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Dear Friends of the College,

I am filled with mixed emotions as I write this letter. In October, I announced to the college that I would be leaving my position as dean to become the founding chancellor at Yachay University, or Yachay Tech, the first research university in Ecuador. The vision and ambition of this project are great; the goal is not only to build a new university, but also to transform a nation and a region. Although I am very excited about the opportunity and the challenge, it is very hard to leave the Eberly College of Science and Penn State. This college and Penn State will always be in my heart. Over the last 16 years, I have developed many professional relationships and friendships with faculty, staff, students, and others in the college and across the University. I am very fortunate to have such great colleagues and friends and to have had the opportunity to serve as dean of such a wonderful college.

The college has experienced much growth and improvement over the last decade and a half due to the efforts of the entire college community. The college is filled with internationally recognized faculty and programs and has moved Penn State’s ranking in the basic sciences to among the top ten in the nation. We have recruited great faculty and wonderful students, improved our research and instruction, and have made strides in promoting the public understanding of science. We are continuing to recruit outstanding faculty members, and we have many initiatives underway aimed at enhancing the experience and education of both undergraduate and graduate students. In addition, we are working to substantially enhance the translation of research results and knowledge for the public good.

I have cherished my time at Penn State. Although the decision to take the next step in my career has been very difficult, I am ready to help build Yachay Tech from the ground up. Yachay Tech aspires to become a leading global research university in the basic and applied sciences and one that will stimulate knowledge-based business and address pressing societal needs in Ecuador and beyond.

It has been a great pleasure to work with everyone in the Eberly College of Science and the Penn State community, and I will truly miss Happy Valley. The 16 years that I’ve had the privilege of serving as dean of the Eberly College of Science have been the best years of my life. I look forward to working with the college to build a relationship between Yachay Tech and Penn State Science.

Thank you for making this college so great and such a pleasure to be a part of. I know that the college and Penn State are poised to do even greater things.

Sincerely,

[Signature]

Daniel J. Larson
Life Evolves Back:
In the 1960s, the medical establishment declared the war on infectious disease was won. Today, Andrew Read, director of the Center for Infectious Disease Dynamics (CIDD) at Penn State and a recently appointed Evan Pugh Professor, says not only is the war not won, but that our enemy has evolved resistance to our weaponry and is threatening a serious comeback.

“Much of modern medicine is like chemical warfare against things that harm us—infectious diseases, cancers, and insects that transmit infectious diseases. We throw chemicals at them and most of the time when those chemicals fail, the reason for that is the thing we are attacking has evolved resistance,” said Read. Currently, Read’s lab is taking a look at how and why resistance evolves by focusing on three diseases: malaria, Marek’s disease of chickens, and myxomatosis in rabbits.
Always Evolution

“I can’t remember a time when I wasn’t interested in evolution,” Read said. Growing up in New Zealand, Read was surrounded by what, in a global sense, is considered a very strange ecosystem, though he notes it all seems very normal when it’s where you’re raised. With almost no native mammals, the New Zealand ecosystem relies very heavily on some very unique birds. These endemic birds are what first captured Read’s fascination and led him to his career in evolution.

“I wanted to do my Ph.D. on the evolution side of things and I was working on the question of why peacocks have a big tail and the eyespots. One of the leading theories was that it was a way for males to advertise to females how healthy they are...that got me looking at bird health and one of the things that involved was looking at parasites in the blood of birds. Those are very closely related to human malaria,” said Read.

As he was working on his Ph.D., it occurred to Read that there were a lot of people working with birds, but almost no one was working on the parasites themselves. “They were working on the evolutionary consequences of the parasites, but not how parasites themselves evolve, even though parasites make people sick and evolve in real time. So toward the end of my Ph.D., I got really interested in malaria, thinking all the time that the evolution was bound to matter to human health,” he said. For Read, what draws him to working with the evolution of infection is that he is able to work on basic evolutionary biology problems in a context which has tangible impact on people and can make a real difference in the world. He doesn’t have to compromise on the basic science and there is potentially applied translation built in.

Asking the Hard Questions

Recently, some of the questions being pursued in Read’s lab have stirred some controversy. “The most controversial stuff we’ve done has been on the question of whether or not vaccination could drive the evolution of more virulent bugs,” Read said. He is exploring whether people who get vaccinated against certain infections might actually put unvaccinated people at risk by creating pathogens that have evolved resistance.

Vaccines for diseases like smallpox, polio, rubella, mumps, and measles block transmission and therefore take away the evolutionary potential for the disease. But the next generation of vaccines for diseases like malaria, HIV, and some hepatitis might not work as well. They might protect a host from the disease, but they don’t block transmission, so there is potential for the disease to evolve into something more dangerous than it already is.

In his lab, Read’s group has done some experimental evolution where they’ve shown that if they evolve malaria parasites in the presence of an immunized host, compared to a non-immunized host, the parasites become more virulent. They have also been working for a few years on a virus of poultry on Pennsylvania farms asking whether the same is true there. “That’s of interest because the vaccination has been going on a long time and the virus has gotten quite a lot nastier. We’re looking to see if the vaccination caused that,” Read said.

To illustrate, Read asks, “Why aren’t pathogens super nasty? Ebola is really nasty. Why aren’t most of our pathogens that nasty?” He explains that lethal pathogens kill their host and therefore kill themselves. By killing its host, it stops its transmission potential and won’t, therefore, be favored by natural selection. Natural selection is going to favor strains that keep the host alive and allow the disease to be transmit-
Robert Woods, completed his Ph.D. in evolutionary biology and then went to medical school, so he was able to translate what happens on the wards from an evolutionary perspective.

“I spent a lot of time when I first went there on the wards, rounding with the infectious disease team. They are the people who get called in when the infections have gotten out of control,” Read recounted.

Because a lot of infections are highly treatable, only the very worst cases were brought before the infectious disease team. Read was able to see the very worst infection problems in the hospital and experience the evolution in real time. “It’s amazing to see how it works when it works well. When they get the drug combinations right, the person can be unconscious or delirious and the next day they’re back—talking to you, chatting away, happy—it’s amazing. They look like they’re going to die and the drugs make them better. It’s magic. But that magic goes the other way too. There are times when they look fine and are talking to you and the next day they’re on a ventilator and the next day they’re dead. It’s that fast,” he said.

There are a couple of standout cases that had an impact on Read and his research. The first was a man who had minor surgery performed on his neck and got an infection that started in his back and moved rapidly through his bloodstream, killing him within a few days. He was the first death Read experienced on the wards.

“Our point is that the big successes we’ve had in the past were special types of vaccines and there are other types of vaccines that don’t block transmission; those ones create the potential for evolution and some of that evolution could be harmful to humans. We need to be smarter with next-gen vaccines.”

On the Front Lines
To get a more hands-on feel for the complexities facing doctors on the front lines with these diseases, Read recently embarked on six months of research leave where he was working in the Department of Infectious Diseases in the University of Michigan Health System. Read chose to go to Ann Arbor because a physician there, Robert Woods, completed his Ph.D. in evolutionary biology and then went to medical school, so he was able to translate what happens on the wards from an evolutionary perspective.
evolution happen in the hospital in real time and to see it in individual patients,” Read admitted.

Read and his collaborators are currently writing a case study of another standout patient, Patient ES. Patient ES was presented to the infectious disease team when doctors had tried all but two drugs to treat the infection that was running rampant through the patient. With only two drugs left in the arsenal, doctors wanted to know how they should use them. “We didn’t know a whole lot of things we should have known. For example, with two drugs left, should you use them together or sequentially? Well, the answer to that depends on whether you can select for cross-resistance. So if the bugs can evolve resistance to both drugs at once, you don’t want that. You’d be better off using them separately. And there are records in the literature of the bug she had evolving resistance to both drugs at the same time. So it can happen, but what’s the probability of it happening in ES? I think there are a lot of ways to figure that out, but we didn’t know enough to figure it out, at least not on the timelines that she needed,” Read said.

Read explained that if the problem had been presented at the beginning, before the infection was able to evolve resistance to anything, theoretically the team could have evolved the infection in a lab setting and figured out which was the best way to stop the infection from evolving resistance. For example, should the doctors use all of the available drugs together? Should they cycle through them? Should they use high doses or low doses? “We could have done that in the lab if the lab was set up for that kind of real-time evolution experiment. But we didn’t have anything like that. Nobody has that set up and ready to go. I’ve never heard of anybody trying anything like that,” he explained. Read admits that they may have treated the patient to the best of their abilities, but the point is that they just don’t know for sure.

“She basically died of uncontrolled evolution,” Read said of Patient ES.

What We Don’t Know CAN Hurt Us

So why don’t we have a better handle on evolution? Depending on your view, the number of people in America dying from drug-resistant infections per year is between 25,000-100,000. And the number is rising. “My view is that that is going to be an increasingly serious problem in the 21st century; it already is a very serious problem,” Read said. However, the problem is a complex one.

Doctors today are bombarded by an array of issues; the evolution of resistance is just one. And given that doctors are making decisions based on the patient in hand, evolution is fairly low on their list of concerns. Consider a patient living in a rural area. Two drugs could treat this patient effectively. One is much more expensive and only available at certain pharmacies that may not be readily accessible to the patient. The other is affordable and available at the pharmacy down the street, but may be a little more risky from an evolution standpoint in that it could actually drive the evolution of resistance in future generations of this particular disease. The doctor is most likely going to prescribe the accessible drug because if the patient can’t get any drugs, his immediate health is at risk and the accessible one will effectively treat his disease. It’s not going to harm that particular patient, but it has the potential to create bugs that the patient will be able to pass on to others down the road. Given the immediacy of the other issues, what are doctors to do?

Read thinks he can help. “The way I think of it now is, they’ve got many concerns; our job is to figure out rules they can follow that they can bring our evolution concerns into the decision-making process, but bearing in mind that they’ve
got all these other complexities,” he said.

Read compares doctors in hospitals today to fire fighters. They’re the ones making the hard calls and putting out the fires in the day to day. Read and other evolutionary biologists are like forest ecologists who can tell the fire fighters why the forest is burning and how to make fires less likely in the future. “There is this huge gulf between basic science and the physicians making these clinical decisions. There’s a big intellectual space there that’s vastly underoccupied,” Read said.

The Land Grant Can
To fill that space, Read suggests that maybe we should be looking to another industry that has been putting out similar fires for quite a while: agriculture. “Very analogous problems exist in agriculture where insecticides and herbicides have been thrown at weeds and insect pests for decades,” he said.

As mentioned above, Read’s lab has spent quite some time looking at the poultry industry in particular. From time spent in hospitals and chicken farms, Read has seen some similarities and potential. “To me, there are lots of parallels to what’s happening in a chicken house and a modern hospital—high-density populations and all sorts of drugs and vaccines being thrown around,” he said.

In a modern chicken house, it’s not uncommon to see 30,000 birds being raised at a time. All of those birds hatch at exactly the same time with the same immune status and reach maturity in a little over one month. It is a homogeneous, high-density, large population where there are a lot of viruses and parasites present. Read notes that the evolutionary forces released in that situation are really strong. “The triumph of agriculture has been to contain the diseases. The main reason chicken is as cheap as it is, is because they’ve gotten the diseases under control,” he said. Looking at how farmers have kept these diseases under control may just translate to helping doctors understand how they too can start to manage the evolution of disease.

What better place to explore these parallels than Penn State? There are very few comparable institutions where research and the land grant mission are as intertwined. Penn State is a top research university with excellent work being done in evolutionary biology, infection, and cancer research. And Penn State has a rich history of working on and with farms. Right now, there is a lot of leading work going on in herbicide and pesticide resistance in the University. If Penn State were able to bring all of these elements together, Read believes there is a lot of potential to fill the intellectual space in evolution management.

“My proposition is that it would be possible to get more rigorous and develop a science of evolutionary management which would make the most of the expertise and opportunities in agriculture and bring those to bear on human health,” he said. As Read sees it, the future of resistance management may lie over the unexpected bridge between farmers and doctors.
At Home in the Genome

Frank Pugh has built a career investigating the body's control systems. By Whittney Gould

While the view out of Frank Pugh's lab office in North Frear hasn't changed much in the last twenty-three years, the activity inside has made dramatic leaps and bounds.

Pugh, now a professor in biochemistry and molecular biology, came to Penn State in 1991 with a fascination for basic research that explored the idea of control systems in the human body.

Learning about our body's control systems could be key to understanding how to treat a multitude of diseases and disorders, according to Pugh. “These control systems regulate how your body works. When they get screwed up, you get sick.” Research in Pugh's lab explores the fundamental processes that govern how these control systems work. “Once we understand how they work, we can be a bit smarter about fixing them.”

The control systems that Pugh refers to
are the genes that reside on our genome, and individual human cells contain approximately 20,000 genes. At the controls are molecular proteins that bind to the genes and work in unison for a shared purpose. He likens these proteins to dials and switches that need to be turned or flipped to create the right settings for a specific gene expression program to happen. This is gene regulation.

“Regulation at the DNA level is important for all the functions of the body,” explained Megha Wal, a graduate student in Pugh’s lab. “Many diseases are affected at the gene regulation level or by how the DNA is packaged.”

This is one reason Pugh engages in this basic research that he hopes will someday further disease treatment and lead to more personalized medicine based on a person’s individual DNA makeup: “Here at Penn State, we’re a basic research institution, so our goal is to understand basic mechanisms, which provide the foundation so that disease-specific misregulation of these control systems can be studied.”

In 2004, Pugh, along with his former graduate student Kathryn Huisinga, made an important fundamental discovery about these control systems. The pair discovered that there were two types of control systems that regulate the genome: a general housekeeping system that supports normal everyday functions of the genome, and an emergency system, which operates mainly when cells are stressed.

Whole-Genome Sequencing

Historically, gene control systems have been studied on a single-gene level. “Now, we’re revisiting that concept, but looking at all of the genes simultaneously,” Pugh says. This is made possible because of the advancement of gene sequencing technology, which was a recent development in the field. “We can study every nook and cranny of the genome, which we could not do before.”

Whole genome sequencing can now be performed on a gene sequencer, a machine that can read the entire genome of an organism. And one of the best things about this technology is that it’s now affordable enough for a small academic lab to buy a machine and run it on a typical laboratory budget.

Why is it important to study whole genomes? “We’re picking up some key fundamental concepts across the genome,” Pugh explained. Wal added, “So now you’re getting rules which affect the entire genome rather than one gene or another.”

One way that Wal is using this technology in the Pugh lab is through a collaboration with
Megha Wal came to Penn State as a graduate student pursuing Biochemistry, Microbiology, and Molecular Biology in 2008, after attending a lecture given by Dr. Pugh in Hyderabad, India. As a graduate student, she was allowed to do three different rotations with faculty in the department before choosing her faculty mentor. After completing her three rotations in the fall of 2008, one of which was spent in Pugh’s lab, she officially chose Pugh as her faculty mentor in January 2009. She has been working in the Pugh lab ever since.

What are some of the reasons she made this lab her home at Penn State? In addition to the prestige of Pugh’s highly cited research, Wal felt that his lab’s working environment was different than others: “It’s a big group and of course you have pressure to get results, but it’s a very harmonious lab, and I give credit to Frank for that,” she said. “He has always encouraged us to work as a team, which promotes healthy work relationships and helps us to collaborate better. Getting another person’s perspective on your research is important in building new ideas.”

