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INSIDE

Guest Editorial: Working with Younger Populations on Diversity Issues

Alexis Knaub, Graduate Student, Boston University and FGSA liaison to CSWP

Alexis Knaub

My dissertation research is partially on women in physics, though I have done other work regarding other types of diversity and equity during my time in grad school. I've been lucky to work with many science and engineering students who are interested in knowing more about me. Both undergraduate and graduate students ask me questions about my research and the various committees on which I serve. I enjoy these conversations, because they help me keep in mind how others perceive this work.

In education (my field), we often discuss novices to a subject and understanding their conceptions prior to entering the classroom; these are referred to as naïve conceptions, preconceptions, misconceptions, or what my advisor refers to as missed conceptions. These conceptions vary considerably. For instance, some students in introductory physics may think motion implies force; this is not true of all students but is common enough that instructors should be aware of this. Similar to how students enter a classroom with varying levels of understanding, people have varying levels of understanding social issues in science and engineering. When reflecting upon these conversations, I realize those of us working on diversity and equity issues should work to find out what these younger populations know and don't know.

While I have met some physics students (grad and undergrad) who aren't aware of how few underrepresented racial minorities (URMs) and women are in physics, most do have a somewhat hazy idea. They know that there aren't a lot of women or URMs in their programs or elsewhere and may be aware of some workplace issues such as harassment and discrimination. Some even recognize policy issues that are not inclusive. However, similar to other conceptions to novice learners, they are not fully fleshed or recognized especially in their day-to-day lives. By day-to-day, I mean interpersonal interactions where inclusion issues can be subtle but very much present in the form of microaggressions, small acts that add quickly and harm a person.

Because microaggressions are relatively small acts and constantly in our lives, they may go undetected by both white men and people who are underrepresented

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Absence of Women Faculty is not Proof of Bias in a Physics Department

Susan White and Rachel Ivie, Statistical Research Center, American Institute of Physics

Women's representation in physics lags behind most other STEM disciplines. Currently, women make up 13 to 14 percent of faculty members in degree-granting departments. If we consider only the professorial ranks – full, associate, and assistant professors – women filled 13 percent of these positions in 2010. (2010 is the most recent year for which these data are available by faculty rank.) If we delve a bit deeper into the data, we find that 16 percent of the professorial rank faculty members in physics departments that grant only a bachelor's degree were women in 2010. At PhD-granting departments, women accounted for 11 percent of the professorial rank faculty. Thus, the representation of women among physics faculty members is higher in bachelor's-granting departments than in departments which grant a doctorate in physics. Table 1 provides additional information about the representation of women, men, and department sizes.

Another way we might measure the representation

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in physics. I've met several young physics students who don't believe there are issues at the university level, except perhaps with policies for inclusion, such as maternity leave. I recall one conversation with a woman who didn't realize that her early experiences of not being included in study groups may have been the result of unconscious gender issues from her fellow students.

Some students are, of course, better informed of these issues but still face moments of doubt. Speaking for myself, I have had negative experiences where I have reflected for countless hours and can only attribute those experiences to race and/or gender. However, when I discussed these experiences and pointed out that I believe very strongly they were the results of racial and/or gender prejudices, people, even those who are well-informed or whom others would name as allies for these issues, are in denial that someone they know may have some prejudices. I would often hear "S/he's a nice person!" or something similar, followed by excuses, in what were attempts to negate my experiences. I have no reason to believe these people aren't nice people, but nice people are capable of being prejudiced and displaying their prejudices. Before I had done extensive readings on equity and diversity, I again doubted myself in light of their unwillingness to listen. It turns out I had a misconception that all allies are supportive and willing to be supportive when having to handle such issues.

I write about understanding what undergraduate and graduate students know about diversity and equity/social justice issues not only as an intellectual endeavor, but also as a way to better support those who fall in the underrepresented category and to educate those who want to be inclusive and supportive. After all, what use is this knowledge if we don't apply it? Although facing issues based upon race and/or gender is frustrating, speaking from my own experiences, realizing that it isn't necessarily your actions that are at fault is somewhat comforting, as silly as that may sound. The young women and URMs I've spoken with seem somewhat relieved to know this isn't a character flaw. Otherwise, one is left feeling incompetent or otherwise unqualified. In terms of educating those who want to be inclusive, I find undergrads and grads desire to be supportive of diversity efforts and mean well, but they sometimes have misconceptions of these diversity and equity issues.

Although I think about these issues on a highly academic level and thus, have a good sense of these issues, helping undergraduate and graduate students work through their misconceptions on diversity/equity issues does not have to entail a career dedicated to researching these issues. Non-judgmental conversations are remarkably effective in learning where students are in their thinking and in helping them clear their misconceptions. Like academic concepts, we should ensure that even those who seem to understand the base level don't have misconceptions at more advanced levels. I know there are others out there who, like I used to be, have a rather naïve conception of how diversity/equity issues play out and do not fully understand the complexity of things. Perhaps with more education on these issues, we can not only ensure that the next generation of physicists is reflective of society demographics, but is also informed and readily able to support those who are not in the majority. ■

Bouchet Award Winner Followed a Parental Path to Science

Michael Lucibella, APS Staff Writer

Luz Martinez-Miranda, this year's recipient of the Edward A. Bouchet Award, always knew she wanted to go into science. She was born in Maryland, moved to Puerto Rico when she was five, and is now a professor of materials science at the University of Maryland.

The APS Bouchet Award recognizes a distinguished minority physicist who has made significant contributions to physics research. Martinez-Miranda will receive a stipend and travel support to present a lecture at the APS March Meeting.

Growing up, she assumed she would follow in her parent's footsteps. "I got interested in physics because I was originally interested in chemistry," Martinez-Miranda said. "My parents were chemists."

