IQ) differences as explanations, these gaps were directly traced to the courses taken by the two groups, as per ACT data we requested and obtained. Unlike the White American students, most African Americans had not taken algebra I, geometry, algebra II, and Trigonometry, all of which are covered on the ACT Mathematics test. Similarly, Asian Americans, who generally took calculus, outperformed White Americans in standardized mathematics tests. The courses, their rigor, and their levels (e.g., English I-IV, speech for high school), from K through 12th grade, mostly explain academic achievements and related gaps. Additional factors that are generally overlooked include summer enrichments, daily sociocultural experiences, and other activities that result in time spent on learning tasks which contribute to academic achievement. A similar picture prevails for English. Significant learning "fringe benefits" from having a high socio-economic status accrue (i.e., a large E in the LHP equation for learning English), contrary to the case of students with low socio-economic status (i.e., a large B for learning English).

An online article from AAAS Science Careers, entitled, "Timbuktu Academy: mentoring future scientists" provides additional explanations and resources for understanding the stupendous implications of the Law of Human Performance in broadening participation in STEM fields. Another similar resource is the book, *STEM the Tide* by David E. Drew. The above points about the ACT scores and achievement gaps are directly related to the size of the pool of students for college STEM programs and to retention in undergraduate STEM programs. "Toolbox Revisited," by Clifford Adelman of the US Department of Education, reports on longitudinal studies that show course taking (subjects and levels) and the rigor of these courses as critical factors in degree completion from high school to college, with a singular emphasis on mathematics preparation. However, with the advent of the Common Core State Standards, the future seems promising for minority participation. Indeed, one ignored contributor to the academic achievement gaps (A^2gap) between the general student population and some minority groups is the sub-standard curriculum in some inner city schools. Oh, in some states, it was clamored that parents know best what their children need to learn!

For minorities in inner city schools that are generally not the best, summer academic enrichment programs and activities are particularly important for developing competitiveness. For the last 22 years, we have verified their importance for African American high school students who participated in the Timbuktu Academy summer enrichment programs. For close to 10 of these years, the Department of the Navy, Office of Naval Research, funded the Academy to engage 100-200 pre-college students in intensive academic enrichment activities, per summer, and to support 50 undergraduate STEM majors per year, at least 20 of whom were physics majors. In these summer programs, we utilize the Law of Human Performance, the primacy of languages as vehicles of thought, and the hierarchical structure of learning within and between disciplines to close academic achievement gaps, by design. The closing of the achievement gaps was verified by comparing Timbuktu Academy participants' actual ACT scores on tests conducted before and after the enrichment programs. One of our programs for high school students is called the Summer Science Institute (SSI). In this 6-week course, students spend twice as much time on English as on mathematics. Focus on English, with an explicit emphasis on grammar, is dictated by the generally large B's (LHP equation) for English learning, for many inner city minority students. The critical role of grammar in enabling comprehension, writing, and the overall learning of English, including the enhancement of reading comprehension and science reasoning, illustrate our reference to a hierarchical structure between disciplines. Similarly, knowing the multiplication facts, for studying fractions and proportions, and the order of operations in algebra, points to the taxonomic structure within a discipline; in this case, topics in mathematics.

At the college level, an understanding of the Law of Human Performance greatly assists our undergraduate scholars in the Timbuktu Academy and on the 12 LS-LAMP campuses to understand the origin of their difficulties in some courses, if any, and to manage their time so as to make-up shortfalls that may exist. Mentors and tutors are often needed to identify the gaps in the knowledge and skills base of students. With LHP, they know that maximizing the time for learning and research tasks serves to increase their competitiveness. Hence, once we have established that their funding, including the LS-LAMP scholarship, meets their "needs," no odd jobs are allowed in order to meet the scholars' "wants." Incidentally, it should be noted that these off-campus odd jobs also negatively impact the social integration of the student, as far as campus life is concerned. The maximization of the time devoted to learning and research, as dictated by the Law of Human Performance or of practice, directly led to most of the strands in our systemic mentoring model.

Financial support, communication skills (English) enhancement, generic research activities, execution of specific on- and off-campus research projects (and attendant report writing), the development of a professional culture (including attendance at weekly seminars and conferences), monitoring, and guidance to graduate school or the high technology job market

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APS Sponsors the Conferences for Undergraduate Women in Physics

By Halleh B. Balch

"Encouraging women to pursue physics is a top priority for us."
— Kate Kirby
APS Executive Officer

For the first time in its six-year history, the Conferences for Undergraduate Women in Physics (CUWiP) have taken place with official APS sponsorship. On January 18-20, six universities across the country hosted the Conference under the aegis of the APS Committee on the Status of Women in Physics.

"Encouraging women to pursue physics is a top priority for us. CUWiP has been very successful over the years and we are delighted to be able to lend our organizational support and resources to the conferences," says Kate Kirby, APS Executive Officer.