Pugh’s penchant for collaboration means that Wal is also encouraged to team up with other labs around the world. Currently, she is studying the packaging and assembly of chromatin on a whole-genome level, in particular chromatin remodeler proteins and their function in nucleosome rearrangement, using yeast as the model organism. This research is being done in collaboration with Ludwig Maximilians University in Munich, Germany.

Wal enjoys delving into a deeper understanding of scientific principles, which is a reason she likes the work being performed in the Pugh lab. “It’s fundamental research but it’s very important since it lays the foundation on which applied research is built.”

Wal’s long-term career goal is to teach and inspire the next generation to love and pursue science as she has done. In the meantime, she’s happy to be able to solve scientific mysteries. “I like having the ability to find answers to puzzling scientific questions. It’s a great feeling when you fit the missing pieces of the puzzle together and everything makes sense.”

the laboratory of Professor Philipp Korber at Ludwig Maximilians University in Munich, Germany. The two groups are studying the way genes are packaged inside the nucleus of a cell. Proper packaging into chromatin is critical for the proper control of genes. They are working toward assembling chromatin on a genomic scale in a test tube using individual protein components and machines. This idea had been considered on the single-gene level, but never before on a whole genome. “It sounds almost crazy to try and reconstitute from pure components the entire primary structure of a chromosome,” Pugh explained of the work Wal is doing. “However, if we can achieve this, we will have greater experimental access to understand how whole genomes are regulated.”

The lab is focusing on yeast as the model
organism. According to Pugh: “Most of the principles that we find in yeast also relate to humans. So we use yeast as a test bed for new hypotheses on genome regulation, then if they prove viable we attempt similar experiments in human cells.”

The Pugh lab has contributed important techniques to the study of gene regulation on a genomic scale. They developed novel techniques to map where regulatory proteins bind to genomic DNA with pinpoint accuracy. This provides high-resolution views of the control systems. One method that is gaining popularity, termed ChIP-exo, was patented by Penn State. **Ho Sung Rhee**, a graduate student in the Pugh lab who developed ChIP-exo, related, “It’s like going from the historical 480p resolution of television screens to the now-satisfying 1080p resolution, but applied to the genome.”

**Creating a Collaborative Center**

In 2004, Pugh became director of the Center for Eukaryotic Gene Regulation, which encompasses seven core laboratories located on the fourth floor of North and South Frear Buildings. Their principal investigators study the structure and function of the protein machines that are responsible for gene regulation.

Both North and South Frear have been recently renovated. Pugh feels a special sort of ownership for the floor where the center is located because he helped to design it. When renovations were planned for North Frear, building codes allowed for less research space than was anticipated. In addition, the original architectural design created isolated laboratories that did not foster interactions among their members. “We needed to redesign the floor in a way that both utilized the space and allowed interactions between people.” Pugh stepped up and contributed to a new design, one that removed walls between labs and placed noisy equipment away from people.

Unlike other centers on campus that unite researchers with similar interests who are housed in different locations, the Center for Eukaryotic Gene Regulation is the physical home of its core researchers. “We do a lot of hands-on research and we need people with a variety of expertise to be near each other.”

This method of collaboration pays dividends to the researchers in the center. Pugh recalls
one project in particular where being physically near his colleague David Gilmour, also part of the Center for Eukaryotic Gene Regulation, helped the two labs collaborate on an important project. Gilmour’s lab studies how RNA polymerase moves down a gene to read DNA. Jian Li, a graduate student in the Gilmour lab, was studying how RNA polymerase movement is regulated at individual model genes, using a method call permanganate footprinting. At that time, back in the Pugh lab, Rhee was developing his ChIP-exo technique. “We were thinking we could put those two techniques together to understand how the polymerase pulls apart the DNA to read the DNA sequence on a whole-genome scale rather than on one gene at a time,” Rhee said. Li and Rhee got together and made the idea a reality. “They would have never done that had they not been physically in the same place. There just wouldn’t have been the intensity of interaction that would seed this kind of discovery,” Pugh added.

Happy in Happy Valley
Although when he first took a job as assistant professor of biochemistry and molecular biology in 1991, he wasn’t sure how long he would stay, Pugh is still busy making discoveries at the university where he began his first academic position.

It didn’t hurt that the inhabitants made him feel right at home from the beginning. He joked that one benefit of moving here was that he no longer had to explain the pronunciation of his last name. Sharing a last name with Penn State’s first president Evan Pugh, who has a State College street named after him, meant that everyone could pronounce it.

This year, Pugh had another “Pugh” moment—he was one of three professors on campus named an Evan Pugh Professor in 2014. The Evan Pugh Professorship is the highest honor bestowed upon a Penn State faculty member, and faculty are only selected to join this prestigious group every few years. Pugh was the first faculty member to be selected from the Department of Biochemistry and Molecular Biology.

Evan Pugh isn’t the only Pugh that Penn Staters associate Frank with. His sons Ben and Brian have become fixtures on campus, and daughter Erika is taking a class at Penn State while attending State College Area High School. Ben recently graduated as a Helen E. Eisenhower Award recipient from the Smeal College of Business, and Brian is majoring in electrical engineering in the College of Engineering. Both are Schreyer Scholars. It’s amusing for Frank when he is now often known around campus as the father of Ben or Brian, rather than as a professor in biochemistry and molecular biology.

Pugh had earned many other prestigious accolades before receiving the Evan Pugh Professorship, including winning the Faculty Scholar Medal in 2006 and being named the Verne M. Willaman Chair in Molecular Biology. Pugh’s highly cited work has been published in 88 scientific papers in peer-reviewed journals, and since 2008 he has been editor of Molecular and Cellular Biology.

With the long list of achievements that Pugh has built up during his time at Penn State, he would be a great catch for another research institution to land if he chose to move on. However, Pugh said, “I’m still just as happy as the first day I moved here.” And what keeps him happy? “The students here are fantastic, the support from the university is fantastic, and I love working with my colleagues.”
The Future is Now:
The College's Vision 2014-2019
By Whittney Gould
Every five years, the University and each of its colleges set new strategic directions and goals for their education programs, research, and other initiatives. This year, the Eberly College of Science created its new strategic plan for 2014-19 titled “The Future is Now.”

“Given the status of the college and the many things we want to accomplish with the new University leadership, this strategic plan is the most important one we’ve done in 15 years,” said Dean Daniel Larson.

New Process to Include College Community

The process to put together this year’s strategic plan was a little different than in past years. Chuck Fisher, associate dean for graduate education and professor of biology, was asked by Dean Larson to help lead the strategic planning effort. “When Associate Dean Karin Foley left, we knew we needed more help with developing the strategic plan. We are very fortunate that Chuck Fisher agreed to take it on,” said Larson. Fisher had a few ideas to include the college community in the process. “We wanted to get everyone involved,” Fisher said.

The planning process began with a large town hall for everyone in the college to attend, which was held on March 3. Fisher presented the ideas that the dean’s group had brought forward for the contents of the plan, and asked for the college’s input. He also announced the formation of smaller focus groups, both to gather ideas about the college’s priority areas and to cover topics that the college community felt needed to be addressed in the plan. “We wanted to gather as much input from the college in each of the different areas as possible,” he said.

After gathering the input from the college community, it was decided that eight focus groups would meet on the topics of: increasing our impact on society, staff enrichment and retention, improving the climate in our college, graduate and postdoctoral training initiatives, future growth and infrastructure, enhancing diversity and gender balance, research themes, and undergraduate education. Anyone in the college with an interest in the topic of a focus group was invited to attend.

Although there was some initial concern that the focus groups would be under-attended, attendance was strong. “The focus groups were all well attended, ranging from 20-50 people and the feedback was overall positive. Most of the feedback we received was ‘this is good, tweak it just a little’ rather than serious complaints,” Fisher said. “It was a reaffirmation that we have good people in the college, that they care, and that we’re on the right track.”

Improving the College’s Climate and Diversity

During the focus groups, certain issues floated to the top of the priority list for the strategic plan. At the focus group “Improving the Climate in Our College,” Fisher saw a need to incorporate a theme of improving climate and diversity throughout the whole strategic plan, rather than just continuing the tradition of focusing on those issues in the additional “Framework to Foster Diversity” plan. “It was apparent to the dean’s group that diversity and climate were a major part of the plan, so we decided to fully integrate it in the college plan,” Fisher said. An appendix to the strategic plan was included to create easy access to the portions of the plan that relate
specifically to climate and diversity and allow a quick look at our progress in these areas. “We have always integrated climate and diversity planning with our strategic plans—climate and diversity are essential elements of the plans—so we were happy to see that become the University's approach,” said Larson.

Using the most recent College Climate Survey, administered in 2012 by the college Climate and Diversity Committee, as a guide, the dean’s group set goals to improve some specific areas of climate and diversity in the college that were concerns, including a focus on improving the diversity and gender balance of the faculty. This is important, Fisher said, because “improving the college’s climate will only help us recruit and retain the best faculty and students.”

Tracy Langkilde, associate professor of biology and Tombros Administrative Fellow for Undergraduate Research, was part of the dean’s group strategic planning team this year. She agrees with Fisher’s assessment that improving the climate of the college will help recruit strong hires. “Having lots of female faculty always makes it easier to recruit more female faculty.” She adds that diverse faculty hires create a ripple effect in recruiting students: “I think having a diverse faculty also recruits more diversity, both of faculty and of students. One of the wonderful outcomes of recruiting diverse faculty is that these faculty tend to attract top minority applicants.”

Recruiting and retaining female faculty is a big goal for the college in the next five years, says Fisher. “A really serious consideration for our college if we want to increase recruitment
and retention is that we have to be family friendly. We are going to lose young female faculty to places that are more family friendly if we’re not absolutely at the forefront,” he said. He admits that the topic of making the college more family friendly had always been on the agenda for the strategic plan because “it’s the right thing to do,” but the priority was reaffirmed for the dean’s group as a result of discussions in the focus groups. He was, however, surprised by the high priority that a family-friendly workplace had for a female faculty member making career choices. “We had thought about it as far as employee satisfaction, but not as it making or breaking retention.”

Langkilde, herself a female faculty member, thinks the college does a few things already that make it family friendly. “One really great aspect of our college is that it’s accepted that you can bring your kids to events.” This isn’t the case everywhere, Langkilde notes. “I know faculty from other colleges who have been ‘uninvited’ from events because they chose to bring their family.”

Langkilde says sometimes acceptance in the workplace culture is the key to making a workplace family friendly: “It’s having a culture where it’s okay for you to have kids, it’s okay for you to need to take time off to go to your kid’s school concert, it’s okay for you to bring your kids to things on weekends, to have photos of your kids up in your office, and for that to mean that you can still be a serious scientist or staff person.” She feels the college has the “culture of acceptance” for working mothers.

Fisher would like to build upon those existing initiatives and add lactation stations to the college’s buildings and better advertise the schedule flexibility that could help working mothers in the college.

**Transforming the Educational Experience for All Students**

This strategic plan includes a targeted focus on education across all levels—from undergraduates in all majors at the University to graduate students and postdoctoral scholars. Part of this push comes from a desire to bring the quality of our education programs up to the level of our
Tracy Langkilde, associate professor of biology, was selected as the 2014 Tombros Administrative Fellow for Undergraduate Research. Among the many accolades that recommended her for this position, her passion for undergraduate research and her mentoring of nearly 50 undergraduates in her research laboratory over the last seven years made Langkilde a great fit for this fellowship.

The Tombros Fellowship program attracts faculty who are interested in novel approaches to undergraduate education, whether it’s redesigning a course or finding a different way to engage undergraduates during their time in the college.

For this particular fellowship, the Office of Undergraduate Education saw a need to focus on engaging undergraduate students in research earlier in their education as a way to better connect them to the college. “In the College Climate Survey, undergrads said they left the college early because it was big and impersonal. We’re trying to find a way to better connect undergrads in a community setting, and labs are a great way to become part of a smaller group.”

Langkilde’s passion for engaging undergraduates in research goes back to her own days as an undergraduate student who discovered research. “For me, getting engaged in undergraduate research was important. Sitting in the classroom and hearing people talk about science was one thing, but actually conducting research to explore these concepts was what really got me engaged.”

Since she began her fellowship in January 2014, Langkilde has been hard at work. She helped to roll out the SCIRES Distinguished Research Certificate program, which gives students an opportunity to get formal recognition on their transcript for research work and the production of a thesis. The program had its first four graduates this past May. She’s also working on establishing a life-sciences focused Research Experiences for Undergraduates (REU) program at University Park for Commonwealth campus students to get research experience the summer before they transition to University Park.

This past September, Langkilde ran the first undergraduate poster session for the college. Participants presented their experiences with research, study abroad, Internships, coops, and REUs. Before the poster session, Langkilde gave a workshop on how to create a research poster for the session. The numbers show this project was a success: her workshop had over 300 attendees, and the poster session had 47 presenters.

“She brings terrific energy, dedication, and ideas to the Dean’s Office, and we are delighted to have her on board,” said Mary Beth Williams, associate dean for undergraduate education in the college.
research programs, Fisher said.

“We know how to do research, and we are doing it well. Our research enterprise is top in the country. We know how to hire research faculty, we know how to support research. But we are not the top in the country when it comes to our education programs. Our education programs should be ranked equal to our research. We made a conscious decision to elevate our attention to education in the next five years.”

Much of the educational goals in this strategic plan focus on undergraduates. There are a few reasons for this: first, the Eberly College of Science delivers the second-highest number of credit hours to Penn State students as part of their major degree and general education requirements; and second, only 50 percent of students who enroll in the college graduate with a degree from the college (with a large percentage of these students changing their major at Penn State after admission).

To help retain students who enroll in the college, Mary Beth Williams, associate dean of undergraduate education, and her team created a comprehensive plan to improve the undergraduate student experience in the college. The plan includes facilitating learning communities, updating facilities, requiring co-curricular experiences, expanding advising services, and increasing early-retention efforts.

According to Langkilde, an important component to executing the items in the plan is to update learning facilities in the college: “We’re renovating our teaching facilities. If we’re going to carry out all of our educational reforms, we need to make sure we have facilities which will support them.”

In addition to modernizing outdated laboratories, there are plans to create an Academic Support Center in the east wing of Ritenour Building. The Academic Support Center will bring together many undergraduate student services into a single location, including advising, the Center for Excellence in Science Education, the Office of Digital Learning, Career and International Education, and collaborative learning and meeting space for students and staff. Plans also include a one-button studio to help students and faculty more easily create digital video recordings.

Some items in the undergraduate education portion of the strategic plan might seem aggressive, like requiring all students to have a co-curricular experience. Co-curricular experiences encompass engaging in research, study-abroad experiences, internships, and peer-led teaching experiences. Currently about 74 percent of the graduating senior class in the college already participates in these experiences, which is one reason for the requirement. “Co-curricular opportunities allow students to apply and practice what they learn in the classroom, and build community and support networks which contribute to increased persistence and success,” said Williams.

Other strategies to increase undergraduate student success in the plan include expanding advising services and increasing early-retention efforts in the college.

Advising goals include having a wider range of advisers trained to assist students and tailoring advising services to specific student needs, including students transitioning from other Penn State campuses, international students, and first-generation college students. The goals of early-retention efforts are to better identify at-risk students early and be able to match resources and modes of instruction to help these students succeed when they first begin to struggle.