She also credits her grandmother with inspiring her career in science. Her grandmother's formal education stopped at the third grade, but she always insisted Martinez-Miranda's mother go to college. "This is something that I consider very important," Martinez-Miranda said. "It's because of that my mother went and studied chemistry."

Her high school teacher's somewhat unorthodox way of teaching physics first got her thinking about physics as a career. Instead of focusing on inclined planes or free-falling balls, he delved into the refraction and reflection of light.

"He actually went into the optics part of physics," Martinez-Miranda said. "I think that … optics, which is more visual and more associated with physical phenomena… made it more attractive to me."

When she went to college she combined her parents' love of chemistry with her own love of physics. At the University of Puerto Rico she majored in physics and minored in chemistry, which turned out to be a prescient decision. By her sophomore year she knew she wanted to explore the experimental side of physics.

In addition, Martinez-Miranda always had an eye for the artistic, or rather an ear. As an undergraduate, she also studied piano and graduated with a bachelor of music from the Conservatorio de Música in Puerto Rico.

Once she finished her master's in physics, also at the University of Puerto Rico, she left for the Massachusetts Institute of Technology for her PhD. Upon arriving, she found a number of researchers there working with liquid crystals. Again, her artistic side came out: she was taken by the intricate beauty of liquid crystals she saw under a microscope.

"Liquid crystals are very interesting materials," Martinez-Miranda said. "If you look at them in a microscope, they're visually very attractive and very interesting."

The more she worked with the crystals, the more her background in experimental physics and chemistry came in handy. "I think that the field of liquid crystals requires [this combination] more than many other fields," Martinez-Miranda said.

After receiving her doctorate, she left for the West Coast to do her post-doc work at the University of California, Berkeley. "At MIT I was working on just the basics of liquid crystals," Martinez-Miranda said. "At Berkeley they were looking at it from the point of view of how liquid crystals interact with a surface… I went from being very basic to applications."

She then spent a year as a visiting professor at Kent State University at their liquid crystal center. While there, her research interests started to evolve. She started working on thin films as well and when she took a position at the University of Maryland, she expanded further into work on nanoparticles. "Studying nanoparticles is in a way very similar to doing a thin film study," she said.

In the process, she moved back toward basic research and away from finding immediate practical applications. "I am way [over] on the fundamental side," Martinez-Miranda said. "I'm interested in finding out how they interact and how can you modify the interaction."

Her work on liquid crystals interacting with nanoparticles is helping to lay the groundwork for future generations of electronics and medicine. "It has applications not only in biophysics, but also in photovoltaics and many other applications," Martinez-Miranda said. One potential route is to use these materials in display devices.

She said that she's also excited about a new collaboration with a chemist in Chile, which pulled Martinez-Miranda toward another new direction. Up to this point, all of the materials she's worked with have been monomeric, but now she'll start exploring the potential applications of polymer liquid crystals. She said she expects that the mechanical properties of polymers could lead to entirely new applications.

She is also excited about the chance to travel to different universities and share her research as part of the Bouchet lectureship. She has already put together a list of schools she hopes to visit, many of which have large Hispanic populations. In addition she is also planning to lecture at the upcoming meeting for the Society for Advancement of Chicanos and Native Americans in Science.

"The APS Meetings are described as general meetings, but they are specific to [physics]," Martinez-Miranda said. "The nice thing about that meeting is you get all of [the sciences]."

This article was originally published in APS News.

Luz Martinez-Miranda

The APS Bouchet Award recognizes a distinguished minority physicist who has made significant contributions to physics research.

Brazil: I Taught, I Learned, I Lived!

Kathleen Foote, PhD candidate at North Carolina State University

Kathleen Foote is a physics PhD candidate in the Physics Education Research Group at North Carolina State University. This story was originally published in APS News.

Katie Foote and host, Dr. André Vieira, at the SCALE-UP classroom during his visit to North Carolina State University (Photo courtesy of Katie Foote)

Do you have a story to share with the Gazette readership? Email women@aps.org

As a physics PhD candidate at North Carolina State University specializing in physics education, I love to see how people teach and learn science, especially in other countries and cultures. The US-Brazil student exchange program—sponsored by APS and the Sociedade Brasileira de Física—immersed me in an exploration of Brazilian education at the secondary and university level, while I shared information about American educational innovations.

In May of 2011, another APS travel grant sponsored my trip to India to survey and interview women about studying and working in science. I enjoyed the work so much that I sought out the opportunity to collect similar data upon my return to North Carolina. There were remarkable similarities in the stories I heard, but the differences were intriguing. I decided to go to Brazil to add a South American perspective to these findings. While I was there, I gave three colloquia on SCALE-UP [Student-Centered Active Learning with Upside-down Pedagogies] to share my dissertation work. I traveled to four cities and talked to representatives from five schools and universities.

My trip began with ten days in Brasilia, the capital of the country that was built in the middle of nowhere in 1960. It was carefully planned to look like an airplane from above and is filled with unique, modern architecture. Reva Garg, a physics professor at the University of Brasilia (UnB) was my primary host and she welcomed me into her home. Her primary research is in non-linear optics, but she has also published and presented work on women in physics. Her Indian background made her a perfect host for this cross-cultural project. After work, she and her husband would take me on cultural excursions to the national theatre and the famous Metropolitan cathedral, and make me the most delicious local foods and juices.

While at UnB, I interviewed and surveyed dozens of undergraduate students and faculty members, compiling stories from women whose participation in physics spanned a half a century. Just as in the US, Brazilian women are dramatically outnumbered in the natural sciences. Recently, a couple of professors have been volunteering to develop programming to interest women in these fields, despite minimal outside support.