The Conferences for Undergraduate Women in Physics were conceived by two graduate students at the University of Southern California in 2006 and is still organized and run by students at the host universities. Through invited talks by successful women in physics, panel discussions on graduate school and physics careers, and the opportunity for students to present their own research through talks and a poster session, the Conference aims to give young women the resources, motivation, and confidence to pursue graduate work in physics and in careers related to physics.

Career Panel at the 2013 Cornell CUWiP (photo courtesy of Cornell University).

"Adding APS sponsorship has been very transformative"
— Daniela Bortoletto, a professor of physics at Purdue University and the present chair of the CUWiP faculty committee

The focus of APS sponsorship will be to provide an institutional home for the conferences, which have grown from twenty-nine attendees in 2006 to almost five hundred in 2011. This year, the conference organizers expect almost one thousand students.

"Adding APS sponsorship has been very transformative," says Daniela Bortoletto, a professor of physics at Purdue University and the present chair of the CUWiP faculty committee. "We needed a framework that would enable us to organize more effectively."

Organization is a particularly challenging task for CUWiP because each satellite conference is organized by the local undergraduate students, sometimes with the help of graduate students, post-docs and faculty.

With APS sponsorship, CUWiP will formalize a national organizing committee to maintain continuity in future years. The national committee will be composed of undergraduates who have led past conferences, those who hope to organize future conferences, as well as a current member of the Committee on the Status of Women in Physics, and a representative from the APS Education and Diversity department.

Applications for the 2014 conferences will be accepted until November 1, 2013. Apply online at aps.org/link/cuwip

"Among the goals of the national organizing committee", says APS Director of Education and Diversity Ted Hodapp, "is to think about how you bring the organization forward, and learn from past conferences."

Apart from the new CUWiP wiki that both organizes meeting notes and outlines how to organize a conference, APS sponsorship enables CUWiP to apply for multi-year funding grants from federal and private organizations. Until now, organizers had to apply for new government and university grants every year. "The ability to apply for multi-year grants will be very important to the future of the conferences," says Bortoletto.

"APS sees it in its mission to back these ideas," says Hodapp. "We put our name behind it; we put our resources behind it."

Bortoletto agrees. When she helped host the conference at Purdue in 2011, APS provided information on physics graduate and career resources. "Even having the information around made the students more aware of what APS can do for them. APS really does offer a lot of information for students; through the conferences, there is a more direct contact between students and the APS."

This year's conferences brought together almost nine hundred undergraduate students at six host universities across the country. This year's six universities were California Institute of Technology (198 attendees), Colorado School of Mines (129), Cornell University (135), University of Central Florida (87), University of Illinois in Urbana-Champaign (235), and University of Texas at Austin (88). As in years past, the independence of the local conference sites produced a diverse and vibrant conference weekend.

At the University of Central Florida, co-coordinators Asma Amjad and Tracy Becker organized a Science Café where eight physicists spoke about their research with small groups of attendees. In tandem with the larger talks, workshops on graduate schools, CV writing, and a poster presentation of student research, the Science Café provided a "very interactive environment in which the speakers could talk about their research and also about their lives," said Becker.

Shannon Glavin, UIUC student, and her conference co-organizers shared this goal: "There are very strong male science role models," she said, noting

Trading cards encouraged student networking during the Illinois CUWiP (photo courtesy of the University of Illinois).

scientists like Carl Sagan and Bill Nye. "These conferences are a great way to share female role models as well." Glavin hoped that students would return to their home universities with a greater sense of their part in the network of women in physics.

Also emphasized in this year's conferences were careers in industry or in fields related to physics. At UIUC and the Colorado School of Mines, the organizers included a career panel that had physicists who were almost exclusively in industry. Every student has role models in academia from classes, noted Glavin, but undergraduates get much less exposure to careers in industry. The University of Central Florida held a well-attended industry fair, and the Cornell conference featured an industry career panel.

"You always hear that you can do anything with a physics degree," noted Glavin, "but it was really interesting to meet people who actually do."

This year, the Colorado School of Mines hosted the conference keynote address by University of Colorado Boulder physicist Margaret Murnane. The keynote was webcast to the other five sites, offering an opportunity for conference attendees across the country to realize their common experience. While many of the conferences included student presentations, faculty talks, and graduate and career workshops, the decisions of the local organizing committees made each host conference unique.

For example, the Mines conference had a 22 percent male attendance. Mines organizer Nicole Johnson explained that the organizing committee at Mines had attended the 2012 conference hosted at Stanford University and had noticed that there weren't any men. "Mines is 75 percent male across campus," said Johnson, "and we thought that all of the lessons at Stanford were completely applicable to men too."