The education improvement efforts extend to faculty, graduate students, and postdoctoral
THE EBERLY COLLEGE OF SCIENCE CONTINUES TO GROW in its accomplishments and quality. Below, we highlight some of the college’s achievements as well as areas in which we currently fall short of our goals.

Penn State is among the top 10 institutions nationwide in the basic sciences.

The number of science professionals who have graduated from the college.

The number of undergraduate students enrolled in the college in fall 2013.

The number of student credit hours taught per year; the college is second only to the College of Liberal Arts in this arena.

The number of credit hours taught online in 2013-2014.

In life sciences ranking of the college’s first MOOC by coursetalk.org.

The percentage of the 2014 graduating seniors in the college who did research, an internship, or study abroad while at Penn State.

The percentage of undergraduate matriculants who persist to graduation from the college.

The number of faculty holding membership in the National Academy of Sciences, the American Academy of Arts and Sciences, or the Royal Society (UK).

The number of times papers published by college scientists were cited in 2013.

College research expenditures in USD in fiscal year 2013.

The percentage of the University’s postdocs that are in the college.

The percentage of female tenure-line faculty.

The percentage of African-American and Hispanic tenure-line faculty.

The percentage of 2014 undergraduate applicants to the college who are white Americans.
scholars as well. New faculty training will now include pedagogical training, which can be continued annually through workshops presented by the Center for Excellence in Science Education. “There’s a lot of things you’re not trained to do, like manage a lab, work with and mentor personnel and students, and teach,” said Langkilde, who says she wishes that more of this type of training was available when she started.

New graduate student and postdoctoral mentoring programs encourage better communication between students or postdocs and their mentors. When the college created the Individual Development Plan and mentoring program for postdocs, the guidelines were benchmarked with the National Science Foundation, the National Institutes of Health, the National Postdoctoral Society, and many peer institutions to create a compilation of the best practices in the nation. A similar approach is being made to improving graduate student mentoring practices. Graduate students will also be offered a variety professional development modules to help them learn soft skills important in both business and academic settings, as well as training in public communication and technology transfer. The end goal of the graduate student and postdoctoral mentoring programs is to better prepare these groups for the diversity of career opportunities available to them.

**Increasing Our Impact on Society**

Another area the college hopes to improve upon during this strategic plan period is increasing our impact on society. Specifically, this means both communicating research more effectively to the college’s audiences, and translating more of the college’s research into public good. **Andy Stephenson**, associate dean for research, says this is another area where the college hopes to benchmark with its research excellence. “The college lags behind our peer institutions in terms of moving our research from the lab bench into society. This is preventing the college from fully capitalizing on the economic, educational, and societal benefits of our research enterprise.”

Improving this area starts with better communication. Equipping members of the college, including graduate students and postdocs, with the abilities and skills to speak to the media, the general public, industry, and policy makers will greatly enhance the college’s visibility outside the University.

**Allison Lewis**, a graduate student in biology who attended the strategic planning focus groups, is excited by the prospect of empowering graduate students to help increase the college’s

**ALLISON LEWIS AND DREW WHAM PARTICIPATE** in the USA Science and Engineering Festival in Washington D.C. in April 2014 as an outreach activity for the college. Read more about the festival on page 36.
public visibility. “Public outreach and communication to policy makers is key to continued support in the sciences,” she said. Lewis enjoyed the strategic planning focus group “Increasing Our College’s Impact on Society,” because it enabled graduate students to team up with communications specialists and faculty with experience dealing with the media to discuss effective ways to highlight Penn State research. “Graduate students hope to become a point of contact to share information about exciting findings and ongoing projects in their labs,” she said.

Outreach is a great way to increase the college’s visibility, but time spent doing outreach wasn’t always regarded as significant in the academic community, said Lewis. This focus group reinforced the importance of outreach efforts, which can include community events, after-school programs, blogs, and educational app development. “By drawing more significance to time spent on science outreach, students and faculty can both contribute to our shared goal of increasing our impact on society.”

An important aspect of translating the college’s research to the public is intellectual property (IP). In addition to positively increasing the college’s impact on the world around us, IP can generate a revenue stream to help alleviate pressures on tuition and fees and allow internal funding for high-risk, potentially high-reward basic research. In addition, many grant applications now require a broader impact in addition to research merit.

But there are a few hurdles to developing and commercializing the college’s research, namely a general lack of awareness or knowledge about the process. Beginning with this strategic plan, all new faculty, graduate students, and postdocs will receive instruction in IP awareness and learn how to recognize potential IP and the steps to take to develop and protect the IP.

If the IP initiatives are successful, they could help with a challenge that the college faces in implementing many areas of the strategic plan, said Fisher. “Many of the initiatives require money, and dollars are tight right now. We need to be aware of this and make sure we are generating funds for some of our big ideas.”

Fisher is confident that the college will work together to meet all of the goals set in the strategic plan. “We have a great college, and they are vested.”

"GRADUATE STUDENTS HOPE TO BECOME A POINT OF CONTACT TO SHARE INFORMATION ABOUT EXCITING FINDINGS AND ONGOING PROJECTS IN THEIR LABS."
Most people say that it is the intellect which makes a great scientist. They are wrong: it is character. – Albert Einstein

As dean of the Eberly College of Science for the last 16 years, Daniel Larson has worked diligently to achieve ambitious goals for the college and to instill vision and direction for its continued growth and success. A strong, compassionate leader and pioneering scientist, Larson has been a champion for science education and research, and has brought together faculty, staff, students, alumni, and friends of the college in strategic efforts to strengthen the college and expand its international reputation. He has transformed the college into a nationally and internationally ranked institution that is considered to be at the top of the Big 10, in the top 10 U.S. science colleges, and one of the top two public science colleges in the United States according to a comprehensive study done by the National Research Council.

Some other impressive accomplishments under his leadership include his support for graduate research and undergraduate instruction, his high professional and ethical standards, his success in recruiting outstanding faculty members, his support for diversity and promoting a climate that is inclusive and respectful, and his encouragement for initiatives to enhance the public understanding of science. In recognition that his performance, methods, and achievements exemplify the highest standards of administrative excellence, Larson was honored as the recipient of Penn State’s 2012 Award for Administrative Excellence.

Larson leaves a legacy as an instrumental figure in the college’s successes. His understated yet firm guidance enabled the college to grow its programs, people, and research. Already known as an outstanding scientist, educator, leader, and administrator before he came to Penn State, Larson also gained the respect of the Penn State community and beyond with
his insightful perspectives, passion for science, communicative nature, and approachability.

At the end of December Larson will leave Penn State at the to pursue a challenging new endeavor in South America, where he will be the founding chancellor at Yachay University, the first research university in Ecuador. Also known as Yachay Tech, the university aspires to become a leading global research university in the basic and applied sciences and one that will stimulate knowledge-based business and address pressing societal needs in Ecuador and beyond. Yachay Tech is being built as the core of the new city of Yachay in northern Ecuador, otherwise known as the “City of Knowledge” (Yachay means “knowledge” in the Kichwa language). This planned city is a first for Latin America, and the Ecuadorian government envisions it becoming a regional center of science and technology.

In his role as chancellor, which he will assume in January 2015, Larson will be the chief academic officer. His responsibilities will include hiring deans, department heads, and faculty members, as well as establishing the academic directions of the new university. Additionally, Larson plans to develop a relationship between Yachay Tech and Penn State to enhance education and research opportunities at both universities.

“It is always a bittersweet moment to lose a leader like Dan, who has contributed so much for so long to our institution, and contributed in such a profound and transformative manner. Eberly, and indeed Penn State, have been forever changed for the better through Dan’s leadership and commitment. He leaves a substantial legacy, and a strong foundation from which the new dean will be able to continue to advance the college. I am sure—convinced in fact—that Dan will do great things in, and for, Ecuador. They are fortunate, indeed, to have recruited him,” said Penn State Executive Vice President and Provost Nicholas P. Jones.

Before joining Penn State in 1998 as dean of the Eberly College of Science, Larson was the Maxine S. and Jesse W. Beams Professor of Physics at the University of Virginia, where he was among the most highly respected researchers and consistently was ranked among the best physics teachers. At the beginning of his career, Larson was an assistant professor of physics at Harvard University from 1970 to 1975, and was an associate professor of physics there from 1975 to 1978. He then joined the University of Virginia in 1978 as an associate professor of physics, was promoted to professor in 1987, was associate dean of arts and sciences from 1989 to 1991, was chairman of the physics department there from 1991 to 1997, and was named the Maxine S. and Jesse W. Beams Professor of Physics in 1996. He also was a visiting professor at the U.S. National Bureau of Standards in 1985 and 1986 and at Chalmers University in Sweden in 1986 and a visiting scientist at the Laboratoire Aimé Cotton in France in 1991. He joined the Penn State faculty as professor of physics and dean of the Eberly College of Science in 1998 and was named the Verne M. Willaman Dean of the Eberly College of Science in 2001.

Larson graduated summa cum laude with a bachelor-of-arts degree in physics and mathematics from St. Olaf College in 1966. He earned his master’s degree in 1967 and his doctoral degree in 1971, both in physics at Harvard University. He was named a Woodrow Wilson fellow in 1966 and was a National Science Foundation graduate fellow from 1966 to 1970.
New Grant and Experiment Help to Further Penn State Millennium Scholars Program Goals

How can we increase the number of U.S. students from underrepresented backgrounds earning advanced degrees in science and engineering fields? Penn State, the University of Maryland Baltimore County (UMBC), and the University of North Carolina at Chapel Hill (UNC) have partnered with the Howard Hughes Medical Institute (HHMI) to conduct an experiment to find out.

UMBC’s Meyerhoff Scholars program has been successful for more than 25 years in providing paths for underrepresented students in STEM fields to pursue advanced education. Meyerhoff Scholars have gone on to earn 423 advanced science degrees and 107 medical degrees. That type of success is what Penn State was looking for when it created the Millennium Scholars program, modeled after the Meyerhoff program.

The Penn State Millennium Scholars program, a joint venture between the Eberly College of Science and the College of Engineering, supports incoming college freshmen that have committed to the long-range pursuit of an advanced degree in a science or engineering field. The program targets underrepresented groups and provides major scholarships for four years to students who are accepted into the program and maintain a 3.5 grade point average.

“Because this grant supports the partnership between all three schools, we have the opportunity to learn from
UMBC’s historical experience. This gives our students a vision of where we can go as a program and also what they can accomplish if they just focus and keep the end goal in mind,” said Starlette Sharp, director of the Penn State Millennium Scholars program.

As part of this research project with the Howard Hughes Medical Institute, Penn State receives a $2.375 million grant that will help fund between 24 and 48 Millennium Scholars per year for five years. Associate Dean Mary Beth Williams, principal investigator on the grant, said, “With generous support from HHMI, we are able to expand the number of science Millennium Scholars, and also carefully study the elements of the program to understand how we can use this to support all students.”

Sharp is excited by the opportunity the grant will provide for the program: “Associate Dean Williams being awarded this highly selective grant gives the Penn State Millennium Scholars program a lot of credtablility on a highly visible platform.”

During the five-year award period, Penn State will evaluate the success of the program based on several factors. The evaluation plan for the program will focus on compiling the academic, scientific, and social experiences of each student. The evaluation plan will also document the Millennium Scholars program implementation, including gathering and organizing information about
how the program runs with the goal of disseminating ideas and lessons learned to other large public state institutions. Throughout the award period, Penn State will measure changes in campus climate, including experiences with institutional discrimination, commitment to diversity, academic and interpersonal validation in the classroom, and cross-racial interactions. Together, these data will enable Penn State to recommend ways to create environments that are conducive to STEM success at Penn State, partner institutions, and beyond.

This new funding and experiment goes into effect as the second cohort of the Millennium Scholars program begins their journey at Penn State. There are a few changes to the experience this year that serve to provide extra support to the Millennium Scholars.

The summer bridge was enhanced in a few ways. The first change was that the students took an English class this year. “This was a great way to bring in the importance of scientific writing skills,” said Sharp. She also worked with the math workshop team of Nathaniel Brown and Ryan Flynn to fine tune the summer bridge so that student deficiencies could be detected earlier and early intervention practices could be implemented. Philip Bevilacqua, who teaches the chemistry workshop, made some changes to focus on teaching the students how to learn chemistry and its fundamentals, which seems to be paying off. The early outcomes from the first chemistry exam were promising.

This fall, the Millennium Scholars moved into a new science and engineering community in Ritner and Wolf Halls—with students in several other science- and engineering-focused living-learning communities. Together, the two residence halls provides living and learning spaces for 600 students in STEM fields, with both casual and study common spaces to promote collaborative learning and good study habits. The new living space gives the Millennium Scholars a unique opportunity to participate in—and in later stages, lead—science- and engineering-related programming geared toward STEM students.

The HHMI grant funded a fall retreat for the Millennium Scholars and their counterparts this year. Students from all three schools funded by the grant met for a retreat in Virginia to hear talks from guest speakers and display their research.

“HHMI also provides travel funds, which give our students additional opportunities to network, give research presentations, and really immerse themselves in the field with other cutting-edge scientists,” said Sharp. “The grant provides many exciting opportunities for our students.” —Whittney Gould
Research Leading to Practical Benefits for Society

Federal granting agencies increasingly expect researchers to develop intellectual property (IP) and transfer it to the public to commercialize as discernible impacts from the research grants they provide. The generation of IP and its transfer to the public are major goals of the new strategic plan of the college. The new IP/Tech Transfer initiatives in the college are aimed at educating our faculty, postdocs, and grad students about the IP/Tech Transfer process and assisting in the capture of the potential IP generated by the college, at providing the inventors with guidance as to how to enhance the utility of their IP and increase its chances of being transferred to the public good, and by providing research funds to smooth the transfer of the most promising IP from the lab bench to society. Each issue of the Science Journal will highlight a faculty member whose intellectual property has real potential to benefit society.

Gong Chen, the Verne M. Willaman Chair in Life Sciences and professor of biology, has developed a revolutionary technology that holds real promise as a potential therapy for traumatic brain and spinal cord injury and Alzheimer’s and Parkinson’s diseases. In healthy brains, astrocytes connect neurons to the blood vessels. However, when a brain is damaged, the astrocytes become reactive (swelling and dividing) and form a scar-like tissue over the damaged areas of the brain. The glial scar stops the spread of the damage but at the same time also creates a barrier that prevents neurons on either side of the damage from connecting. Dr. Chen’s technology converts reactive astrocytes into functional neurons to replenish the lost neurons and also allows the neurons to re-establish contact across the scar tissue. While there are still many ways to improve before reaching the actual human therapy, Dr. Chen’s technology may be a cause for optimism on some of the most intransigent problems in modern medicine.

—Andrew Stephenson, associate dean for research and graduate education

Whether a human brain suffers from an injury or disease, there is one common thread: glial scar tissue, which limits the functional recovery of the affected brain areas. When neurons in the brain die or degenerate, glial scar tissue forms and does not ever heal, causing a unique problem for patients who now lack healthy neurons in these areas and are unable to get rid of this scar tissue without further damaging their brains.