At UnB, I also met with the relatively new physics education group. They develop teacher-training programs, connect schools to community resources and engage students in research projects, mostly at the secondary level. They have also compiled over a hundred hand-made experiments and demonstrations as a physics-learning lab for visitors What I saw at UnB made me realize the ingenuity of individuals who wanted to share their love of science without many resources or much financial support, since improving education is only starting to become a priority for the Brazilian government.

I visited the private American School of Brasilia to see the "best-case" scenario of high school education in Brazil. The physics class felt like a SCALE-UP classroom: students worked in groups to collect real-time lab data, solve problems on whiteboards and present results to classmates. Unfortunately, active and collaborative learning opportunities are rare in Brazil, especially in public schools, because financial resources are tight and often, teachers are not trained appropriately. This was true even back in 1950, when Richard Feynman complained about the shallowness of education here, since he found students could only recall facts, not apply information.

Realizing that students need to do more than memorize information to be innovative, productive members of today's workforce, physics professors at the University of Sao Paulo (USP, South America's best university) applied for funding to implement SCALE-UP's minimal lecture, technology-rich, highly collaborative approach. I wanted to make sure to visit and see how they use this reformed pedagogy and classroom design. SCALE-UP has been spreading rapidly (currently to almost 200 institutions worldwide) and André Vieira had been inspired to try it at USP after talking to a collaborator at Duke University.

Sao Paulo's 12 million residents make it the biggest city in Brazil and one of the most diverse, blending indigenous, African, European and Asian heritages. Sao Paulo actually has the largest population of Japanese people outside of Japan. I asked if ethnic diversity provided motivation for adopting SCALE-UP, since at NC State it significantly reduced failure rates for women and other traditionally underrepresented groups. USP professors are more concerned with handling differences in economic background and incoming knowledge, especially after recent affirmative action efforts. Universities are required to accept a certain percentage of students from public high schools, which historically provide a notoriously poor education, thus the preparation of students varies significantly.

My last meeting was with the Chemistry Education Group at Brazil's largest Federal University in Rio de Janeiro (UFRJ). The disparity between rich and poor is especially apparent in Rio, a city infamous for its favelas (slums). Educating these students is a challenge, since many struggle with drugs, gangs, and lack of food and healthcare. The Chemistry Education Group has rapidly expanded its facilities to include computer labs and rooms for experiments for students whose schools cannot afford these supplies, and their outreach efforts keep growing.

Overall, Brazil and the United States face similar challenges as large, diverse countries trying to stay competitive in an increasingly technological age. I enjoyed the opportunity to share dialogue with Brazilians in a variety of positions about educating the next generation of scientists and engineers. I expect these collaborations to last a lifetime–I am working with my UnB host on a paper and Andre Vieira from USP came to visit my University to see SCALE-UP in action. Every time I said goodbye to someone in Brazil, they wanted me to promise to come back. I hope I will be able to return soon! ■

Bias in Physics Departments *continued from page 1*

of women faculty members is to look at the composition of individual departments. Doing this, we find that only 53% of 503 bachelor's-granting departments had women faculty members. On the other hand, almost all (92%) of the 192 PhD-granting physics departments had women on their faculties. The sheer number of bachelor's-granting departments which have no women faculty members (236) as compared to the seemingly small number of PhD-granting departments with no women faculty members (15) suggests that the representation of women in departments which grant a doctorate is fifteen times higher than that in bachelor's-granting departments.

However, we must ask: is the latter measure valid? In statistics, validity refers to whether or not a statistic actually measures what it is supposed to measure. Our analysis shows that whether or not an individual department has women faculty members is not a valid measure of bias in that department. This is because we find that whether or not a physics department has a woman among its faculty largely depends on two factors, and not necessarily on bias:

- the number of faculty members in the department and
- the proportion of women in the pool of all faculty members.

We can explain why the proportion of bachelor's-granting departments with no women among their faculty is so much higher than that of PhD-granting departments by examining the typical size of these departments. The median size of bachelor's-granting departments is four faculty members. Twenty percent of bachelor's-granting departments have only one or two faculty members. When the pool includes only 16 percent women and the department has only one or two faculty members, we expect 80 percent of these departments to have no women among their faculty. To illustrate this concept, we consider a drawer of socks: 16 are orange and 84 are green. If we randomly select two socks from this drawer, it is unlikely that there would be at least one orange sock. The only way to be sure we would randomly select at least one orange sock from this drawer would be to draw more socks. Thus, departments with more faculty members are more likely to have at least one woman. We calculate these expectations using the binomial distribution. Even if half of all faculty members were women, we still would expect one-fourth of the departments with two faculty members to have no women – and another one-fourth to have no men. This is akin to tossing a fair coin twice: half the time you would get one head and one tail (not necessarily in that order), and the other half you'd get all tails or all heads.

PhD-granting departments typically have many more faculty members. The median size of PhD-granting departments is 22 faculty members; the very largest bachelor's-granting department has 27 faculty members. If we have a faculty pool that is 11 percent female and 89 percent male, we would expect over 92 percent of randomly selected departments with 22 faculty members to have at least one woman among their faculty members. Referring back to the sock example, if we drew twenty-two socks, we would expect to see at least one orange sock 92 out of 100 times we repeated the experiment. In a recent report (Number of Women in Physics Departments: A Simulation Analysis), we looked more closely at the composition of physics department faculty members. Using simulations, we randomly assigned the existing faculty pool into departments of various sizes (selected to match the actual distribution of department sizes). We found that 49% of bachelor's-granting departments and 12% of PhD-granting departments are expected to have no women among their faculty given the current representation of women among physics faculty members and the size of physics departments.

We recognize that the selection of a new faculty member is not a random event. Many factors affect the composition of a physics department, including factors the department can impact, as well as factors beyond the control of the department. The department might consider the fit of the applicant's research with the department's mission and existing faculty members' areas of expertise, the ability of the department's infrastructure and setting to support the applicant's research, the ability of the applicant to secure external funding, and a variety of other factors including personalities. The applicant also has factors to contemplate including externalities such as family issues and competing offers – both within and beyond academia. Even so, the expected percentages of departments with no women among their faculty are higher than the actual percentages. These results suggest that something—perhaps intentional recruitment — is happening that leads to women faculty members in more departments than expected.