Johnson and her peers used blind admissions and an application that promoted a diverse and engaged conference attendance at Mines. Applicants wrote a personal statement of their goals for attending the conference. "We wanted to look for people who really understood the mission of the conference and we were looking for applicants to speak a bit about diversity in physics and across the sciences," said Johnson. "One of the most interesting things we noted," she said, "is that some of the best essays on diversity were written by men."

A physics and mechanical engineering double major at Colorado State University, Forrest Craft says he applied to attend the conference at Mines to learn how he could help increase the diversity in physics. "I thought that one of the main goals of the conference was to put people together with different viewpoints–I think that that is very necessary for science," Craft said. ■

This article, previously featured in APS News*, was edited by Deanna Ratnikova for inclusion in the Gazette.*

Please Update Your Address

Dear Gazette *Reader,*

The APS Roster of Women and Minorities is also used as the Gazette *mailing list.*

If your address has changed and you wish to continue receiving the Gazette*, please visit www.aps.org/programs/roster/enroll.cfm to re-register and select The* Gazette *Mailing List as your Roster group.*

Questions? Contact Arlene Modeste Knowles at roster@aps.org.

Keep reading the Gazette*!*

Professional Development Reads *continued from page 1*

ment is particularly important for underrepresented minorities in selecting their majors. Helping students understand that there are a multitude of careers available to them with their physics degrees—and giving them solid professional development in addition to simply teaching them scientific skills—will not only help draw more students into the discipline, but will also encourage them to finish their degrees, armed with tools to help them to be successful after they graduate, in any of the career paths they are likely to take.

The books featured here are full of strategies for becoming a successful physicist. For example, in *The Art of Being a Scientist*, the reader learns about a variety of topics relevant to navigating graduate school—including turning challenges into opportunities, publishing and building your network at conferences, and understanding and capitalizing on your strengths in the context of your research project. In *Successful Science Communication: Telling it Like It Is*, the reader can experience a spectrum of scientific perspectives on the importance of communicating clearly to non-scientists (whether they be policy makers, students, or our neighbors), as well as explore the broader ethical context of science in society.

Though some of these books may have been written to address physicists working in a particular field or sector, they all contain good advice for physicists that translate to a variety of career paths. I would encourage anyone interested in improving their "non-scientific" physics skills, or who is in a position to mentor other physicists, to take a look. ■

[1] *T. Olsen, "AIP Career Pathways Project: A Preliminary Report," Radiations, Fall 2012*

We know that good career preparation is strongly correlated with high retention rates among physics departments.

Celebrating Spectra – The Laser Superhero

By Deanna Ratnikova, APS Women & Education Programs Administrator

Summer 2009 was a blockbuster summer for movies based on comic book characters. This was also Dr. Becky Thompson's first year with the American Physical Society (APS) Public Outreach Department. Thompson joined APS to run PhysicsQuest—a story-based activity that exposes middle school students to the fun and relevance of science. When the Outreach Department chose to highlight Nikola Tesla for their next PhysicsQuest kit, Thompson had an idea: "The great War of the Currents was as good a story as anything Marvel [legendary comic book company] had written" so she wrote the Tesla PhysicsQuest manual as a comic. Students read the comic, conducted activities, and helped the Amazing Tesla defeat the Evil Edison. "The new format was a hit," reported Thompson, "and we decided to stick with it for the coming years."

The next year, APS teamed up with OSA, IEEE Photonics and SPIE to put on LaserFest—a yearlong celebration of the 50th anniversary of the first working laser. It was only natural that the 2010 PhysicsQuest kit be based around lasers. The problem Thompson faced, however, was which laser scientist to use as the kit's character and inspiration. Deciding that there was no way to pick just one laser scientist, Thompson created Spectra, the laser superhero.

Unlike other PhysicsQuest characters (Albert Einstein, Ben Franklin, Marie Curie, and the aforementioned Nikola Tesla), Spectra did not possess a ready-made story, so Thompson built Spectra's world and background using the Spectra comic book series. When writing the comics and preparing PhysicsQuest kits, Thompson aimed to keep students engaged by making the stories and activities fun and ensuring the plot themes were relevant to their age group. ■

PhysicsQuest

PhysicsQuest is a story-based activity that exposes middle school students to the fun and relevance of science. APS provides a free PhysicsQuest kit to registered 6-9th grade physical science classes, home school groups, science clubs, and after-school programs. The kit includes a user's manual and materials for four physics experiments.

PhysicsQuest aims to teach middle school students physics concepts, but its overarching goal is to give them a positive experience with physics. APS is focusing this program on middle school students because these grades have been identified as the point when many students lose interest in math and science.

Learn more at www.PhysicsCentral.com.