New research from Gong Chen’s lab has developed a potential treatment for glial scar tissue, using a revolutionary method called reprogramming to turn glial cells into normal neurons. This method uses the protein NeuroD1, which was known to be important for the formation of nerve cells in the hippocampus. NeuroD1 is expressed into the glial cells, changing their gene expression profile and transforming glial cells into neurons. Essentially, Chen’s findings allow the brain to heal itself by changing the gene expression of the reactive glial cells to create healthy neurons where original neurons were lost.

Even better, Chen’s gene therapy does not use outside injected cells. The therapy can be performed in vivo, inside the patient’s brain using his or her own glial cells. This means there is no immunorejection or risk of creating a tumor in the brain because the neurons being created do not divide.

Chen’s discovery could help a wide variety of patients, including those who suffer from nerve injuries, Alzheimer’s and Parkinson’s diseases, stroke, and even Amyotrophic lateral sclerosis (ALS). Chen’s team is working on novel delivery methods for these potential therapies, including small molecule-based drug tablets, which would revolutionize treatment for brain disorders.

—Whittney Gould

Researchers in Gong Chen’s lab have used glial cells to regenerate from damaged cells the healthy and functional neurons that are critical for transmitting signals in the brain, shown in green in this image in the brain of a mouse with Alzheimer’s disease. The red areas are the red-stained nuclei of neuron cells. Credit: Chen lab
Fall Welcome Day is all about welcoming incoming science freshmen to the University Park campus. Traditionally, it has been a day for freshmen to get to know the college, each other, and what is expected of them as students at Penn State. Three years ago, Associate Dean for Undergraduate Education Mary Beth Williams transformed the event into a fun, inviting extravaganza and it has grown ever since. This year an exciting new element was added: the Network for Excellence in Undergraduate Science, or NEXUS.

NEXUS is a new student group dedicated to building the Eberly College of Science community by connecting with freshmen on day one and facilitating relationships in and across majors.

In 2013, 13 students volunteered to help with the logistics of moving incoming freshman through the day’s activities. Bailey Groves, ’16 Science and vice president of NEXUS, recalled how the idea for NEXUS started to form that day: “One of [the volunteers] would start a conversation with a student or two, then all of a sudden 30 kids would come and we’d be sitting in a circle having conversations about what it’s like here. There were questions like, ‘What should I expect from my Chem110 class?’ to ‘What should I expect from this professor?’ to ‘What if I have to drop a class? What do I do?’ Every concern they had was just pouring out and everyone was listening because 90 percent of them have the same questions and you don’t know who to ask.”

In the spring semester of 2014, a call went out for volunteers for a new group that would be focused on connecting with incoming freshman, answering those questions, and building a sense of community from the start. 60 students eagerly answered the appeal. Groves says, “It was pretty impressive as a brand-new club to have so many students who just really wanted to help out with the Eberly College of Science because they knew how much room for improvement there was as far as getting students connected.”

On August 24, 2014, the new group assembled to help approximately 800 new students navigate through the Fall Welcome Day activities. It began in Eisenhower Auditorium where the students were checked in by their major and assigned a row in which to sit. Throughout the auditorium, NEXUS leaders were stationed to help students find their seats and start to get acclimated to their groups. Dean Williams welcomed the group and gave a dynamic presentation to introduce the freshman to their new community. She laid out the college’s expectations for new students and highlighted the Class of 2018’s abilities. She introduced faculty, resources, and opportunities within the college. And she got the students excited about their career path through an interactive activity that asked them to think about how their intended major could help address global issues.
After the college meeting, the NEXUS leaders moved their smaller groups of about 20 freshmen between getting class photos taken and eating lunch. Then, groups went on campus tours and had informal icebreakers and small group conversations where the students could ask the NEXUS leaders their questions and get to know fellow freshmen in their majors. Carolyn Jensen, director of the Eberly College of Science Advising Center and adviser to NEXUS, noted, “From small majors to larger majors, we wanted them all to have that same sense of community.”

From the icebreakers, the groups moved into departmental meetings where they could connect with faculty and learn more about their specific department. NEXUS leaders again facilitated conversation by asking some questions and getting their groups involved in the presentations. Then, it was time for Creamery ice cream and a family-friendly carnival in Pelick Courtyard.

Faculty and staff were encouraged to bring their families to meet the broader college family in a fun, relaxed atmosphere with games and science demonstrations. The new freshmen were given a preview involvement fair and were able to get a more relaxed, in-depth look at the science-specific clubs before the general involvement fair a few days later. Groves said, “We want the science community to be a community—keeping everyone involved with each other and touching base. It makes that 40,000 seem like much less.”

About the day, Groves recounted, “It was a long day, but it was a fun day.”

Looking forward, Groves and Jensen have big plans for NEXUS and Fall Welcome Day. Groves said, “We want to turn it into more of a carnival—more games, more involvement, and a little bit bigger.” And they hope to carry the connections made on that day through the year in a more organized way.

Next year, groups will be assigned by PSU16 courses, known as the “first-year seminar.” NEXUS leaders can then “adopt” a seminar and assist the adviser with the class through the semester, giving presentations about research, study abroad, and other opportunities and answering questions from a student perspective. Jensen said, “First-year seminars are a chance for students to connect with faculty and now also upperclassmen. Science students face special challenges. Science is hard. This way, you have an upperclassman who is experiencing those challenges say, ‘Yes it’s hard, but you can survive and you can thrive. You can do this.’ They are basically guides to show the students how to succeed in the Eberly College of Science.”

Groves said, “We’re ready to move forward. Everyone is just really excited for what we can do next.” —Carley LaVelle
When Associate Dean of Undergraduate Education Mary Beth Williams was reviewing statistics about the student body in the Eberly College of Science, some of the data was troubling. One statistic in particular stood out to her: students who began a degree in the college at a campus other than University Park in the “2+2” program had a retention rate significantly lower than students who began the same degrees at University Park. Many of these students came from underrepresented groups or economic backgrounds that made college a financial difficulty for them already.

Because of the Eberly College of Science’s strong commitment “to recruiting and retaining a diverse student body,” Williams wanted to do something to increase academic success for these students. What kinds of interventions could be made to help students from other Penn State campuses make a successful transition to University Park?

From this question, the Science Dean’s Scholarship program was born.

Williams sought the counsel of her student office assistants, Mira King ’14 Biochemistry and Molecular Biology, and Emeka Egeruoh ’13 Biology, to help her identify the specific needs and challenges associated with change-of-campus students. King, a native of Trinidad and Tobago, had just completed a difficult transition to University Park from the Penn State Harrisburg campus. Egeruoh had moved to University Park from Penn State Erie. “Transferring to University Park from a Commonwealth campus was like being thrown into a new world—everything was ten times as big, ten times as fast-paced, and ten times as hard,” says King. “I just didn’t know how to fit in or where to begin trying.”

King and Egeruoh’s suggestions helped Williams shape the Science Dean’s Scholarship program to better meet the needs of change-of-campus students. Williams secured a grant from the National Science Foundation (NSF) to begin the scholarship program, which includes aggressive changes in advising and the addition of peer mentorship. The NSF project will investigate if these changes can increase retention rates for 2+2 students, particularly among underrepresented groups. The NSF grant funds the program for three years, providing $4,000 scholarships to students transitioning to University Park from another campus for each of the final two years of their undergraduate education in the Eberly College of Science. The program can currently support 20 students per year.

Sara Roser-Jones joined the college advising center team as an advising program coordinator and Commonwealth campus liaison. Roser-Jones will serve as an academic adviser for these change-of-campus science students, beginning when they are at the Commonwealth campuses and continuing as they transfer to University Park, and each student will be paired with a peer mentor to guide them through their campus transition.

As the college evaluates the impacts of these advising and mentoring strategies, Williams would like to expand the program into research. “The vision and goal is getting these students involved in research sooner, to integrate them in their disciplinary communities, to prime
them to succeed,” says Williams. This research initiative would be similar to the current NSF-funded Research Experiences for Undergraduates in the college, with no tuition charge and a research stipend for each student in the program. Williams would start the students in research projects during the summer, when campus is quieter, to help ease the acclimation to University Park campus.

Although she graduated in May, King is very supportive of the Science Dean’s Scholarship program and wishes she could have been a participant during her campus transition: “If I initially had access to the perks that this program provides for its students, the quality of my transition experience would have been undoubtedly improved,” she says. “This program has the potential to greatly enhance the quality of the Penn State 2+2 change-of-campus plan.”

If you would like to get involved with the program as an alumni mentor or would like to donate to the scholarship program, contact Dean Williams at mew17@psu.edu.

—Whittney Gould
USA Science and Engineering Festival

Where can you find Penn State scientists, NASA astronauts, and reality science TV show personalities all in the same room? The USA Science and Engineering Festival, of course.

The USA Science and Engineering Festival takes place every two years in Washington, D.C., and brings together both aspiring and current scientists, engineers, and science enthusiasts from several states. The event draws both big science personalities like Bill Nye, Mike Rowe, and Michio Kaku, along with working scientists from places like NASA, NSF, Lockheed Martin, and university science programs.

This year’s festival was the third time the event has occurred, and the second time the Eberly College of Science has been part of the action. More than 50,000 people attended the festival this year.

“The USA Science and Engineering Festival is an important event to attend for us because it is a platform on which to translate science and research efforts to a very broad and diverse audience,” says Michael Zeman, director of science outreach and engagement for the college. The event attendees ranged from young children interested in science to adult scientists indulging in their passions.

The college’s exhibit at the festival included hands-on activities in astronomy, biology, and nanotechnology, and even gave visitors a taste of Science-U summer camp. The activities ranged from infrared heat detection technology used to discover far-away exoplanets and a project to collect DNA from doodles, to learning about the nanotechnology inside cell phones and tablets and the creation of test tube lava lamps.

There were some major differences between the college’s 2012 exhibit and this year’s presence. Starlette Sharp, director of the Penn State Millennium Scholars Program, was at the exhibit to talk about the new Penn State Millennium Scholars scholarship opportunity for students interested in science and engineering. The program just began work with its second cohort of students this summer and has plans to reach more of the nation’s best science and en-
engineering students through events like the USA Science and Engineering Festival.

The Nittany Lion mascot made several appearances at the exhibit this year too, posing for photos with visitors and helping young children learn about science. Along with the Nittany Lion, the exhibit had another larger-than-life Penn State celebrity helper: Penn State Science alumnus John Urschel, ’12 ’13g Mathematics also worked the exhibit and gave a presentation on the science of football with noted scientist and author Dr. Ainissa Ramirez on the event’s Curie Stage. It was a packed weekend for Urschel: in addition to helping at the exhibit and with Ramirez’s presentation, he was being followed by an NFL Films camera crew for the documentary TV show “Hey Rookie, Welcome to the NFL.” (Two weeks later, Urschel was officially drafted into the NFL by the Baltimore Ravens.)

While the potential for college outreach and teaching was great, our staff and students also did their share of learning while at the festival:

“The fair was not only great for us to do outreach for the people in attendance, but I also found it very educational to see all the different ways other groups were doing outreach,” said Chris Thawley, a graduate student in biology who helped with the Department of Biology’s DNA doodle activity at the festival. Zeman agrees with Thawley’s assessment: “I think the group that traveled to the event exemplified the spirit of discovery shared throughout the college.”

The college’s alumni society also had a presence at the festival, holding a reception for Washington, D.C. area alumni to gather after attending the festival.

While this year’s event was undoubtedly a success for the college, Zeman can’t wait for the college to return to the festival in 2016: “We were fortunate to attend, and look forward to making the 2016 festival even better. We hope to see more alumni there, too!”

—Whitney Gould
Years of Service Recognition

We’d like to take this opportunity to recognize the years of service that our faculty and staff have committed to Penn State. The college is fortunate to be able to recognize the following dedicated members of the college community for their service in 2014.

30+ Years of Service:
George Andrews
Carol Baker
Augustin Banyaga
Piotr Berman
Moses Chan
Dohn Dunmire
Beverly Hazzard
Barbara Garrison
Barbara Kennedy
Wen-Ching Li
Lisa Reiter
Ayusman Sen
Carl Sillman
Leonid Vaserstein
Nicholas Winograd

Zhi-Chun Lai
Ying Liu
Vykuntha Padala
Donald Schneider
Olanrewaju Sodeinde
Leisa Townsley
Graham Thomas

5 Years:
Isabella Cattadori
Daniel Costantino
Matthew Croyle
Jill Duarte
Pamala Garito
Keisha Johnson
Edward Kaiser
Cheryl Keller Capone
Julia Kregenow
Yuexing Li
Suvarth Mahadevan
Jennelle Malcos
Allen Minns
Kristen Robinson
Sheryl Rummel
Scott Selleck
Michael Siegel
Eric Wafula
John Wallace
Jason Wright
Albena Zikatanova

25 Years:
Kenneth Barger
Patricia Buchanan
Richard Cyr
Florence Dunlop
David Gilmour
Nigel Higson
Kathryn Kensinger
Rodney Kreuter
Christine Onder
Debra Putt
Laurie Roan
Amy Stover
Eileen Swales
Jinchao Xu

20 Years:
Paul Babitzke
Patrick Broos
Dianne Burpee
Jamie Corman

30+ Years of Service:

15 Years:
Squire Booker
Daryl Branford
Margaret Chester
Michael Eracleous
John Hopkins
David Hunter
Bernhard Luscher
Christine Keating
Pamela Mitchell
Robert Vaughan
Edith Rudy
Timothy Treaster

10 years:
Marc Fabbri
Murali Haran
Dana Hosko
Dezhe Jin
Jamie Kennea
David Little
Paul Lucas
Katherine Masters
Bharath Narayanan
Kenneth O’Hara
Aleksandra Slavkovic
Michelle Stone
Melissa Thomas
Alexander Yakhnin

Thank you for your service
In June 2014, Penn State’s undergraduate degree in Biochemistry and Molecular Biology (BMB) was one of the first programs nationwide to be awarded accreditation from the American Society of Biochemistry and Molecular Biology (ASBMB). Penn State is among only 14 colleges and universities across the country to have received the designation since the ASBMB established the accreditation program in 2013. The certification confirms to students, as well as prospective graduate and professional schools and employers, that the education attained by Penn State Science BMB graduates meets the standards established by the leading national scientific association for biochemistry and molecular biology.

“We were truly thrilled to earn accreditation in the first round of applications,” says James Endres Howell, director of undergraduate studies in BMB. “We knew our program is one of the very best in the country, but public recognition from ASBMB was especially gratifying.”

The ASBMB is a nonprofit scientific and educational organization with more than 12,000 members. Founded in 1906, the society is based in Rockville, Maryland. The society’s purpose is to advance the science of biochemistry and molecular biology through publication of scientific and educational journals, organization of scientific meetings, advocacy for funding of basic research and education, support of science education at all levels and promoting the diversity of individuals entering the scientific workforce. —Tara Immel

## Interactive eBook Introduces New Ways to Teach and Learn General Chemistry

In this age of skyrocketing textbook prices, selecting a textbook that matches the content and pedagogical style of a course is a challenge. This has been true for the general chemistry course (CHEM 110) at Penn State, where we have pioneered using an “atoms first” approach: we first examine the structure and behavior of substances on the atomic level, and then connect these concepts to observable macroscopic properties. After years of teaching using textbooks whose content ordering conflicted with this approach, we began work on an eBook. We envisioned that creating a book in an electronic format would allow us not only to customize the course content and layout to match our specific needs, but that it would enable us to also introduce various state-of-the-art interactive elements that would aid the nearly 4,000 students who take the course every year.