This is not entirely good news, however. Since women are found in more departments than expected, more women than expected are the sole woman

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Highest Physics Degree Awarded	Bachelor's	PhD
Smallest Department (# of faculty members)	1	3
Median Size (# of faculty members)	4	22
Largest Department (# of faculty members)	27	75
Women's Representation among Professorial-Rank Faculty Members	16%	11%
Departments That Have No Women	47%	8%
Departments That have No Men	1%	0%
Number of Departments (2010)	**503**	**192**

Table 1: Basic Data on Faculty Members in Degree-Granting Physics Departments

Susan White

Rachel Ivie

CUWiP Local Organizing Committees: A Behind-the-Scenes Look

Megan Matthews, Florida State University

Megan Matthews

CUWiP are three-day regional conferences held for undergraduate physics majors each January.

The local police department gets a call about a disturbance one night. When they arrive on the scene, they hear someone yell out "No! John, don't-" followed by a gunshot. The officers quickly rush into the building and find a lawyer, a doctor, and a mailman with a dead body and a gun on the ground at their feet. Without asking any questions, the cops take out their handcuffs and arrest the mailman. How do they know he is the murderer?

There is a simple answer to this riddle, but few people can figure it out quickly. We know the suspects by their jobs and nothing else except that one of them is named John. So how did the police know that the mailman pulled the trigger and not the lawyer or the doctor? Simple: the mailman was the only man in the room, and "John" is a man's name. If the riddle said that there were two nurses or two dancers and a mailman, then it wouldn't be much of a riddle, would it?

As we grow up, we unconsciously learn that there are jobs for men and jobs for women. Science, and physics in particular, is not known for attracting women. There's always an element of surprise in someone's reaction when I tell him or her that I'm a physics major, and in a way, it's justified. AIP released a report that said "Currently, women earn just 21% of bachelor's degrees and 17% of PhDs in the field." At Florida State University, there are currently 142 physics graduate students, of which only 31 are women; meaning there are five men for every one woman. It's no secret that women are underrepresented in physics, but there is a certain blindness to this fact and this is only the first issue that women in physics face. I got involved in organizing the Southeastern Conference for Undergraduate Women in Physics (SCUWiP) at Florida State University this year because of these challenges, but I've learned more about what it takes to make a difference than I ever imagined.

Our Local Organizing Committee (LOC) is made up of 12 women, including undergraduates, graduate students, and faculty. Planning officially began once we received word that our proposal to host a CUWiP conference had been accepted, but we were unofficially thinking about what a CUWiP at FSU would look like on the drive home from the 2013 SCUWiP at the University of Central Florida. Our goals for this conference are two-fold: (1) create an environment for undergraduate women in physics to connect and (2) present an accurate picture of all of the career options that are available to us.

As we drove from Orlando to Tallahassee, we knew that to accomplish these goals we would have to infuse as much interaction between attendees as possible and search for successful women in a wide array of physics subfields. However, once the official planning was underway we realized there are many more things to consider for a successful conference.

Since we are a relatively small group, we split up into sub-committees with 2-3 people in each. Overall we had to coordinate the speakers, the participants, the food, transportation, lodging, and activities. While there is some crossover between the different subcommittees, we were mainly able to focus on our personal tasks and therefore dedicate our time in the most valuable way for the best results. I'm involved in locating and booking the speakers and in planning the activities that will take place during the conference.

There are two general avenues that one can take once she has her degree — be it a bachelor's, master's, or doctorate — and is ready to begin her career in physics: academia or industry. We wanted to have equal representation from both disciplines to truly show our attendees the breadth of options that they have. This starts with spending a few hours on the internet scanning through physics department websites of nearby universities and trying to gauge the effectiveness of a potential speaker based on her given biography and a picture, if you're lucky.

Finding the academic speakers and contacting them proved to be a fairly simple task; their emails are current, active, and listed right next to their names. The challenges we faced in finding speakers was maintaining a balance between all the different areas of physics and contacting non-academic speakers. Since they don't work at a university, their contact information is harder to track down, and they have stricter availability. Calling big companies like Lockheed-Martin and Siemens resulted in getting bounced from one person/robot to the next until you get pushed off the phone or directed to a voicemail box that most likely won't generate a call-back. The trick to talking to an actual, useful human being is to ask for a specific person as soon as possible and don't mention what you want until you have her on the phone. Industry is different than academia, there are more pressing time constraints and demands and it's important to consider that since we are asking them for three days of their lives.

The speakers at the conference are only part of the puzzle. At the end of the day, this event is designed to benefit undergraduates, and a successful conference requires cohesive planning. To ensure that everyone is on the same page, each committee has face-to-face meetings once a week. These meetings are scheduled for an hour each, but usually tend to run longer. For me, this means that the week is divided between classes, research, and conference needs. I squeeze in calls and emails to potential speakers wherever I can, whether it's the fifteen minutes between one class and the next or the two hour break before I head into work. Planning the conference hasn't eaten up large blocks of my time, but it requires the same dedication as my other commitments. At FSU we are planning to have a night of physics demos, which means that it's the

LOC's responsibility to setup, run, and explain the physics behind each one. To accomplish this we need to meet with the man in charge of the demos for the physics department and learn as much as we can. It's interesting and fun, but it takes time and that time has to be planned for.