All five Spectra comics are available online at physicscentral.com/explore/comics/

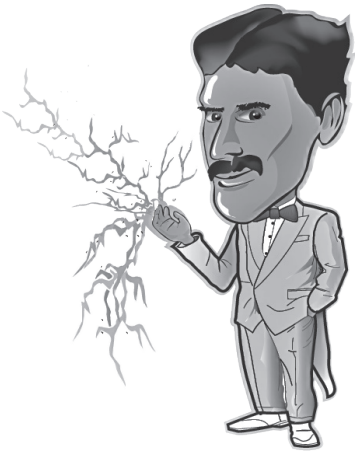
PhysicsQuest Over the Years

PhysicsQuest began as a World Year of Physics 2005 project with a kit based on **Albert Einstein**. Nearly 10,000 free kits were sent out that year.

PhysicsQuest 2006:
Ben Franklin's Secret Message

PhysicsQuest 2007:
Marie Curie's Floating Classes

PhysicsQuest 2008:
Nikola Tesla and the Electric Fair



PhysicsQuest 2009:
Spectra's Power

PhysicsQuest 2010:
Spectra's Force

Guest Editorial *continued from page 3*

are seven (7) of the Ten-Strand Systemic mentoring model of the Timbuktu Academy and of LS-LAMP (www.ls-lamp.org). The guidance to graduate school includes preparation for the graduate record examination (GRE), even though we know that the score is not a measure of any potential for research. Further, the large B's for English are clear barriers for many minority students who would otherwise do well in Ph.D. degree programs. Most of our Academy scholars have to study our handout on English grammar and usage or the *Blue Book of Grammar*. The guidance to graduate school has another component at Southern University; i.e., undergraduate Mathematical Physics I and II. First year graduate courses rest on a reasonably solid background in mathematics. Thus, it did not surprise us when we did the counting in 2010 that, from 1995 to 2009, 10% of all African Americans who earned the Ph.D. degree in Physics or directly related fields were graduates of Southern University.

I invite you to continue to reflect on the Law of Human Performance or of practice as it pertains to education and learning. Complex processes, like research, are learned through increasingly sophisticated and reflective practice. An understanding of the implications of this law for the educational process and systemic mentoring is key to providing the necessary interventions that will result in broadening the participation of under-represented groups in STEM. ■

Diola Bagayoko, Ph.D., is a Distinguished Professor of Physics at Southern University and A&M College in Baton Rouge, Louisiana, and Director of the Timbuktu Academy and of the State wide Louis Stokes Louisiana Alliance for Minority Participation. LS-LAMP is funded by the National Science Foundation [NSF HRD-1002541]. Bagayoko is a member of COM.

The Law of Human Performance, applies to complex problems when they are broken down into simple tasks and applied in a specific order.

Women Physicist of the Month Program

The APS Committee on the Status of Women in Physics (CSWP) began a program to highlight exceptional female physicists in January 2012. Each month a new woman is the face of www.WomenInPhysics.org and a short bio is featured on the website showcasing the amazing talents of female physicists.

The physicists chosen for the first half of 2013 are (in order of feature):

Liubov Kreminska, University of Nebraska-Kearney

Laura Reina, Florida State University

Sultana Nahar, Ohio State University

Valerie Otero, University of Colorado at Boulder

Heide Doss, Consultant and Education Specialist

Reina Maruyama, Yale University

Mercedes Richards, Penn State University

The CSWP Woman Physicist of the Month award recognizes female physicists who have positively impacted other individuals' lives and careers. The award is not restricted to just research physicists, but open to students, teachers or any woman doing physics-related work. Nominations are accepting on a rolling basis.

To nominate someone, the name, institution/facility/company, and email of both the nominee and nominator should be emailed to women@aps.org. The nominee's CV and a nomination statement up to three paragraphs should also be included in the email as attachments. ■

Meeting childcare grants will be available again for attendees of the APS March and April Meetings. Learn more at www.WomenInPhysics.org. Applications will be accepted starting in the fall.

International Society of Muslim Women in Science (ISMWS)

by Dr. Sultana N. Nahar, Department of Astronomy, The Ohio State University

The ISMWS practice is "Regardless of other commitments, of the 24 hours of the day, we save a few hours for ourselves for our scientific work."

In 2008, I attended the international conference on Modern Trends in Physics Research (MTPR) held in Egypt. There I met Muslim women scientists from Egypt and surrounding Arab and African countries who all wore hijab. I was impressed by their quiet, but curious and intellectual minds and devotion to physics. Most did not have any exposure to western advanced research, and they were involved in research with very limited resources and interaction with other scientists. If given the opportunity to conduct collaborative research with scientists in developed countries, these individual educators and researchers could make considerable advances in science and produce more scientists through mentorship.

Although Islam encourages both men and women to knowledge, the number of Muslim women in science is far behind than any other group or race. Stemming from my experience at MTPR and the idea of bringing these women scientists into one network, I founded the International Society of Muslim Women in Science (ISMWS) in April 2010.