With the help of undergraduate students from the Department of Computer Science and Engineering, we developed a suite of interactive tools: simulations, animations, and interactive illustrations; video demonstrations of chemical phenomena; tutorials; and self-assessments. An interactive periodic table illustrates elemental properties and periodic trends. A molecular viewer allows students to explore molecular geometries, orbitals, dipoles, hybridization, and colorful maps of electrostatic potentials.

The content is organized into 17 lessons with integrated example problems and optional enrichment modules. An interactive course syllabus details reading assignments and has direct links to an online question bank of homework problems. Adaptive assessment tools are in the planning stages, and will provide a mechanism to increase retention by identifying gaps in learning for individual students. The content can be used for residential instruction, online delivery, hybrid instruction, or as enrichment material in many other settings. The eBook is now used by all sections of CHEM 110, and content is currently being developed to cover our General Chemistry II course (CHEM 112).

—Lori Stepan Van Der Sluys, Mary J. Bojan, and Pshemak Maslak, Chemistry
Harry Allcock, Penn State Evan Pugh Professor of Chemistry, has been elected as a member of the National Academy of Engineering (NAE) for his pioneering research in phosphazene polymer chemistry and its use in the field of biomedical materials. Election to the NAE is an honor bestowed upon members by current NAE members, and is among the highest professional honors awarded to engineers and scientists. Allcock conducts research at the interface between inorganic and organic chemistry, polymer chemistry, and materials science.

Iliana Baums, associate professor of biology, has been awarded a 12-month Humboldt Research Fellowship for experienced researchers by the Alexander von Humboldt Foundation. The Humboldt Foundation is a nonprofit organization established by the Federal Republic of Germany that promotes international research cooperation. Recipients receive support for extended research at a German research institution of their choice. The fellowship is awarded in a worldwide competition to highly qualified scholars who are not living in Germany. Baums has elected to conduct her research at the Max Planck Institute for Marine Microbiology in Bremen. In Bremen, she plans to study the role of symbiotic bacteria in how the deep-sea corals they inhabit respond to oil exposure from human activity and natural sources.

Amie Boal, assistant professor of biochemistry and molecular biology, and of chemistry, recently was named a Searle Scholar. The Searle Scholars Program was established at the Chicago Community Trust in 1980 and is funded from the estates of Mr. and Mrs. John G. and Frances C. Searle. The program annually recognizes fifteen exceptional young faculty members and supports independent research in medicine, chemistry, and the biological sciences.

Niel Brandt, distinguished professor of astronomy and astrophysics, has been selected as the Verne M. Willaman Professor of Astronomy and Astrophysics. The appointment, effective on August 1, 2014, is awarded by the Office of the President of the University, based on the recommendation of the Dean of the Eberly College of Science, in recognition of Brandt’s national and international reputation for excellence in research and teaching.

Daniel Costantino, lecturer in physics, has been honored with the 2014 C.I. Noll Award for Excellence in Teaching by the Eberly College of Science Alumni Society. Instituted in 1972 and
named in honor of Clarence I. Noll, dean of the college from 1965 to 1971, the award is the highest honor for undergraduate teaching in the college.

Eric Feigelson, professor of astronomy and astrophysics and of statistics, has been selected to receive the 2014 Penn State Faculty Scholar Medal for Outstanding Achievement in the physical sciences. The award recognizes scholarly or creative excellence represented by a single contribution or a series of contributions around a coherent theme. A committee of faculty peers reviews nominations and selects winners of the award.

Miriam Freedman, an assistant professor of chemistry, has been honored with a Faculty Early Career Development (CAREER) award from the National Science Foundation (NSF). The CAREER award is the most prestigious award given by the NSF in support of junior faculty members who exemplify the role of teacher-scholar through outstanding research, excellent teaching, and the integration of education and research. The CAREER award provides five years of funding and is given to assistant professors by NSF directorates at different times during the year.

Mark Maroncelli, professor of chemistry, has won the American Chemical Society’s Joel Henry Hildebrand Award in the Theoretical and Experimental Chemistry of Liquids. Maroncelli will receive this award in recognition of his distinguished contributions to the understanding of the chemistry and physics of liquids in a ceremony during 2015 at the 249th annual meeting of the American Chemical Society in Denver. The award is sponsored by ExxonMobil Research and Engineering.

Roy Olofson, professor emeritus, has been named a 2014 Fellow of the American Chemical Society. The ACS Fellows Program was created by the ACS Board of Directors in December 2008 “to recognize members of ACS for outstanding achievements in and contributions to Science, the Profession, and the Society.”

Alex Radocevich, an assistant professor of chemistry, has been honored with a Faculty Early Career Development (CAREER) award from the National Science Foundation (NSF). The CAREER award is the most prestigious award given by the NSF in support of junior faculty members who exemplify the role of teacher-scholars through outstanding research, excellent teaching, and the integration of education and research. The CAREER award provides five years of funding and is given to assistant professors by NSF directorates at different times during the year.

Radocevich has also been honored with an Alfred P. Sloan Research Fellow award in recognition of his research accomplishments. Sloan Research Fellowships are intended to enhance the careers of the very best
young faculty members in seven fields of science: chemistry, computational and evolutionary molecular biology, computer science, economics, mathematics, neuroscience, and physics. The primary focus of Radosevich's research is to develop more efficient chemical reactions that reduce the environmental impact of chemical production. The methods developed in Radosevich's laboratory can be applied to a range of areas, from pharmaceutical synthesis to fuel production.

C.R. Rao, Emeritus
Holder of the Eberly Family Chair in Statistics, long recognized as one of the world's top statisticians, has been awarded an honorary doctorate degree from the Indian Institute of Technology, Kharagpur. He received the degree at the Convocation of the Indian Institute of Technology on July 26 this year “for his contributions to the foundations of modern statistics through the introduction of concepts such as Cramer-Rao-Inequality, Rao-Blackwellization, Rao-Distance, Rao-Measure and for introducing the idea of Orthogonal Arrays for the industry to design high quality products.”

Song Tan, professor of biochemistry and molecular biology, has been honored with the 2014 C.I. Noll Award for Excellence in Teaching by the Eberly College of Science Alumni Society. Instituted in 1972 and named in honor of Clarence I. Noll, dean of the college from 1965 to 1971, the award is the highest honor for undergraduate teaching in the college.
**New Faculty**

Jessica M. Conway, assistant professor of mathematics, focuses her research on the mathematical modeling of infectious-disease dynamics. She is particularly interested in the interplay between viral infections and therapeutic interventions with HIV as her current focus. Her models inform the appropriate use of therapy to treat, or prevent, infection. Before joining Penn State, Conway was a postdoctoral fellow in the Theoretical Biology and Biophysics group at the Los Alamos National Laboratory from 2012 to 2014, in the Department of Mathematics at the University of British Columbia from 2008 to 2012, and in the Division of Mathematical Modeling of the University of British Columbia Centre for Disease Control from 2008 to 2010. She earned a bachelor's degree in applied mathematics at McGill University in 2002, and master's and doctoral degrees in applied mathematics at Northwestern University in 2003 and 2008, respectively.

Carina Curto, associate professor of mathematics, is particularly interested in neural coding and how such codes arise from networks of neurons in the brain. She analyzes data sets of electrical activity in the brain computationally, and uses this electrophysiological data as the basis for constructing theoretical models that can be studied mathematically to understand how neural coding arises. In addition to traditional methods for analyzing and modeling neural data, Curto develops innovative approaches using applied algebra, topology, and geometry. Previously, Curto was an assistant professor of mathematics at the University of Nebraska-Lincoln from 2009 to 2014, a Courant Instructor at New York University from 2008 to 2009, and a postdoctoral associate in the Center for Molecular and Behavioral Neuroscience at Rutgers University from 2005 to 2008. She earned a bachelor's degree in mathematics at Duke University in 2005.

Vladimir Itskov, associate professor of mathematics, works at the intersection of mathematics and theoretical neuroscience. He develops new mathematical tools for understanding the organization and function of neural networks in the brain. His work combines mathematical and theoretical approaches with data-driven investigations of mammalian brain function. Before joining Penn State, Itskov was an assistant professor of mathematics at the University of Nebraska-Lincoln from 2009 to 2014 and a Swartz Postdoctoral Fellow in the Center for Theoretical Neuroscience at Columbia University from 2006 to 2009. He also held postdoctoral positions at Rutgers University and Duke University. Itskov earned a bachelor's degree in mathematics at the Moscow Institute of Electronics and Mathematics in 1995 and a doctoral degree in mathematics at the University of Minnesota in 2002.
Donghui Jeong, assistant professor of astronomy and astrophysics, is a theoretical astrophysicist and cosmologist interested in broad questions about the beginning of the universe. He uses large-scale observations, such as the distribution of high-redshift galaxies that are quickly moving further away from Earth, to understand inflation at the beginning of the universe, the acceleration of the expansion of the universe, the mass of subatomic particles like neutrinos, and whether the general theory of relativity is valid on large scales and at early times. Previously, Jeong was a postdoctoral scholar at the Center for Astrophysical Science at Johns Hopkins University from 2011 to 2014 and a Robinson Postdoctoral Scholar in theoretical cosmology at the California Institute of Technology from 2010 to 2011. He earned bachelor’s and master’s degrees in physics at the Korea Advanced Institute of Science and Technology in 2002 and 2004, respectively, and a doctoral degree in astronomy at the University of Texas at Austin in 2010.

Kin Fai Mak, assistant professor of physics, combines techniques from nanoscale electronics and from optics to study the behavior of electrons in two-dimensional materials. His research is focused on understanding unusual electronic phenomena that occur when electrons are confined in crystals only a few atoms thick, such as massless electrons in graphene. Before joining Penn State, Mak was a Kavli Fellow in physics at Cornell University from 2012 to 2014 and a postdoctoral fellow at the Nanoscale Science and Engineering Center at Columbia University from 2010 to 2012. He earned a bachelor's degree in physics and mathematics at Hong Kong University of Science and Technology in 2005 and a doctoral degree in physics at Columbia University in 2010.

Timothy Meredith, assistant professor of biochemistry and molecular biology, uses a combination of biochemistry, genetics, and genomics to understand how the membrane that surrounds bacterial cells is assembled and maintained, and how the environment of the cell alters this process. His work aims to identify genetic factors in bacteria that contribute to antibiotic resistance and impact the ability of human pathogens to cause disease. Before joining Penn State, Meredith was an instructor in the Department of Microbiology and Immunobiology at Harvard Medical School from 2012 to 2014, a bacteriology laboratory head at the Novartis Institute for Biomedical Research from 2010 to 2012, a senior research biologist at Merck Research Laboratories from 2009 to 2010, and a postdoctoral researcher in the Department of Microbiology and Molecular Genetics at Harvard Medical School from 2006 to 2008. He earned a bachelor's degree in biochemistry at Villanova University in 2000 and a doctoral degree at the University of Michigan in 2006.
Kari Lock Morgan, assistant professor of statistics, focuses on improving undergraduate education in statistics and developing improved statistical methods for determining cause and effect. In statistics education, she pioneered the use of simulation-based methods to introduce inference to students in an intuitive way that allows them to visualize and better understand the key concepts. In her research, she has developed methods to ensure that groups being compared statistically are balanced and therefore truly comparable. Before joining Penn State, Morgan was an assistant professor of the practice in statistics at Duke University from 2011 to 2014. She earned a bachelor's degree in mathematics at Williams College in 2004 and a master's and a doctoral degree in statistics at Harvard University in 2007 and 2011, respectively.

Dennis Pearl, professor of statistics, is director of the Consortium for the Advancement of Undergraduate Statistics Education (CAUSE) and was a member of the team that developed an award-winning “buffet” strategy for teaching introductory statistics. In addition to his work in support of statistics education, Pearl's research involves the application of statistical methods to DNA sequence data to estimate the probability of evolutionary relationships among a group of organisms. Before joining Penn State, Pearl was emeritus professor of statistics and biostatistics at The Ohio State University beginning in 2013. Pearl began his academic career at Ohio State as assistant professor in 1984, became associate professor in 1990, and became professor in 1997. During his time at Ohio State he was active in collaborating on interdisciplinary projects with biomedical researchers. Pearl earned bachelor's, master's, and doctoral degrees in statistics at the University of California, Berkeley in 1972, 1975, and 1984, respectively.

Jie Shan, associate professor of physics, uses the interaction between light and matter to study and control the electronic properties of nanoscale materials. She is particularly interested in understanding the optical properties and dynamics of novel, sheet-like atomic crystals such as graphene, graphane analogues, and other two-dimensional monolayers that are potentially useful for new electronic and photonic applications. Before joining Penn State, Shan progressed from assistant to associate professor of physics at Case Western Reserve University from 2001 to 2014 and was a visiting research scientist and Marie Tharp Fellow at Columbia University from 2008 to 2009. She earned a diploma in mathematics and physics at Moscow State University in 1996 and a doctoral degree in physics at Columbia University in 2001.
Bharath Sriperumbudur, assistant professor of statistics, focuses his research on the intersection of mathematical statistics and machine learning. He develops theoretically rigorous and computationally efficient parameter-free statistical procedures for the analysis of high-dimensional and complex data such as non-Euclidean graphs, trees, and strings. In particular, he is interested in the interplay of functional analysis and operator theory in the development of these procedures, which can test hypotheses, estimate density, and select features from complex data. Before joining Penn State, Sriperumbudur was a research fellow in the Statistical Laboratory at the University of Cambridge from 2012 to 2014, and a postdoctoral research associate at the Gatsby Computational Neuroscience Unit at University College London from 2010 to 2012. He earned a bachelor's degree in electronics and communications engineering at Sri Venkateswara University in 1999, a master's degree in electrical engineering at the Indian Institute of Technology in 2002, and a doctorate degree in electrical and computer engineering at the University of California San Diego in 2010.

Zhiren Wang, assistant professor of mathematics, studies a branch of mathematics known as dynamical systems, which aims to describe the trajectory of a point in a geometric shape, given a set of rules that characterize the movement of the point. In the problems that he focuses on, the geometric shape and the rules often arise from an algebraic setting and are connected to number theory and other mathematical subjects. Before joining Penn State, Wang was Gibbs Assistant Professor of Mathematics at Yale University from 2011 to 2014 and a postdoctoral fellow at the Mathematical Sciences Research Institute in 2011. He earned a bachelor's degree at Fudan University in 2004, masters' degrees from Ecole Polytechnique and University Paris-Sud in 2006, and a doctoral degree at Princeton University in 2011.
Kristina Kaldon, a senior majoring in astronomy and astrophysics, recently received the USRA Education Award. The USRA Scholarship Program provides college scholarships to students interested in pursuing careers in the physical sciences or engineering with an emphasis on space research or space science education. Kaldon is the second student from Penn State to receive the award.