While the conference is still a month away, it's easy for it to feel like we have all the time in the world, but time flies. Even as a I get ready for the holidays with my family, I'm thinking about networking games and the best ways to force strangers to talk to each other and have fun doing so. Right now, we can focus on all of those little details that will make our conference different from the ones at other host sites, but after the New Year everything will be ramped up. All the LOC can do for now is get as much done before that final two week push when it all has to come together.

Luckily for me, I am also part of the conference calls with the National Organizing Committee (NOC). These calls help me keep everything in perspective and remember that this is being done at seven other universities across the country. We're all working toward the same goals and facing similar challenges. At these conferences, women in physics are given a glimpse into their futures; they get to see all the opportunities that are out there and get advice about how to deal with any issues, discriminatory or otherwise. I choose to believe that the more informed women in physics are about the current status of under-representation and its potential causes, the more power we have to change it. There truly is strength in numbers, and that is why I got involved in organizing this conference.

Gender bias isn't something we're inherently born with; we learn about it as we grow up from our parents, teachers, and peers. At some point, kids start to think about family and feelings as "womanly" topics and math and science as "manly" topics, but that's not true. Everyone has the ability to do whatever she wants and it's hard enough to figure out what that is without having the world tell you that you shouldn't, or wouldn't be better at something else because of your gender. The Conferences for Undergraduate Women in Physics are one small way to help encourage women to pursue, or continue pursuing, physics in spite of these issues, and any time commitments that I have to make are more than worth it.

With this in mind, I'll leave you with one final riddle and maybe this time the answer won't be so hard to see. A father and son are on their way to pick up a pizza when they get T-boned by a truck as they're going through an intersection. The paramedics declare the father dead at the scene, but they quickly rush the son to the nearest hospital for emergency surgery. However, just as they are about to start the operation, the surgeon looks down at the boy and says, "I can't operate; he's my son." How is this possible? ■

Interested in serving as a host institution for the next CUWiP? Apply by February 15; details online at www.WomenInPhysics.org

Bias in Physics Departments *continued from page 5*

in their department. This isolation of some women physicists is a consequence of having at least one woman in many departments when the overall representation of women is low.

Our analysis does not show that individual departments do not discriminate against women. It simply shows that not having women faculty members cannot be considered—in the absence of other factors—as evidence of bias in a particular department.

Representation ≠ Equity

Just because a department has women faculty members does not make that department's climate encouraging or supportive for women. Furthermore, even reaching 50 percent representation of women among the pool of faculty members will not ensure equitable treatment for women. The concept of equity includes impartiality, fairness, and justice. It is possible for these things to be unequally distributed even if there are women in every department and even if the representation of women in physics reaches 50%.

One example of how bias affects women independently of their representation comes from our 2010 Global Survey of Physicists. Almost 15,000 respondents from 130 countries answered this survey, and the representation of women in physics can vary widely from country to country. We asked male and female respondents about their access to resources and opportunities. Resources include things like access to graduate students or employees to assist with research, clerical support, research funding, and travel money. Opportunities include being invited to give a conference talk, serving on a committee for a grant agency, and serving as editor of a journal. Our results show that women have access to fewer opportunities and resources than men. The sex differences hold even when we controlled for the respondent's age, sector of employment, and location. These results suggest that simply increasing the representation of women may not increase women's access to opportunities and resources. Lack of equity in these areas may need to be assessed on a case-by-case basis, as the CSWP Climate Site Visit Program does.

In conclusion, we can show that the lack of women faculty members in a department is not prima facie evidence of bias against women. Rather, it is the result of two factors: the number of faculty members in the department and the proportion of women in the pool of all faculty members. Additionally, the fact that a department has women faculty members does not mean they are treated equitably. The "problem" of women in physics is complex and cannot be solved by just increasing the representation of women in physics—either overall or in individual departments. It is also too complex and nuanced to be distilled into any single measure. ■

The isolation of some women physicists is a consequence of having at least one woman in many departments when the overall representation of women is low.

2013 Blewett Fellows Integrate Family & Physics Careers

Michael Lucibella, APS Staff Writer

Established by APS in 2004 by a bequest from the estate of M. Hildred Blewett, the Blewett Fellowship enables women to return to physics research careers after having had to interrupt those careers. This year APS awarded two new fellowships, and renewed the award to one of last year's fellows. The fellowship consists of a one-year award of up to $45,000.

Amy Daradich

Amy Daradich

It was her high school teacher's passion for physics that first drew Amy Daradich to the subject.

"It was genuinely exciting," she said. "When people have enthusiasm for what they do, it's really infectious."The experience sparked a deep interest in her to understand how things work, and to get to the root of problems. She decided physics was the path for her.

Daradich hails from Toronto and enrolled at the University of Toronto after graduating from high school. For her undergraduate degree she dabbled in several fields, but ended up focusing on biophysics. However, once she started taking the required fundamental courses for her master's, she found herself drawn more towards geophysics and studying the long-term evolution of terrestrial planets.

"There are so many interesting things to work on," she said.

She met her husband while at the University and they were married while attending school together. However, in early 2007 he landed a job in Edmonton, Alberta, about 2,000 miles away.

Also in early 2007 Daradich discovered she was pregnant, and would be due shortly after defending her PhD thesis. She graduated in September of 2007, then immediately moved to Edmonton to be with her husband. Her son was born in November, but there was a complication. He had a congenital heart defect and needed several surgeries early in life. Daradich planned to take some time away from research to care for him while he was undergoing these procedures.

She had originally thought she would be able to take only a year off from work to care for him, and had placed his name on numerous wait lists for childcare facilities. However when that year was up, no slots had opened up for her son, so she continued to stay home with him. In the fall of 2009, while she was still waiting for childcare, her husband's startup relocated to Québec City.

Unfortunately, at about the same time, her father's Parkinson's disease took a turn for the worse and she spent much of 2010 traveling between Québec City and Toronto to care for him. Her father passed away in October of 2010.