The charter of ISMWS contains the following:

"Women throughout the world are making rapid strides in all forms of human endeavor. This is true in basic areas such as health and education, as well as in the most advanced avenues of arts and sciences. However, progress is not evenly spread and is lacking in many parts of the world. The situation is exceptionally dire and distinctively weak for Muslim women in regards to their involvement in science. While they are intellectually capable, admirably inquisitive and deeply interested in exploration of the science of the universe, they remain quietly behind by the traditional family responsibilities and cultural environments. It is therefore an opportune time to address what we recognize to be a widespread and profound need, the advancement of Muslim women scientists, not only from Islamic countries but worldwide.

While upholding their traditional values, and consistent with their social and cultural environments, we would like to encourage and inculcate their natural abilities in the pursuit of scientific disciplines at the highest levels. With that aim, we form this International Society of Muslim Women in Science which will have the following objectives.

- Seek and enroll moslem girls and women engaged in, or desirous of, a professional career in science education and research
- Enable mutual interaction on a global scale through electronic emails and other means of communication,
- Establish associations and affiliations with other international scientific societies and organizations for possible collaborations, especially with (i) American Physical Society (APS), (ii) International Network of Women Engineers and Scientists (INWES), (iii) American Association for Women in Science (AAWS)
- Provide information and find venues for participation in international scientific conferences,
- Provide information and help on higher studies, such as for Masters and Ph.D., in international advanced institutions,
- Coordinate programs with educational and research institutions in all countries,
- Approach national and international governmental and non-governmental agencies for support in activities of the society, such as from the Organization of Islamic Countries (OIC) and United Nations agencies such as UNESCO.
- Organize international workshops, conferences, and courses on general and specialized scientific topics
- Provide scholarships/grants for advanced studies at major universities,
- Establish a center, institute, or even a university in a convenient located and relatively open and accessible city in an Islamic country. Such an institution should support permanent and visiting faculty and other positions.
- We will add and modify the terms and policies, upon consent of our members, to accommodate the needs of other Muslim women in science.
- We would consider science women of other religion if they and our members find it to be beneficial for them."

Dr. Nahar with physics majors at UAEU.

ISMWS members in Sultan Qalauun's palace in Al Azhar in Egypt.

The charter and network of ISMWS has been presented at a number places in a few countries. It was presented in Aligarh Muslim University in India and at the United Arab Emirates University (UAEU) after my physics seminar presentation. At UAEU, some non-science students were also interested in becoming members of ISMWS. Additionally, I taught a course on atomic spectroscopy at Cairo University which was attended by graduate students, researchers, and faculty members of seven institutes, and most of the female participants were enthusiastic and became members of ISMWS.

ISMWS has a network of about 125 Muslim women in science from 24 countries, such as USA, Afghanistan, Algeria, Bangladesh, Canada, Egypt, India, Indonesia, Iran, Iraq, Jordan, Kenya, Kuwait, Lebanon, Morocco, Pakistan, Palestine, Russia, Saudi Arabia, Sudan, Syria, Turkey, and the United Arab Emirates. About half of these women have a Ph.D. Information on the network is available at: http://www.astronomy.ohio-state.edu/~nahar/ismws.html

Membership to ISMWS is free, and members can be from any area of science. To become a member, a person needs to express the willingness to become a member and email information about degree or position, area of study, institutional address, countries of residence and nationality, and his/her email address.

It may be noted that the issues with women in science in general is not limited to only Muslim women; everyone faces some common problems. The ISMWS network encourages research presentations and publications by circulating the news and provides information to communicate with each other, useful information on securing financial help for higher education, scholarships, conferences, and job postings. ■

Professor Lotfia El Nadi of Cairo University and the laser institute NILES and Dr. Sultana Nahar have also cofounded the International Society of Arab Women in Science (ISAWS) with similar objectives to encourage Arab women to science profession. ISAWS has about 240 members from seven Middle Eastern and African countries.

Lotfia El Nadi and Dr. Nahar answer some questions at Al Azhar University.

Dr. Nahar chairs a session on women physicists at Wayne State University.

Successful Science Communication: Telling it Like It Is

Reviewed by Vidhya Ramachandran, Member, CSWP

Vidhya Ramachandran

As a physicist, I am as proud as the next scientist of our culture of data-driven quest for the truth, with a modicum of mild, barely-concealed impatience for those who choose to understand the workings of the Universe through other means. This culture has reached the point where many of us have stopped explaining our science to those other people because we "cannot get across to them." *Successful Science Communication: Telling It Like It Is* points out that this attitude is not only uncalled for but actually deleterious to the cause of science by allowing non-scientists to steal center-stage on various topics of ultimate importance to humanity, where science has much to contribute. Time and time again, we have seen the scientific agenda stolen by politicians, religious leaders, activist groups and others who communicate in absolutes and superlatives while, as scientists, we have to temper our messages with statistics and reality. Does that mean that we will always lose key debates on Climate Change, GMOs, Cloning and so on? Absolutely not, this book argues, if we communicate successfully and consistently.