Kaldon conducts research with Kevin Luhman, professor of astronomy and astrophysics, in the field of infrared astronomy. This research is conducted using images from the Spitzer Space Telescope and the Wide-field Infrared Survey Explorer (WISE). Kaldon helps Luhman search for binary brown dwarf companions to nearby stars with defined proper motions using different epoch images (anywhere from months to years apart) which are aligned to see if any surrounding stars have the same movement across the sky as the primary star (usually a white dwarf). Kaldon also completed an internship at the Franklin Institute in Philadelphia and a Research Experiences for Undergraduates (REU) program at the Arecibo Observatory in Arecibo, Puerto Rico. “My experience at the observatory was easily the best time of my life and I am so happy I was able to gain hands-on experience and experience the Puerto Rico culture,” she said.

Kaldon is involved in six clubs and organizations at Penn State, and she has held many leadership roles in her organizations. In addition to being involved in Astronomy Club, Astronomy Department Outreach, Three Broomsticks, and the Student Red Cross Club, Kaldon has served as historian for Science LionPride and is currently president of the Society of Physics Students. Kaldon’s leadership experience was cited by the USRA as a reason she stood out above other applicants for the scholarship.

—Whittney Gould
# Undergraduate Student Awards and Honors

## Braddock Scholarship

The Braddock Scholarship, an award for exceptional freshman science students, was established by the late Homer Frick Braddock, a Mount Pleasant, Pennsylvania native, who earned his bachelor’s degree in mining engineering from Penn State in 1906. The Braddock Scholarship is available to outstanding high-school seniors who are interested in studying science at Penn State. Since 1984, this generous gift and prestigious financial award has provided needed and helpful funds to over 240 deserving students. The 2014 Braddock Scholars are:

<table>
<thead>
<tr>
<th>Freshman:</th>
<th>Sophomores:</th>
<th>Seniors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matthew Allan</td>
<td>Laura Beebe</td>
<td>Avik Sarker</td>
</tr>
<tr>
<td>Alayna Kennedy</td>
<td>Alice Cai</td>
<td>Shalome Sine</td>
</tr>
<tr>
<td>Robert Liu</td>
<td>Sarah Galang</td>
<td>Priyanka Solanki</td>
</tr>
<tr>
<td>Steven Makkar</td>
<td>Kenneth Hall</td>
<td>Rachel Thomas</td>
</tr>
<tr>
<td>Riddhi Patel</td>
<td>Jingyi Jiang</td>
<td>Anna Wing</td>
</tr>
<tr>
<td>Mila Tamminga</td>
<td>James Johnston</td>
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<tr>
<td>Collin Van Son</td>
<td>Elizabeth Lesko</td>
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<td></td>
<td>Amar Paul</td>
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<td></td>
<td>Joseph Puthenpurayil</td>
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<tr>
<td></td>
<td>Amanda Reese</td>
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<tr>
<td></td>
<td>Kokila Shankar</td>
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</tr>
<tr>
<td></td>
<td>Grant Smith</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Juniors:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Victoria Bertocci</td>
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<td></td>
<td>Joshua Bram</td>
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<td></td>
<td>Sarah Chang</td>
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<td>Reshma John</td>
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<td></td>
<td>Valérie Lindner</td>
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<tr>
<td></td>
<td>Janine Mistrick</td>
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<tr>
<td></td>
<td>Jacqueline Patterson</td>
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</tbody>
</table>

## Doris N. McKinstry Scholarship

The scholarship was established by Doris McKinstry to recognize and support outstanding female undergraduate students enrolled in (or planning to enroll in) the Biology or Premedicine majors in the Eberly College of Science, who have earned a grade point average of 3.0 or higher, and who are permanent residents of Pennsylvania. Students receiving the scholarship for 2014/2015 are:

<table>
<thead>
<tr>
<th>Taylor Boyer</th>
<th>Julia Carter</th>
<th>Ghazal S.H. Khorrami</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gabrielle Care</td>
<td>Maren Healey</td>
<td>Kayla Kisen</td>
</tr>
</tbody>
</table>

## Millennium Scholars Program

Penn State's Millennium Scholars Program was established to attract, support, and retain a cadre of high-achieving scholars whose shared expectation for academic excellence and inclusiveness will lead to an attainment of a Ph.D. and leadership positions in science research. The following students were recently awarded a Millennium Scholarship:

<table>
<thead>
<tr>
<th>Cohort #1 (2013)</th>
<th>Cohort #2 (2014)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaleb Bogale</td>
<td>Tiffany Bamfo</td>
</tr>
<tr>
<td>Emily Cribas</td>
<td>Stephanie Brown</td>
</tr>
<tr>
<td>Taylor Curtis</td>
<td>Connor Cassady</td>
</tr>
<tr>
<td>Sachira Denagamage</td>
<td>John Esteves</td>
</tr>
<tr>
<td>David Heineman</td>
<td>Zachary McGuire</td>
</tr>
<tr>
<td>Liyana Ido</td>
<td>Alexandra Nader</td>
</tr>
<tr>
<td>Zahare Khayat</td>
<td>Alison Pennell</td>
</tr>
<tr>
<td>Rebecca Plessel</td>
<td>Emma Price</td>
</tr>
<tr>
<td>Taylor Soucy</td>
<td>Gabrielle Swain</td>
</tr>
<tr>
<td>Victoria Spadafora</td>
<td>Inger Wang</td>
</tr>
<tr>
<td></td>
<td>Sneha Yennawar</td>
</tr>
</tbody>
</table>
Science Dean's Scholarship

The scholarship is for math and science students who begin their Penn State degrees at one of the Commonwealth campuses, and who transition to University Park to complete a degree in the Eberly College of Science. Students receiving the scholarship for 2014/2015 are:

- Nicholas Borden
- Brittney Boucher
- Bridget Brafi
- Kimberly Brafi
- Megan Criswell
- Matthew Downing
- Anthonia George
- Tyler Groner
- Colleen Gross
- Devina Harnita
- Connie Hernandez
- Marissa Madsen
- Brieyanna McWilliams
- Juanita Mennor
- Ebone Selfridge
- Tadir Shapir
- Sindeep Singh
- Priscilla Sintim-Agyeman
- Joshua Wilkins

College Undergraduate Poster Exhibit Winners Announced

Twelve undergraduate students from a variety of science disciplines were selected as winners at the Eberly College of Science Undergraduate Experiences Poster Session held on September 25 on the Life Sciences Bridge. Students who have had a research experience, internship, co-op, or study abroad were invited to participate. Participants presented a poster for other interested students and faculty members.

The winners include:

- Overall Life Science - Joshua Bram (Biology)
- Overall Physical Science - Zachary Waszczak (Chemistry)
- CBBC - Mark Herr (Biology)
- CIDD - Christopher Rae (BMB)
- MRSEC - Sachira Denagamage (Biology)
- Biology 1st - Ciara Hovis (Biology)
- Biology 2nd - Kaleb Bogale (Biology)
- BMB 1st - William Chase (BMB)
- BMB 2nd - Mustaffa Hammudi (BMB)
- Forensic Science - Nathan Shugarts (Forensic Science)
- Math - Ailaura Donahoe (Math)
- Physics - Kristina Kaldon (Astronomy and Astrophysics; Physics)

Congratulations to all of the winners!
Jeffrey Oliver of Newark, Delaware, was honored as the student marshal for the Eberly College of Science during Penn State University’s summer commencement ceremonies on Saturday, 16 August 2014 on the University Park campus. Oliver’s faculty escort for the commencement exercises was Leana Topper, a lecturer in biology.

Oliver graduated with a 4.0 grade point average and a bachelor of science degree in science. He is in his third year of medical school at Thomas Jefferson University’s Sidney Kimmel Medical College in Philadelphia as part of Penn State’s six-year Accelerated Premedical-Medical program. While at Penn State, Oliver earned the President’s Award for freshmen in 2011. In 2012, he earned the President Sparks Award, the Ruth E. Duffy PreMedicine Endowment, and membership in the Phi Kappa Phi Honor Society. He also received the four-year Paul C. Brucker Scholarship, which is given to one student in each graduating class of the Pre-medical-Medical Program.

As part of the Premedical-Medical program, Oliver has conducted research at Thomas Jefferson University in orthopedics and sports medicine. He worked with Javad Parvizi, clinical research professor of orthopedic surgery at Jefferson, on a project studying some of the outcomes and complications of total hip or total knee replacement in patients with bowel disease. He presented this work at a national conference on orthopedics. He also worked with Jeremy Close, instructor in family and community medicine, and David Shipon, instructor in cardiology, reviewing the use of electrocardiogram and echocardiogram tests in pre-participation screenings for middle school and high-school student athletes.

In addition to his academic achievements, Oliver was highly involved in community service at Penn State. In 2012, he traveled to Port-au-Prince, Haiti, as part of the World in Conversation Project. During a month in Haiti, Oliver worked at King’s Hospital on a project studying financial stability and backup-generator power at the hospital, a business incubator that provided microloans to Haitian entrepreneurs, and a hospital ministry that visited and provided care to patients at hospitals across
Port-au-Prince. He was a member of the service organization, Students Engaging Students, acting as their 2012 Penn State IFC/Panhellenic Dance Marathon (THON) family-relations chair and recruitment chair. He was also a member of PRIDE, Penn State's sportsmanship team, serving as their vice president in 2012. Oliver also tutored Penn State student athletes in organic chemistry, physiology, and statistics at the Morgan Academic Support Center for Student Athletes.

At Thomas Jefferson University, Oliver worked as a teaching assistant for anatomy labs. He also continued his community-service contributions at JeffHOPE (Health Opportunities, Prevention, and Education), a weekly clinic providing free healthcare services to Philadelphia's homeless population.

Oliver said that he was surprised and humbled to be selected as student marshal. “This honor really belongs to the wonderful faculty, advisors, mentors, family, and friends who helped set me up for success during my years at Penn State,” he said. Studying at Thomas Jefferson University in Philadelphia for the last two years, Oliver said that the Penn State experience does not end when you leave State College. “Being a part of one of the most extensive alumni networks in the world allows you to maintain your connection to this fantastic community full of welcoming people,” Oliver said.

After completing the medical program at Thomas Jefferson University's Sidney Kimmel Medical College, Oliver hopes to join a residency program to continue pursuing his goal of becoming a clinician. In addition, he hopes to continue to make medical education a part of his life.

Oliver, a graduate of Caravel Academy in Bear, Delaware, was accompanied at commencement by his mother, Gail Oliver (Penn State ‘86) of State College, Pennsylvania; his father, Kris Oliver of Twins Falls, Idaho; his brothers, Matthew and Michael Oliver; and his grandfather, Daniel Bernitt, senior research associate emeritus at Penn State. —Sam Sholtis
Some of the biggest disease threats to humans don’t start out as human diseases at all. Although they date back millennia, zoonoses—diseases that can be transferred from wild animal populations to humans—are still responsible for the spread of many modern human health issues. Students in the Eberly College of Science have a unique opportunity to study zoonoses, along with African ecology and world health concerns, by taking the international summer science course Biology 498A: Biology of Eco-Health.

Doug Cavener, professor and head of the Department of Biology, who had helped to establish a collaboration between Penn State and the Nelson Mandela African Institute of Science and Technology in Arusha, Tanzania, was inspired to create a short-term science study abroad experience in Tanzania for Penn State students. He recruited Paul Shaffner, director of Career and International Education in the Eberly College of Science, and Anna Estes, a research associate in Huck Institutes of the Life Sciences, to help design and teach this course. The course they designed is tailored to teach a class of 8 to 12 students through hands-on individualized instruction during a three-week summer excursion to Tanzania.

What is eco-health? Shaffner describes eco-health as “the connection between human health and different environmental factors.” The environmental factors can include landscape and vegetation changes, the impacts of livestock and wild animal populations, and the diseases that come along with it, including zoonoses.

This is the second year for the class and draws on the diverse research expertise of the instructors: Shaffner with political ecology and geography, Estes with wildlife ecology, and Cavener as a geneticist working on sequencing the giraffe genome. This combination of experience covers many facets of eco-health and brings well-
rounded expertise to the class.

The experience for the students starts on U.S. soil, when they get together with their classmates a few months before the summer departure date to go over information about Tanzania: learning introductory Swahili and about the history and culture of the regions they will be visiting, along with reading up on recent research studies done in these areas.

When they arrive in Tanzania, they first head to Ndarakwai Ranch in West Kilimanjaro. Ndarakwai is a privately-owned game ranch, and one of the few places where visitors are allowed to do “walking safaris” because there is a lower concentration of dangerous game than many national parks. This allows the students to perform behavioral ecology research while walking through the ranch accompanied by armed rangers. These behavioral studies usually focus either on baboons or impalas, and the students learn different sampling methods and compare their collected data with previously published data on those animal groups. “The students essentially design a mini research project,” Shaffner said.

While at Ndarakwai, students visit nearby homesteads where they begin to learn about local livelihoods, culture, and the pastoral Maasai life. “Some of the major diseases emerging in the world are zoonoses, and many of these diseases make the jump to human populations in places where people practice pastoral livelihoods,” Shaffner explained, which is why the class partners with members of the Maasai ethnic group. The Maasai are very dependent on cattle for food and income and the students study how environmental factors affect the Maasai culture and livelihood.

Because their culture is so tied to their cattle, the Maasai perceive health much differently than we would in the West: “When you ask about the health issues they deal with, the first thing they start talking about is the health of their cattle,” Shaffner said. “They are just as interested in diseases that their cattle are facing as issues their families are facing.”

The class also learns about zoonoses that affect regional ecosystems. In the Serengeti-Mara ecosystem, the class studies the effects of rinderpest and canine distemper on wildlife. Rinderpest, a disease introduced by German cattle that decimated the wildebeest population in the Serengeti, shook up the food chain and altered the landscape (in addition to providing a food source for predators, wildebeest help maintain a balance of grassland and woodland in the Serengeti), though wildebeest populations are now at pre-rinderpest levels. A more contemporary disease challenge in the Serengeti is canine distemper, which has jumped from domestic dogs into African wild dogs, a vulnerable species already listed as endangered by the International Union for the Conservation of Nature.

Other areas the students visit as a part of the course include the Tanzanian safari capital of Arusha, the unique Lake Natron natural area, the Great African Rift escarpment, and the Wasso Regional Hospital in rural Loliondo. The perspective and culture of local Tanzanians is a mainstay in class discussions, ranging from issues of land use and resource allocation, to more controversial issues like poaching and reproductive health issues. The class visited the Nelson
Mandela African Institute of Science and Technology in Arusha to learn how local scientists are tackling these issues.

A core theme of the class is demonstrating the interdisciplinary nature of challenges involved in addressing global health issues like zoonoses. This material is best learned in person, by seeing the landscape and meeting people, Shaffner said. “One of the things I try to drive home and one of the fundamental pieces of the course is that in a lot of these complicated human-nature interactions, very few things are as black and white as they seem when learned in the classroom.” —Whittney Gould

Daiyon Kpou: How Studying Abroad in Africa Revitalized my Perspective on Science Careers

Often, when I tell people that I study both Biology and African Studies, they reply, “Wow, those are two completely different subjects!” I often agreed with those people, until I gained a new perspective this past summer by studying abroad. During May and June, I participated in Biology 498A: The Biology of Eco-Health. It was a course that showed me the areas where science and Africa converge.