"After not working for four years and having that gap on my résumé, I was like 'I've got to work,'" Daradich said.

In early 2011, she finally located a childcare service that would watch her son four days a week. She was able to find work at a bio-photonics lab, through a friend she knew from graduate school. Although glad to be back doing research, she really wanted to return to studying the evolution of planets.

"I really missed it, but I didn't realize how much until I got back to work," she said. "Research is really something you think about all the time, even when you're not right there."

Transitioning back to doing research has not been easy. "I think it's a big problem in academia right now," Daradich said. "All fellowship opportunities really dry up within about three years of finishing your PhD."She added that the Blewett fellowship was a welcome exception. She plans to use the award to travel to Cambridge, Massachusetts for a year and collaborate with researchers at MIT and Harvard.

"I think having this award will do a lot for getting me back in the game," she said. "I wouldn't have had this opportunity if not for the fellowship."

Leslie Kerby

Leslie Kerby

Leslie Kerby has returned to academia after nearly fifteen years away from research.

Kerby received her bachelor's degree in physics when she was 22 years old. She was first drawn to physics because of the mathematics that underlies so much of the field.

"I love mathematics but I'm not a pure mathematician. I wanted to apply it to something," Kerby said. "I kind of sit on the fence in my work between physics and engineering."

However, after she received her bachelor's degree, she put her career on hold in order to raise her children. She had married her husband at a fairly young age and had children young as well. In keeping with her religious family background, it was up to her to raise the children.

While she was raising her kids, she occasionally tutored and taught physics as an adjunct at the local physics department. She also is an accomplished classical collaborative pianist and briefly considered pursuing it as a career.

"I love music but I also love science," she said, adding that she didn't think that she would be able to support her five children as a musician.

After her divorce three years ago, Kerby decided to return to research. She enrolled at the University of Idaho and started working towards her master's and PhD. As an undergraduate, she had always been drawn to quantum mechanics, so she started looking around for ways that she could mix quantum mechanics with applied research.

"That was my favorite field," Kerby said. "[It] probably stems from my love of mathematics as well."

Her advisor, Akira Tokuhiro, recommended that she study nuclear engineering, in particular the computational quantum mechanics of it.

"This is a field that I would both enjoy and be pretty good at," Kerby said.

While in graduate school, she got an offer to work on nuclear physics at Los Alamos National Laboratory in New Mexico. There, she's been working to upgrade the code that's commonly used by physicists calculating nuclear reactions.

"I've been working on upgrading it so it includes the emission of light, high-energy fragments in nuclear collisions," Kerby said.

She finished her master's degree last spring and is on track to earn her PhD in about two years. Working as a full-time student has not been easy for Kerby. She has full custody of her five children, ranging in age from 15 down to two. In addition, because of budget cuts and a divisional reorganization, the amount of funding she is set to receive from Los Alamos in the coming months is less than she had budgeted for.

She said the Blewett scholarship will go a long way to pay tuition costs at the University of Idaho, with money left over to care for her children.

"It's a great honor," Kerby said. "The future is bright and promising."

Sujatha Sampath

This is the second year of Blewett fellowship funding for Sujatha Sampath.

Her career stalled somewhat after finishing her postdoc research in 2003. She followed her husband, who was working as an engineer in Milwaukee, but she had trouble finding a permanent research position there. Since then, she's worked a series of short-term and part time research positions in order to maintain her visa status.

In 2010 she got a temporary appointment at the University of Milwaukee, where she has been continuing work she started years earlier. In 2005, she joined a team of researchers from Arizona State University. They were studying the molecular structure of spider silk using synchrotron X-rays at Argonne National Laboratory. She also currently holds another temporary appointment at the University of Wisconsin.

"The fellowship has really helped me diversify the areas in which I'm doing research, within the scope of the project," Sampath said.

Over the last year she started using infrared tomography and electron microscopy to investigate the structure of silk.

"These are sort of independent techniques but they will give very complementary information," she said. She added that the infrared tomography will help her understand more about the chemistry of silk, while the electron microscope offers a better physical picture of the strands.

"The idea is to understand the structure from different angles."

She also started working with another team of polymer researchers who have been working to develop a synthetic spider silk. Spider silk is a remarkable material, stronger than steel, yet more flexible than Kevlar or nylon. Researchers have been trying to reproduce the natural substance for years, and Sampath is seeing how close researchers are getting.

"What we are trying to look at is the structure of the synthetic silks," she said. "That will allow us to compare them to the natural silks."

In addition, over the last year she's published two research papers based on data taken years before, and is currently working on submitting a third. She said that over the next year she hopes to work with other kinds of biopolymers and to find a permanent position. ■

Sujatha Sampath

Applications for the Blewett Fellowship are due in June. Learn more at go.aps.org/apsblewett

Women and Minorities Named to Fellowship

Each year, APS members are nominated by their peers to fellowship in the society. New Fellows are elected after careful and competitive review and recommendation by a fellowship committee on the unit level, additional review by the APS Fellowship Committee and final approval by the full APS Council. Only ½ of 1% of the total APS membership is selected for Fellowship in the Society each year. This year, 23 women and 5 minorities were named to Fellowship.

THE DIVISION OF BIOLOGICAL PHYSICS

Margaret Cheung

For her contributions to modeling and simulations necessary to achieve a comprehensive understanding of the folding, structure and function of a protein in a cellular environment.

Zuzanna Siwy

For her innovative use of nanopores in the development of biosensors and nanofluidic ionic circuits.

THE DIVISION OF CHEMICAL PHYSICS

Angela Wilson

For her work in the understanding, development, and application of ab initio methods and basis sets.

Celeste Sagui

For her fundamental contributions to the field of computational biophysics and statistical mechanics, her development of algorithms for simulating long-range electrostatic forces and free energies, and her insights into the understanding of biomolecular structure and nanoscale growth phenomena.