The book is a collection of essays authored by a spectrum of representatives from the sciences (academic and otherwise), media, business, NGOs, government organizations and so on. While the essays are mostly Britain- and Euro-centric, the message is universal: as scientists, we have to step out of our ivory towers and talk, coherently and non-condescendingly, to the masses if we wish to influence the direction of policy and opinion in the world and recruit more adherents of science. This book being a collection of writings by various authors is actually reassuring in that we are not listening to the opinion of one person or one group of people. In fact, it is eye-opening as to how opinions of scientists are fairly uniform (and actually improving!) across different cross-sections of society. The format also allows for mixing up many different writing styles, so that we need not be discouraged if a particular chapter makes for labored (or boring) reading – there are definitely some that sparkle in contrast.

These chapters shine light on some of the shortcomings society sees in science and the scientific method, which drive a need for clear communication (we scientists have ethics and morality too!). Several chapters deal with a variety of ways that scientists can reach out to the public, with sound advice on how to make these communications more interesting and captivating, and even how to explain the uncertainty of statistical results in a comprehendible manner to a lay audience. I found particularly compelling several personal experiences (successful and otherwise) shared by individuals of communicating with general audiences. This book is also a treasure trove of resources, references and links to data in the area of public understanding and appreciation of science and scientists.

If you have been hesitating to talk about your science to non-science audiences take a look at this book for motivation, ideas and guidelines – at the very least we may recruit more bright, young minds to science instead of losing them to Wall Street! ■

Save the Date!

The 2014 PhysTEC Conference will be held May 19-20, 2014 in Austin, TX. www.ptec.org/conferences/2014

2014 Professional Skills Development Workshops for Women Physicists

With support from the National Science Foundation, APS will continue to offer Professional Skills Development Workshops for Women Physicists one day prior to the APS March and April Meetings. In 2014, the workshops will be offered March 2 in Denver, CO and April 4 in Savannah, Georgia.

The all-day workshops are conducted by professional facilitators. Participants separate into two groups (postdocs/students and faculty/scientists) for the day's activities to allow them to interact with each other and with the facilitators. Participants discuss a variety of case studies and are encouraged to bring their own experiences for discussion as well.

Although priority is given to postdocs, graduate students completing their degrees within six months of the workshop are also invited to apply.

The online application is available at www.WomenInPhysics.org. The deadlines to apply are December 6, 2013 (for Denver) and January 10, 2014 (for Savannah). ■

How to Succeed as a Scientist: From Postdoc to Professor

Reviewed by Michelle Dolinski, Assistant Professor of Physics, Drexel University

As a new Assistant Professor, I've seen my world shift rapidly from the laboratory to the classroom, and from thinking about the next week or month to planning years in the future. It's not a natural transition, and there are plenty of stumbling blocks along the way. *How to Succeed as a Scientist: From Postdoc to Professor* is aimed squarely at this transitional time in a young researcher's life, which makes it a valuable resource.

In *How to Succeed as a Scientist*, Barbara J. Gabrys (a physicist) and Jane A. Langdale (a biologist) compile material from a series of workshops that they gave to postdoctoral researchers in the United Kingdom. The book is designed to be broad enough to cover biological and physical sciences. The content is divided into three main sections headed "Becoming an independent researcher," "Thriving in your new job," and "Managing your career," although the divisions are somewhat artificial. Each section is further broken down into subtopics with literature surveys, excellent practical advice, and exercises for the reader. Unfortunately, some of the exercises fall a bit flat without the workshop dynamic to provide discussion and feedback. Similarly, the lack of discipline-specific information leaves a gap that should be filled by further reading and mentoring.

Some sections work better than others. There is a great deal of information about management (of time, projects, and people), which makes sense for the role of a modern principle investigator. While it is true that this is an area most scientists are not formally trained in, these sections of the book rely heavily on Stephen Covey's *The Seven Habits of Highly Effective People*, and are somewhat repetitive. Comparatively, the sections on such important topics as grant writing and teaching seemed relatively sparse. To illustrate the book's points with concrete and personal examples, several career essays by successful scientists both in and out of academia are included, and they are evenly distributed between male and female contributors. Overall, the information in the book applies equally to men and women, and the authors acknowledge the additional barriers that women may face pursuing a career in science.

There are some aspects of the book that make it less useful to a researcher in the United States. The book is focused heavily on the UK system, with emphasis on Independent Research Fellowships. Practical career advice benefits from specifics, including details of how interview processes and funding agencies work that are specific to the country. The organization also leaves something to be desired. The question of whether to pursue an academic career at all appears roughly halfway through the book. In addition, the final section of the book discusses the organization of higher education institutions, which would illuminate some of the discussion earlier on.