For three weeks, the course took me to Tanzania, a nation on the east coast of Africa that is known for its wildlife and rich cultural history. My professors, Anna Estes, Douglas Cavener, and Paul Shaffner, started by providing me with a foundation on the scientific methods of environmental analysis and research. They demonstrated how to plot areas of vegetation; how to identify animals according to their tracks, feces samples, and calls; and how to identify native plants according to their leaf shapes and thorn patterns. Using this knowledge, my classmates and I classified hundreds of organisms.

In certain areas, zebras were as common as squirrels in State College, monkeys and baboons roamed freely throughout the savannas, and acacia trees displayed their natural predation defenses with their thorn-bulb structures. Our class completed several safaris in both the West Mount Kilimanjaro area and Serengeti National Park. We observed exotic animals in their natural environments while they were either hunting, eating, lounging, or displaying other typical behaviors.

Progressing into the healthcare portion of the course, my class also travelled to an area named Loliondo to visit the Wasso Hospital, a Catholic hospital that provides Western medical service to over 21,000 Tanzanians a year, 63 percent of whom are children. During a brief lunchtime discussion, a medical doctor spoke of the barriers that the hospital faces in
making Western medicine accessible to Tanzanians. A major concern, he stated, was a preference for traditional medical practices, such as the usage of natural remedies and spiritual guidance, over Western medicine.

Although he did not want to discount the efficacy of traditional medicine, the doctor expressed that one particular ethnic group—the Maasai—adhere so closely to their traditional beliefs that they may not address issues, such as Brucella infections and female genital mutilation (FGM). The Maasai are a nomadic people who, despite the pressures to assimilate to their neighboring towns and cities, have remained devoted to their heritage. For example, there are movements to end FGM because it is considered a violation of human rights and a physically and emotionally damaging procedure; yet, the Maasai view it as a symbol of womanhood and often denounce requests to end the practice. Also, the Maasai may increase their risk of contracting Brucella, a dangerous bacterial disease that is spread through cow milk, by not boiling their milk before drinking. Boiling milk does not conflict with traditional Maasai beliefs, however some Maasai consider it too inconvenient to practice and choose to drink non-boiled milk. These are two of many examples where Maasai culture affects public health in Tanzania; many other concerns exist for other ethnic groups and areas.

Currently, I am pursuing a career in global environmental health, so this course gave me the chance to visualize my potential as a public health professional. The Biology of Eco-Health class provided a cohesive experience, during which I learned about real global health concerns, interacted with eco-health professionals in Tanzania and culminated in compiling my lessons and analyses into a research paper. Studying abroad gave me a fresh perspective on how science can better the world and how I can become a pioneer for change.

Daiyon Kpou is majoring in biology and African studies. She plans to graduate from Penn State in 2015.
The Saturday following the Spring 2014 finals week, I boarded a plane with several of my classmates from Newark, New Jersey, to begin my journey to China. We had two long flights ahead of us, and some of us had no idea what would await us once our plane landed on the other side of the world. Although I had been to China before, I could never have imagined what the next three months would hold. This summer I was going to China for two study abroad programs: Molecular Cell Biology with Applications to Cancer taught by Wendy Hanna-Rose at Fudan University in Shanghai, and Cancer Biology taught by Zhi-Chun Lai at Peking University in Beijing.

My journey began with a five-week program in Shanghai, where seven other Penn State students joined me, and we took courses with Fudan students. During this time we were given the opportunity to experience Shanghai and travel to other nearby cities, such as Hangzhou and Nanjing. In Shanghai, we had the opportunity to immerse ourselves in a culture many of us had never previously experienced. Not only did we learn in the classroom, but also our experiences and interactions with the local people, and other foreigners, helped us to learn more about ourselves. Every day had its conflicts and struggles, which varied in magnitude from attempting to order lunch, to finding our way back to campus using only English.

From the conclusion of the class at Fudan, I had around three weeks until my next course in Beijing, so I took this opportunity to travel with my friend to visit his family in Taiwan where I had the chance to travel around the island and experience another Asian culture, much different from what I had experienced in Shanghai. After several days in Taiwan, I boarded a plane to Beijing for the next part of my journey, and my friend returned to the United States, leaving me alone in China.

I stayed in Beijing for a week before the students arrived for the next course. At Peking University two other Penn State students joined me, and we took the course alongside students from Peking University and Beijing Normal University. The course lasted approximately a month, and while we were in Beijing we were given numerous opportunities to be immersed in Chinese culture. We were taken to see many tourist attractions around Beijing, including the Summer Palace, the Forbidden City, and the Great Wall.

Every city had its own culture; every day was an opportunity to learn not only about the people around me, but also to learn about myself. Coming from a small town in central Pennsylvania, this journey was life changing. Although the reason for my journey was to study, my three months of living in China and Taiwan gave me much more than any classroom could. I was given the opportunity to grow as a person and further understand myself; words could not begin to describe the impact that this journey has had, and will have, on my life.

**Garrick Treaster** is majoring in biochemistry and molecular biology. He plans to graduate from Penn State in 2016.
Anna Wing: Fellowship Program Leads BMB Student to Germany

This summer, the DAAD-Rise fellowship program granted me the fantastic opportunity to do research in Germany for ten weeks at the University of Freiburg. A new country, a new research focus, and a new level of intensity—I didn’t know quite what to expect from my first internship experience.

With the help of Dr. Kristina Schachtrup and Katharina Rauch, a Ph.D. student, I gained my first exposure to the field of immunology and the exciting modern research into regulatory T cells. I had my first experience isolating cells from actual organs (mouse lymph nodes) and the chance to use new-to-me techniques like flow cytometry and luciferase assays. I discovered the amazing feeling of looking at my FACS data and realizing that I wasn’t just guessing at results but actually understanding the conclusions.

For me, though, the most exciting part of the lab was how closely it was tied to patients. The Schachtrup Lab was part of a larger collective called the Centre for Chronic Immunodeficiency, a group of laboratories and doctors that includes everything from lab bench work to genetic mapping to clinical studies, all under one umbrella. The variety of approaches to the same problem allowed for collaborations that provided breadth and perspective that could never have been accomplished by one lab alone. Seminars seamlessly transitioned from the molecular role of a protein into case studies of patients actually at the research institution. It’s easy to lose sight of the goals of research while spending weeks at the lab bench, and seeing the ways in which research affects real lives helped sharpen my perspective and remind me how essential the world of research is for people living with difficult illnesses.

The world outside of the lab had just as much to teach me as the world inside it. I embarrassed myself plenty with my nonexistent German before finally getting comfortable with the words for my favorite foods. I discovered the struggles of no free water and no public bathrooms at reliably inconvenient times. I learned how to laugh at myself, how to ask for help when I needed it and how to navigate a new place on my own.

I learned that small things change from one country to another, both in laboratories and outside them—maybe autoclaving instead of bleach or a dearth of peanut butter. But no matter where I go, I’ve met incredibly smart, passionate, dedicated, patient people who represent the best of what we can do—from helping a lost American to fighting off disease. I hope that in my future as a doctor or as a researcher, I can join their ranks.

Anna Wing is majoring in biochemistry and molecular biology and is a Schreyer Honors College scholar. She plans to graduate from Penn State in 2016.
This past July, physics graduate student Kathryne Sparks Woodle added an interesting accolade to her long list of achievements: she was the first graduate student to be named an American Physical Society (APS) Woman Physicist of the Month.

Sparks Woodle is an experimental particle astrophysicist in Tyce DeYoung’s lab who works on the High Altitude Water Cherenkov (HAWC) Observatory studying very high-energy gamma rays produced at cosmological distances. She describes this work as “an exciting collaboration between Mexican and American physicists that detects particles from some of the most extreme environments known in the universe, such as supernova explosions, active galactic nuclei, and gamma-ray bursts.”

Sparks Woodle has won many awards over the years for her work, including Penn State Downsborough and Duncan Fellowships, the Penn State Graduate Student Service Award, and a Penn State Commission for Women Achieving Women Award. She was also recently named a U.S. delegate to the 5th International Union of Pure and Applied Physics International Conference for Women in Physics. These awards show something in addition to her ad-
vanced knowledge of physical sciences: her interest in inspiring women and other minorities underrepresented in science to join the field.

“"I firmly believe that we need to actively encourage women and other minorities to stay involved in science. Solving challenging problems often requires tackling them from many perspectives, and the more people with diverse backgrounds working on a problem, the better chance we have of solving it,” she said. “Many studies have been done showing that unconscious bias still permeates our interactions and persists throughout society. I believe that making people aware of the challenges women and other minorities face while providing specific techniques to combat them will help make the environment better for everyone.”

Penn State provides many opportunities for Sparks Woodle to pitch in and help with her causes. She works as a graduate student mentor with the Upward Bound Math and Science Program, which helps low-income and potential first-generation prospective college students prepare for math and science in college. After helping with the program for three summers, she had originally decided to focus on writing her thesis this summer instead. Then she met this year’s group of students. “Once I met the young ladies in our lab, I could not stay away. They were very inquisitive and excited about learning, showing great potential for the future.” This affected her view of her career: “My experiences with the Upward Bound program helped cement my desire to work promoting equality.”

Sparks Woodle was also involved in a pilot program to help foster science education in women, serving as a lead teaching assistant for an experimental women-only introductory physics class. She is committed to work with the Graduate Women in Science (GWIS) group, where she has co-chaired the group’s annual Voices conference twice and was vice president. She served as president in another group she’s involved in, Physics and Astronomy for Women. Both groups have afforded her opportunities to perform campus and community outreach.

The variety of experience she’s gained at Penn State and the subsequent opportunities have given her many ideas for her future career. What does she want to pursue upon graduation? Many things. “First, I’d like to work for a national science society, one that runs programs that promote diversity in STEM.” The satisfaction she experienced chairing an American Physical Society’s 2014 Conferences for Undergraduate Women in Physics showed her that such work would be fulfilling for her. After that? “I am also interested in the implementation of science policy in the government. I could see myself enjoying working at the National Science Foundation.” And her third choice for career pursuit? “I would like to work in a science outreach office at a university, potentially helping run diversity-supporting grant programs.”

Her dreams may seem varied and ambitious, but they have one thing in common: “All of these possibilities would allow me to continue to contribute to the scientific community in a fulfilling manner and help promote issues about which I am passionate.” —Whittney Gould
Alaska to Argentina with a Dissertation in Between

Writing your dissertation can be challenging enough under normal circumstances, but recent statistics Ph.D. student Daisy Philtron added an extra sense of adventure to her experience.

Philtron and her husband Jason, ’13g Acoustics, have embarked upon a 20,000-mile journey by bike from Alaska to Argentina. The two avid bikers began their trip on May 10 in Anchorage, Alaska, and hope to make it to Argentina by December of 2015. Jason had completed his graduate work in acoustics before they set off, but Daisy began the trip writing her dissertation along the way.

“We decided to take the trip now before we started our careers or had any children. It just seemed like the best window of time for a year-plus trip. We decided on this route (Alaska to Argentina) in part because it requires only two languages, both of which we speak. Also, it would afford us a chance to visit many friends and family in the U.S. and Canada portion of the trip,” Daisy explained.

Although this is the longest trip the Philtrons have undertaken, they have completed long-distance cycling trips before. Two years ago, Daisy and Jason completed a trip from the Mexican border to the Canadian border through the Sierra Nevada and Cascades mountain ranges. “As soon as that trip was over, we started to plan for our next big trip,” Daisy said.

It would take the Philtrons two years to prepare for the 20,000-mile journey from Alaska to Argentina. That time was spent primarily on buying and testing gear and saving up the funds for the trip. “Luckily, bicycle travel is cheap and it was easy to save what we needed,” Daisy said.

The two planned their route from Alaska to the Mexican border—the rest will be taken day by day. “Our route is fluid, so we plan as we go.”

Daisy admitted it was challenging to work on her dissertation while on such a trip: “It was stressful, since there was an obvious deadline that I did not want to miss. I am very excited to have the dissertation in the rearview mirror.”

Daisy can breathe easy about her Ph.D. now: she and Jason paused their journey to return to Happy Valley for a week in September, and Daisy successfully defended her dissertation.

At the time of publication, Daisy and Jason have traveled more than 7,000 miles of their 20,000-mile trip and were passing through Mexico. You can follow Daisy and Jason’s travels on their website, ThePhiltrons.com.

—Whitney Gould
Over the past few decades, rising ocean temperatures and overexploitation have resulted in coral reef degradation at a global scale. The resulting dramatic loss of biodiversity has devastated fisheries essential to economic and social well-being. Ecosystem decline is increasingly apparent, and as a result, we are realizing the intimate connections between the ocean’s health and our own.

In June, Secretary of State John Kerry convened scientists, lawmakers, advocates, and government leaders for the inaugural “Our Ocean” conference to examine the global threats facing our oceans and strengthen partnerships across research, the private sector, civil society, and foreign governments. The two-day long meeting, held at the U.S. Department of State, offered an opportunity for scientists to inform and support the development of solutions to the most pressing issues in ocean ecology.

As an invited conference participant, I had a front-row seat to the complicated landscape of coordinated policy efforts. The conference topics focused on marine pollution, illegal fishing practices, and ocean acidification. Considering the complexity and scale of these problems, marine scientists and government leaders discussed and further examined the primary variables underlying decline in each area.

Pacific reefs host some of the most pristine ecosystems on the planet but are becoming increasingly unstable. Palau President Tommy Remengesau highlighted the country’s successes in management of their coastal waters. However, he also called for necessary attention to combat global climate change, which is already damaging Pacific islands despite regional policy efforts. Changes in ocean temperatures and climate patterns damage and destroy sensitive corals. In Palau, our lab team has established permanent reef transects in order to monitor individual corals over the long term. We expect that this data will inform policy decisions to ensure ocean resilience into the future.

The conference generated $800 million in commitments to conservation efforts from the international community and expanded protections in the south-central Pacific Ocean by the Obama administration. The forum led to the creation of a concrete action plan for the continued development of unified global policies.

With effective management based in sound science, our ecosystems can recover. This unprecedented gathering shows us that not any single entity can solve these problems. Fortunately, everyone has a stake in protecting our oceans—the key to safeguarding economic opportunities, food security, and political stability is sustained dialogue and shared prioritization from both the scientific community and major decision-makers.

Allison Lewis is a Ph.D. candidate in the biology department.
Five Graduate Researchers Selected for National Science Foundation Graduate Research Fellowship Program

The Eberly College of Science is pleased to announce that the college is hosting five new National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) recipients for the 2014-15 academic year. The students join 17 new researchers, along with 57 prior recipients continuing in the University’s graduate degree programs in the Eberly College of Science and the colleges of Agricultural Sciences, Earth and Mineral Sciences, Engineering, Health and Human Development, Information Sciences and Technology, and the Liberal Arts, as well as the Intercollege Graduate Degree Programs.

The 2014-15 class of new fellows in the college are Natasha Batalha, astronomy and astrophysics; Andrea Chan, ecology; Ryan Martinie, chemistry; Lauren Quevillon, biology; and Lyanne Valdez, chemistry.

According to the NSF website, the GRFP is “the oldest graduate fellowship program of its kind with a history of selecting recipients who achieve high levels of success in their future academic and professional careers,” and that “fellows benefit from a three-year annual stipend of $32,000 along with a $12,000 cost of education allowance for tuition and fees, opportunities for international research and professional development, and the freedom to conduct their own research at any accredited U.S. institution of graduate education they choose.”