Deirdre Shoemaker

For her leading role in the investigation of dynamical and binary black hole space-times and their observational signatures.

THE DIVISION OF COMPUTATIONAL PHYSICS

Jorge O. Sofo

For contributions to computational discoveries in transport, structural and optical properties of materials, including the prediction of graphane, a hydrogenated form of graphene, the properties of an ideal thermoelectronic material, thermoelectric properties of superlattices, and the development of efficient computer codes to determine the transport and optical properties of solids.

THE DIVISION OF CONDENSED MATTER PHYSICS

Premala Chandra

For contributions to the theory of frustrated antiferromagnets and glasses, ferroelectrics and heavy fermion materials.

Alejandro L. de Lozanne

For spectroscopic imaging of complex materials using scanning tunneling microscopy.

Marija Drndic

For development of novel nanofabrication methods for graphene nanoelectronics and fast biomolecular analysis in solution.

Elisa Riedo

For atomic force microscopy studies of nanoscale friction, liquid structure and nanotube elasticity, and the invention of thermochemical nanolithography.

Donna Sheng

For insights into topological and strongly correlated phases of matter using computational methods.

James Valles

For experimental contributions to the understanding of the relationship between structure and the 2-dimensional superconducting-insulating transition.

THE DIVISION OF FLUID DYNAMICS

Rama Govindarajan

For contributions to our understanding of laminar-turbulent transition, especially in viscosity-stratified flows.

THE DIVISION OF LASER SCIENCE

Jie Shan

For outstanding contributions in understanding the physics of electronic and optical phenomena in nanoscale materials through the development and application of novel optical probes.

THE DIVISION OF MATERIALS PHYSICS

Claire Berger

For seminal contributions to the development of epitaxial graphene electronics.

Cherie Kagan

For innovative work in manipulating chemically and exploring physically the properties of inorganic and organic solid state materials, from colloidal nanocrystals and organic and organic-inorganic hybrid materials, and in exploiting these materials in electronic, optical, and optoelectronic devices.

THE DIVISION OF PHYSICS OF BEAMS

Sandra Biedron

For her fundamental advancement of light sources, including the control of light and harmonic light generated from coherent electron beams and the development of high-power ling wavelength sources.

Katherine Harkay

For significant contributions to the understanding of the physics of electron cloud effects and the experimental investigation and understanding of collective effects, as well as for playing leading roles in development of photocathodes and superconducting undulator technology.

THE DIVISION OF PARTICLES & FIELDS

Darin E. Acosta

For searches for new lepton-quark couplings and compositeness at hadron colliders, and for contributions to the success of the CMS experiment at the LHC through leadership in the areas of detector commissioning, trigger, and coordination of the physics program.

Bonnie Flemming

In recognition of her leadership in neutrino physics and her role in promoting the liquid argon techniques for neutrino detection.

Kate Scholberg

For work with atmospheric and accelerator neutrinos that established the phenomenon of neutrino oscillation, and for leadership in the worldwide effort of the supernova neutrino detection.

THE DIVISION OF PLASMA PHYSICS

Christine Charles

For discovery of current-free double layers in helicon plasma sources, development of helicon ion beam generators, and their application to space propulsion and materials modification.

THE DIVISION OF POLYMER PHYSICS

Alejandro Rey

For innovative mathematical modeling of polymers, fibers, liquid crystals, and biological membranes. Nominated by: Division of Polymer Physics

THE TOPICAL GROUP ON FUNDAMENTAL CONSTANTS

Susan Gardner

For pioneering work in strongly interacting physics and its interplay with weak decays and for numerous insights into important tests of CP violation and the Standard Model of particle interactions.

THE TOPICAL GROUP ON INSTRUMENT & MEASUREMENT SCIENCE

Marilyn Schneider

For outstanding contributions to x-ray measurements from laser-produced plasmas.

THE TOPICAL GROUP ON STATISTICAL & NONLINEAR PHYSICS

Karin Dahmen

For establishment and exploring the deep connections between non-equilibrium phase transitions and avalanche phenomena in diverse fields encompassing materials, geophysics and neuroscience.

THE FORUM ON THE HISTORY OF PHYSICS

Diana Kormos Buchwald

For her pioneering work in the history of the physical sciences, especially her exemplary editorial leadership on The Collected Papers of Albert Einstein.

THE FORUM ON INDUSTRIAL & APPLIED PHYSICS

Simone Raoux

For seminal contributions to the science and technology of phase change materials and phase change random access memory technology that opened up a whole new field of memory technology. ■

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*!*

CSWP Recognizes 12 Outstanding Physicists in 2013

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 her brief bio is featured on the website. In 2013, the following women were featured by CSWP (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
Janet Conrad, Massachusetts Institute of Technology
Renee Diehl, Pennsylvania State University
Emma Ideal, Yale University
Rhiannon Meharchand, Los Alamos National Laboratory
Stephanie Slater, CAPER Center for Astronomy & Physics Education Research

For information on nominating women and minorities for APS prizes and awards, please visit www.aps.org/programs/honors/nomination.cfm

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. ■

Diversity Census Seeks Clearer Picture of Membership

By Michael Lucibella

The recently formed Diversity Working Group within the APS staff is putting together a "diversity census" about the APS physics community. As part of this effort, members are being asked to update their profiles to include more demographic information.

"[It's] to get a sense of where we are with diversity in regard to the APS structure," said Arlene Modeste Knowles, APS career and diversity administrator and co-chair of the committee. "We have had to work with membership to make changes to the database to collect data and do the census."

Demographic information, including gender, race, and ethnicity, has been a part of membership profiles for more than two years. However, not all members have filled out all of the information. In addition, the profile options are changing. Race and ethnicity, previously one category, is being split into two categories, so members are being asked to fill in both.