Overall, *How to Succeed as a Scientist* provides thoughtful guidelines for anyone who is starting a career as an independent researcher or guiding postdocs through the transition. This book would be an excellent resource for a faculty member planning to give similar seminars for postdoctoral researchers at his or her institution. ■

Michelle Dolinski

Other APS awards for female physicists include the Blewett Fellowship and the Maria Goeppert Mayer Award.

2014 Katherine Weimer Award

The Weimer award is open to any female plasma scientist who received her Ph.D. within the ten-year period prior to April 1, 2014. Nominations are active for one selection cycle (three years).

The award consists of $2,000 and funds for travel to the annual meeting where the award is to be presented. The recipient will be invited to give a talk at the Division's annual meeting.

To nominate a candidate, send the following to women@aps.org:

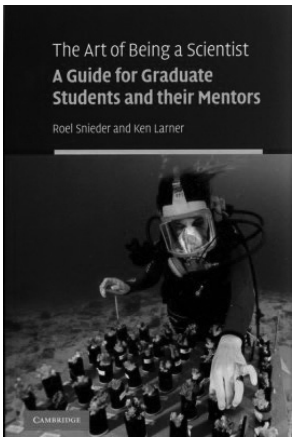
- A letter evaluating the nominee's qualifications identifying the specific work to be recognized
- A biographical sketch
- A list of the most important publications
- At least two, but no more than four, seconding letters

Deadline is April 1, 2014.

More information is available at: www.aps.org/programs/women/scholarships/katherineweimer.cfm ■

DPP

The Art of Being a Scientist



Reviewed by Susannah Moore Dickerson, PhD candidate in physics, Stanford University

Transitioning from undergraduate to graduate studies can be at once an exciting and intimidating prospect. The potential for fascinating research and meaningful discoveries is balanced by the uncertainty of just how, exactly, graduate school works.

The Art of Being a Scientist serves as a practical resource to navigate graduate school. The guide, which stems from a course created by one of the authors, aims to help the reader enjoy an effective graduate experience. As a result, the topics span a wide range, covering everything from the selection of a research topic, to ethics, to post-graduate job applications.

The narrative explicitly avoids field-specific references in order to be broadly applicable. For each topic, the authors typically present a series of questions the student can ask herself, an adviser, a colleague, or a friend. When choosing a research topic, for example, ask: "What is my edge, and does the project match this edge?" and "Do I really like my research supervisor and my close colleagues?"

Once the student is launched in her graduate studies, there is still plenty the book can offer. Need to get out of the third-year doldrums? Check the chapter entitled "Turning challenges into opportunities". Publishing a paper or going to a conference? Get an overview of the principles of good scientific communication. Curious about the job application process? Dip into the penultimate chapter. Many of these topics are too complex for a short guide, and where the authors cannot go into sufficient detail they often provide references for further reading.

Some questions raised—as the authors acknowledge—seem impossible to answer accurately without several years' research experience. Two such examples: "Do I have the resources I need [to complete this research]?" and "If [the research topic has not been solved], why has it not been solved and why do I think that I can solve it now?" The questions are very pertinent, but a prospective graduate student might well need to put them to experienced researchers in order to obtain a truly useful answer.

The breadth of topics covered is both a blessing and a curse. The guide contains valuable information for any stage in a graduate student's career, but to take in all the commentary at once can be overwhelming. Fortunately, the chapters are self-contained and allow for quick reviews of relevant topics as necessary.

Perhaps the most practical way to approach the amount of advice offered is to start with the homework exercises contained in the Appendix's annotated curriculum. While the curriculum is intended for professors looking to start a course similar to the one that prompted this book, the exercises are a good point of departure for the motivated student.

The writing is approachable and conversational, with a deliberate, endearing use of the feminine pronoun to describe the graduate student. In short, this "hands-on guide" is a solid reference for an undergraduate or early graduate, to be consulted as needed throughout her graduate career. ■

Women & Minority Speakers Lists

Need a speaker? Consider consulting the American Physical Society's women and minority speakers lists, online lists of women and minority physicists who are willing to give colloquium or seminar talks to various audiences. These lists serve as wonderful resources for colleges, universities, and general audiences. They have been especially useful for colloquium chairs and for those taking advantage of the Travel Grant Programs for Women and Minority Speakers. The online lists are searchable by state, fields of physics, or speakers' last names.

To find a woman speaker, go to: **go.aps.org/womenspeakers**
To find a minority speaker, go to: **go.aps.org/minorityspeakers**

Do you need an inspiring speaker?

APS offers travel grants to physics departments at U.S. institutions to host women and minority speakers!

The Women and Minorities Speakers Programs are intended to expand the opportunity for physics departments to invite women and minority colloquium/ seminar speakers who can serve as role models for undergraduates, graduate students and faculty. The program also recognizes the scientific accomplishments and contributions of these physicists.