"This information will be used to analyze demographics and provide information to members, but individual information won't be shared with third parties," Modeste Knowles said.

The working group was set up in response to the APS strategic plan, and the census will provide a snapshot of the diversity of the physics community. It will look at the demographic makeup of prize and awards winners, fellows, the elected leadership, invited speakers and other groups. The committee hopes to have the census finished by spring of next year, possibly with a preliminary report ready for the February unit leadership convocation.

"Increasing the diversity within the field of physics and working to ensure we are an inclusive organization are very high priorities," said Kate Kirby, the APS executive officer.

Diversity issues have been a major focus of the Committee on the Status of Women in Physics and the Committee on Minorities, and the groups will collaborate on many efforts.

"This group will be working with the existing committees," said Monica Plisch, associate director of education and diversity at APS and co-chair of the working group. "The diversity census is going to complement what the CSWP and COM is doing."

The working group is composed of ten APS employees, selected for two-year terms. Once the census is completed, the working group will also make recommendations to the APS operating officers. ■

This article was originally published in APS News.

Special Events Focusing on Women & Minorities in Physics

APS March Meeting • Denver, Colorado

Follow @APSMeetings and @APSDiversity on Twitter and subscribe to wiphys@aps.org for announcements about women in physics meetups and other diversity events at the APS March Meeting in Denver.

SUNDAY, MARCH 2

Professional Skills Development Workshop for Women Physicists

Workshop for developing communication and negotiation skills; for post docs and early-career women physicists (participants must be pre-registered). Reception for participants to follow.

TUESDAY, MARCH 4

Women in Physics Meetups Interested in meeting other women in physics? Join us for these informal gatherings:

Stop by Emily's Coffee (1261 Glenarm Place, just one block from the convention center) for a complimentary cup of coffee and a pastry from 7:30–9am, and network with other women physicists before starting a day of sessions.

Unwind at the end of the day from 6–7pm with complimentary beverages and hors d'oeuvres at the Corner Office (1401 Curtis Street, two blocks from the convention center) and then stay for dinner with your new colleagues.

WEDNESDAY, MARCH 5

COM/CSWP Diversity Networking Reception

Learn about the work of the Committee on Minorities in Physics and the Committee on the Status of Women in Physics, network with colleagues, and unwind after a long day of sessions. All are welcome. 7–8pm Sheraton Denver Downtown Room: Governor's Square 15.

The National Society of Black Physicists (NSBP) Meet-up

This Meet-up will provide an opportunity for NSBP members and those interested in the work of NSBP to gather, network, and learn about NSBP initiatives. All are welcome. Students and postdoctoral researchers are especially encouraged to attend. 6–7pm Sheraton Denver Downtown Room: Governor's Square 9.

LGBTQQIAAP+ Round-Table Discussion

The LGBT+ Physicists group welcomes those who identify as gender sexual minorities, as LGBTQQIAAP+, or as allies to participate in a round-table discussion on mentoring physicists. The session will provide an opportunity to learn and discuss successful mentoring strategies at different career stages for physicists in all environments, including academia, industry, etc. 6–7pm, Sheraton Denver Downtown Room: Governor's Square 11.

APS April Meeting • Savannah, Georgia

Please check dates & times of events on the Meetings and hotel calendars, as they may change nearer the time!

FRIDAY, APRIL 4

Professional Skills Development Workshop for Women Physicists

Workshop for developing communication, negotiation and leadership skills; for post docs and senior-level women physicists (participants must be pre-registered). Reception for participants to follow.

SATURDAY, APRIL 5

CSWP/DPF Networking Luncheon

Enjoy lunch while networking with colleagues! Cost: $15; $5 for physics students thanks to DPF's generosity. All are welcome, both men and women. Pre-registration is strongly advised. Food served from 12:00-1:30pm; speaker begins at 1:00pm. Registration for this event is available through the April Meeting registration form. The guest speaker will be Eva Halkiadakis of Rutgers University.

SUNDAY, APRIL 6

Education & Diversity Networking Reception

Learn about the work of the Education & Diversity Department, network with colleagues, and unwind after a long day of sessions. Forum on Education Fellows and recipients of the Committee on Education's Award for Improving Undergraduate Physics will be recognized at this reception. All are welcome.

Dr. Meera Chandrasekhar Honored for Exceptional Teaching

Baylor University named Dr. Meera Chandrasekhar, professor of physics and astronomy and Curator's Teaching Professor of Physics at the University of Missouri, as the 2014 recipient of the Robert Foster Cherry Award for Great Teaching. The Cherry Award is the only national teaching award presented by a college or university to an individual for exceptional teaching.

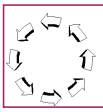
Chandrasekhar earned her bachelor's degree in physics and mathematics from M.G.M. College, Mysore University in India, master's degrees in physics from the Indian Institute of Technology in Madras, India, and Brown University, and a Ph.D. in physics from Brown University. After a postdoctoral fellowship at Max-Planck-Institut in Germany, she joined the University of Missouri faculty.

In addition to the 2014 Robert Foster Cherry Award for Great Teaching, Chandrasekhar has received many other honors, including the 2006 President's Award for Outstanding Teaching from the University of Missouri, 2004 Curators' Distinguished Teaching Professorship from the University of Missouri, 1999 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring from the National Science Foundation, 1998 Missouri Governor's Award for Excellence in Teaching, 1997 William T. Kemper Fellowship for Teaching Excellence from the University of Missouri and 1990 Chancellor's Award for Outstanding Research and Creative Activity in the Physical and Mathematical Sciences. She was honored in 2002 with the Distinguished Alumnus Award from the Indian Institute of Technology. She received an Alfred P. Sloan Fellowship in 1985 and was elected a Fellow of the American Physical Society in 1992. ■

Meera Chandrasekhar

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

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



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