For more information and to complete an online application, please visit:
Women Speakers Program Travel Grants: **go.aps.org/womentravelgrants**
Minority Speakers Program Travel Grants: **go.aps.org/minoritytravelgrants**

Experimenting with your hiring process?

Finding a great science or engineering job or hire shouldn't be left to chance. The American Physical Society (APS) Job Center is your ideal recruitment resource, targeting over 125,000 expert researchers and qualified top-level managers in the highly-specialized disciplines of physics, engineering, and computing. Whether you're looking to hire or be hired, APS provides real results by matching hundreds of relevant jobs with this hard-to-reach audience each month.

http://careers.aps.org

The American Physical Society (APS) is a partner in the AIP Career Network, a collection of online job sites for scientists, engineers, and computing professionals. Other partners include *Physics Today,* the American Association of Physicists in Medicine (AAPM), American Association of Physics Teachers (AAPT), AVS Science and Technology, IEEE Computer Society, and the Society of Physics Students (SPS) and Sigma Pi Sigma.

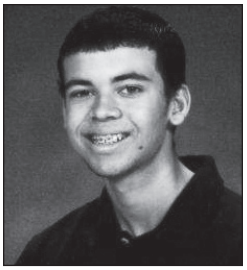
APS physics

APS Announces the 2013-14 Minority Scholars

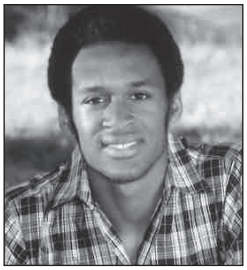
The APS Committee on Minorities is happy to announce that 40 Minority Scholarships were awarded this year: 13 renewals and 27 new recipients. The goal of this minority scholarship is to increase the number of under-represented minorities obtaining degrees in physics. It provides funding and mentoring to minority physics students to enhance their education and help them prepare for success in various careers.

New Recipients


Bryan Anenberg

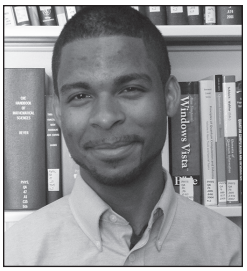

Alaric Bryant


Leopoldo Calderas


Kendall Cole


Marco Cruz-Heredia


Consuelo Cuevas


Alexander Daniels


Patricia Dominguez


Erin Flowers


Rodolfo Garcia


Ismael Gomez


Lawrence Jacob


Joseff Kolman

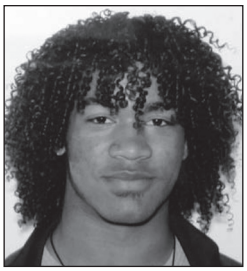

Tewa Kpulun

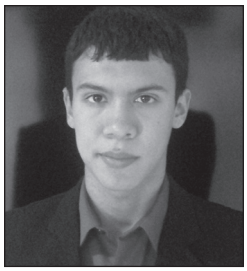

Antonio Martinez

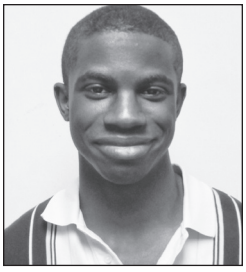

Jordan Melendez


Diego Mundo


Katelyn Neese


Olumakinde Ogunnaike


Jose Pena


Christopher Tiller


Stephanie Torres


Christian Zollner


Daniela Zuniga Sacks

Additional new recipients (not pictured):

Nicole Martinez
Gabriel Vasquez
Jorge Zetina

Renewals


Matthew Acosta


Stephanie Carnell

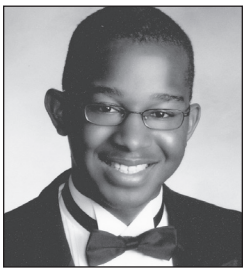

Maya Carter


Jorge Chavez-Saab


Sebastian Gomez


Karla Guradado

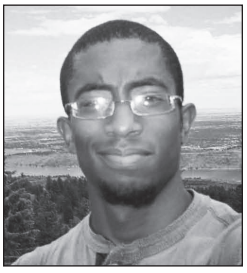

Aria Hamann


Bilal Jones


Calib Lanier

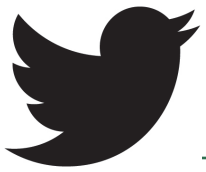

Josue Lopez


Sergio Mundo


Andrew Peterson

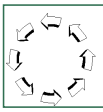

Jamelle Watson-Daniels

The application period for the Scholarships for Minority Physics Majors opens on November 1, 2013 and closes on February 7, 2014. Learn more at www.MinoritiesInPhysics.org.



Follow @APSDiversity on Twitter and request to join the APS Minorities in Physics Facebook group at www.facebook.com/groups/APSMinorities.

American Physical Society
One Physics Ellipse
College Park, MD 20740-3844



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