The NSF program supports outstanding graduate students in the science, technology, engineering and mathematics (STEM) disciplines, and those in STEM education and learning research, who are pursuing research-based master's and doctoral degrees. —Tara Immel

Graduate Student Awards and Honors

Vinita Yadav, a chemistry Ph.D. student in the Sen group, has been selected as a Baxter Young Investigator. This award program was developed to stimulate and reward research that can be directly used for critical care therapies and the development of medical products that save and sustain patients’ lives.

Kari Organtini, a biochemistry and molecular biology Ph.D. student in the Dorman group, has been awarded the 2014 Leslie Ettre Award, the most prestigious award in capillary chromatography. She received the award at the 38th International Symposium of Capillary Chromatography held in Riva del Garda, Italy in May 2014.
“When I say science, you say U! Science! (U!) Science! (U!)”

Each day at Busted! Myth Meets Science began with that cheer lead by Jen Tranell, a seasoned camp director who teamed up with Penn State faculty and students at Science-U to deliver an immersive one-week camp examining misconceptions in science. Science-U camps, the largest K-12 youth program offered by the Office of Outreach and Science Engagement in the Eberly College of Science, draw over 500 campers from around the world each year.

This popular cheer was so enthusiastic each day that it became a part of a new project for Science-U—the Science-U Video Project.

The idea behind the video project, a concept that emerged in a collaborative effort between the college and Penn State Broadcasting (WPSU), is to produce engaging online and televised videos that show children being real science investigators. The college and WPSU are hopeful that the project will change how science and research are communicated to broader audiences in many ways.

The video project was created to provide teachers and parents with educational content on science, technology, engineering, and math (STEM), that is easy to access from any electronic device, appeals to children’s curiosity, will be televised, and has the ability to combine with existing lesson plans and hands-on learning activities in the classroom or at home.

“As science educators, we often see science education videos that feature a single adult demonstrating an experiment that seems removed from student participation. The science concepts demonstrated through the new video project will be far more appealing because they will be showing young people themselves actively participating in experiments in an energetic science camp setting that captures ‘wow’ moments, surprises and spontaneity,” said Michael Zeman, director of outreach and science engagement.

Science-U successfully attracts hundreds of viewers to the camp website, Facebook, YouTube, and Twitter pages with frequent use of video during camps filled with educational content. The current Science-U learning community, comprised of over 1,000 families, will serve as a pilot viewing group for year-one metrics and assessment.
The collaboration between the college and WPSU has strong potential for national impact. In 2014, five science activities were filmed during the Science-U camps and will be posted to multiple websites and social media locations. The videos will eventually be available to 50,000 monthly college website visitors, 1.22 million WPSU YouTube channel viewers, and 1.5 million PBS Learning Media subscribers. The young students in the videos delivered the majority of the content in these videos. The five-featured activities filmed during the summer of 2014 include:

1. Investigating phases of matter and colloid substances (e.g., oobleck, non-Newtonian fluids)
2. Microbes and food safety (e.g., the 5-second rule)
3. Chemical reactions pressure and gases (e.g., Mentos and diet cola reaction)
4. Chemical digestion of food and energy consumption (e.g., dissecting owl pellets and chemistry in the body), and
5. Mixtures and solutions (e.g., making a comet using dry ice, soil, and other solutes).

What’s in it for science faculty and students? Penn State faculty members develop each camp’s unique curriculum, and researchers, graduate, and undergraduate students assist these faculty members in the implementation of the camp programs. Students at Penn State play a significant role in the delivery of STEM content at Science-U as curriculum mentors and program facilitators. The video project will offer students a chance to build leadership and science communication skills, providing a robust experience that will continue to build year to year.

The final phase of the project is the production of one-minute television-ready versions of the five videos—called interstitials—for broadcast on public television during the weekday children’s programming block on PBS stations. Interstitial videos are typically 60- to 90-second versions that air in between children’s programs. These interstitials will be broadcast nationally via more PBS sister channels. PBS and its more than 360 television member stations are an educational media powerhouse integrating broadcast and online learning. PBS is the #1 source of media content for preschool teachers and the #1 place parents turn to for preschool video online.

Stay tuned and watch for the Science-U videos soon, because parents, alumni, and educators will have a chance to watch and use the experimental designs to educate their own children to think scientifically!

Michael Zeman is the director of the Office of Outreach and Science Engagement.
A Binary Life: Where Math Meets Football

“But do you even know how to play football?” asked a child in the crowd during the question and answer portion of Dr. Ainissa Ramirez’s presentation, “The Science of Football,” at the 2014 USA Science and Engineering Festival.

**John Urschel, ’12 ’13g,** was assisting Dr. Ramirez onstage. The crowd laughed. Did Penn State’s All-American All-Big Ten offensive lineman and team co-captain John Urschel know how to play football?

But to this child, and many in attendance that day, Urschel wasn’t a football player, even as he stood before them wearing his Penn State football jersey under a lab coat. He was a scientist, more specifically, a mathematician.

They were right about that. Urschel had completed both an undergraduate and a master’s degree in math in four years at Penn State, working on a second master’s in math education for his final year of football eligibility. He was selected the department marshal for his major at his undergraduate graduation in May of 2012, and continued to achieve his 4.0 GPA throughout all of his graduate work. He’s won numerous awards for academic excellence, notably the NCAA Senior CLASS Award and the William V. Campbell Trophy, which is given to the nation’s premier college football scholar athlete and is known unofficially as the “academic Heisman.” On top of that, Urschel is a published mathematician, with a mathematics research paper published in the journal *Celestial Mechanics and Dynamical Astronomy.*

But to most people who recognize his name, Urschel is a football player. “Some of you may have heard that I have been known to do a thing or two other than football,” he said at the beginning of the 2013 Big Ten Football Kickoff Luncheon keynote speech. “One could say I dabble in mathematics.” While it’s clear that someone with multiple degrees in mathematics does more than dabble, that line illustrates the big choices he faces with two passions like math and football—passions that don’t easily mesh into a single career.

This might be why the theme of his Big Ten Kickoff Luncheon speech was about preparing for life after football. After all, if Urschel wishes to pursue both of his passions, only one of them can shine at a time. And, as he points out: “Regardless of how far football takes us, we will all leave this game at a relatively young age, and with lots of life left ahead of us.”

Urschel has already thought about what he
Daniel Costantino, lecturer in physics, and Song Tan, professor of biochemistry and molecular biology, have been honored with the 2014 C.I. Noll Award for Excellence in Teaching by the Eberly College of Science Alumni Society. Instituted in 1972 and named in honor of Clarence I. Noll, dean of the college from 1965 to 1971, the award is the highest honor for undergraduate teaching in the college. Students, faculty members, and alumni nominate outstanding faculty members who best exemplify the key characteristics of a Penn State educator, and a committee of students selects the award winners from the group of nominees.

Costantino teaches, and is course administrator for, large introductory algebra-based physics courses aimed at non-physics majors. In most semesters, he also is course administrator for a large introductory calculus-based physics course. He is being honored for his ability to connect individually with students in these large courses and to engage the students in difficult subject matter.

Tan teaches physical chemistry to undergraduate molecular biology and microbiology majors and structural biology to graduate students. He is being recognized for his ability to convey difficult subject matter and abstract concepts in innovative ways that engage students, encourage understanding, and promote retention. He also has mentored more than sixty undergraduate students in his research laboratory, including several who have won prestigious achievement awards.

—Sam Sholtis
Penn State Alumna Named 2014 MacArthur Fellow

Danielle Bassett, a 2004 Penn State graduate, was named a 2014 MacArthur Fellow in September along with 20 other “genius grant” winners. The prize is one of the most prestigious awards given to individuals who show originality, innovation, and creativity in their professional pursuits. Other 2014 winners include artists, lawyers, scientists, historians, and musicians.

“Nobody is told that they are under consideration, so every MacArthur Fellow is surprised by this,” said Bassett, a professor of bioengineering and electrical and systems engineering at the University of Pennsylvania. Bassett’s current research focuses on how the brain is connected and how those connections change with disease and learning new skills, but she has a vast range of experience, starting with her undergraduate work.

Bassett got involved in research early at Penn State Berks, where she worked with an astrophysicist and a professor of literature. After transferring to the University Park campus to complete her physics degree, Bassett got involved in chemistry research.

“Something I wrote a long time ago in one of her many recommendation letters was that I could easily imagine her being the head of the National Institutes of Health one day,” said Rick Robinett, a professor of physics who was Bassett’s adviser at Penn State.

Bassett was the first Penn State student to win the Winston Churchill Scholarship for a fully paid year of academic study at Cambridge University in the United Kingdom. She also won a five-year NIH-Cambridge University Graduate Partnerships Fellowship, which she will use in conjunction with her Churchill scholarship.

As an alumna, Bassett is a mentor with the Schreyer Honors College Mentoring with Honors Program through which she shares advice with and answers questions from her student mentees. In 2012, the Alumni Association honored her as an Alumni Achievement Award winner.

As a MacArthur Fellow, Bassett will receive a five-year, $625,000 grant from the John D. and Catherine T. MacArthur Foundation that is meant to provide recipients the ability to pursue creative research or professional interests.

—Heather Hottle Robbins
Abraham Honored with Title of Penn State Alumni Fellow

On October 8, 2014, twenty Penn State alumni were honored for their outstanding professional accomplishments and given the lifelong title of Alumni Fellow, the highest award given by the Penn State Alumni Association. Among the Alumni Fellow recipients, Donald Abraham, ’58 B.S. Chemistry, was awarded this permanent designation.

Abraham is the Alfred and Francis Burger Emeritus Professor of Medicinal Chemistry and Biological Chemistry, and Emeritus Director of the Institute for Structural Biology and Drug Discovery at Virginia Commonwealth University.

Abraham has conducted research in a variety of therapeutic areas, but he is perhaps best known for his studies of the structure of hemoglobin and the use of that structure in computer-based drug design. During his career, he founded or co-founded three successful companies: Allos Therapeutics, which produced an FDA-approved anticancer drug, eduSoft; a software company that markets the structure-based design program HINT; and kSERO, which specializes in teaching children science through game playing. He also founded and was the first director of the Institute of Structural Biology and Drug Discovery at Virginia Commonwealth University.

Abraham published more than 175 peer-reviewed articles; he edited the sixth edition of Burger’s Medicinal Chemistry and Drug Discovery; and he co-edited the seventh edition. He is the recipient of numerous awards and accolades, including the Humboldt Prize in 1973, the Virginia Outstanding Scientists of the Year in 2001, and the Amgen Paul Dawson Award in Biotechnology in 2002, and he also was awarded an honorary doctorate from the University of Parma (Italy) in 2005. In addition, Abraham was inducted into the American Chemical Society Division of Medicinal Chemistry Hall of Fame in 2010. In 2013, he was awarded an Outstanding Science Alumni Award.

Abraham also earned a master’s degree from Marshall University and a doctoral degree from Purdue University. Abraham, a life member of the Penn State Alumni Association, lives in Windermere, Florida, with his wife, Nancy.

Since the Alumni Fellow’s establishment in 1973, more than 700 alumni have been honored with the title of Alumni Fellow, under 1 percent of all 631,000 living Penn State alumni, by the Penn State Board of Trustees.

“The Alumni Fellow program showcases the significant contributions Penn Staters make to our nation and the world every day,” said Roger L. Williams, executive director of the Penn State Alumni Association. “Even more important, it provides our fellows the opportunity to share their experience and wisdom with students, faculty and staff, thus adding an extra dimension to Penn State’s academic programs.”

—Barbara Collins, edited by Jill Gomez and John Patishnock
Thank you to the alumni and friends who have committed funds for scholarships to benefit students in the Eberly College of Science. Below are gifts received between March 1 and June 30, 2014.

**Dr. Joellen Schildkraut & Dr. Brian Annex Scholarship in the Eberly College of Science (Non-Endowed)**
*Established by: Joellen Schildkraut ('78 B.S. Micro) and Brian Annex
*Amount: $12,500
*Purpose: Provide recognition and financial assistance to outstanding undergraduate students enrolled or planning to enroll in the Eberly College of Science who have demonstrated need for funds to meet their necessary college expenses.

**Leonard P. Suffredini Memorial Award in the Eberly College of Science (Non-Endowed)**
*Established by: Carl Suffredini ('84 B.S. CMPSC) and Ann Suffredini
*Amount: $5,000
*Purpose: Honor and recognize an undergraduate student who is enrolled in the Eberly College of Science and has demonstrated outstanding involvement, recruitment, and service to the college.

**Lewis A. & Opal D. Gugliemelli Distinguished Graduate Fellowship in the Eberly College of Science**
*Established by: Opal D. Gugliemelli* Trust
*Amount: $250,000
*Purpose: Recruit and recognize outstanding first-year doctoral students who exhibit academic excellence and who plan to enroll as candidates for a graduate degree in a program offered by the Eberly College of Science.

**Paul and Mildred Berg Early Career Professorship in the Eberly College of Science**
*Established by: Paul ('48 B.S. Ag & Bio Chemistry; '95 Honorary Ph.D. Sci) and Mildred Berg
*Amount: $534,000
*Purpose: Provide financial assistance to undergraduate students enrolled or planning to enroll in the Eberly College of Science who have demonstrated need for funds to meet their necessary college expenses. First preference shall be given to students from the eligible pool who are participating in a study abroad program.

**Robert and Nancy Nielsen Trustee Scholarship in the Eberly College of Science**
*Established by: Robert ('62 B.S. Phys) and Nancy Nielsen ('63 B.S. Edu)
*Amount: $50,000
*Purpose: Provide financial assistance to undergraduate students who have demonstrated need for funds to meet their necessary college expenses.

**Eberly College of Science Trustee Scholarship in Memory of Dr. Eugene F. Apple**
*Established by: Jane L. Apple
*Amount: $50,000
*Purpose: Provide financial assistance to undergraduate students who have demonstrated need for funds to meet their necessary college expenses.

**Stephen B. Brumbach Distinguished Graduate Fellowship**
*Established by: Stephen B. Brumbach ('71 Ph.D. Chem)
*Amount: $255,457
*Purpose: Recruit and recognize outstanding first-year doctoral students who exhibit academic excellence and who plan to enroll as candidates for a graduate degree in a program offered by the Eberly College of Science.

**Trustee Scholarship for Science Students**
*Established by: H. Jacob Hanchar ('02 B.S. Biol)
*Amount: $50,000

**Norman and Trygve Freed Early Career Professorship in Physics**
*Established by: Trygve Freed
*Amount: $334,000
*Purpose: Ensure that the University can compete for the scientists, scholars, and educators with the greatest potential to contribute to our institution, our students, and our world.

**Dr. George Kosco and Diana Kosco Trustee Scholarship in the Eberly College of Science**
*Established by: George Kosco ('68 B.S. PreMed)
*Amount: $100,000
*Purpose: Provide financial assistance to undergraduate students who have demonstrated need for funds to meet their necessary college expenses.

**Richard and Rebecca Kemmerer Trustee Scholarship in the Eberly College of Science**
*Established by: Richard ('69 B.S. Chem) and Rebecca Kemmerer
*Amount: $50,000
*Purpose: Provide financial assistance to undergraduate students who have demonstrated need for funds to meet their necessary college expenses.

**Norman and Trygve Freed Trustee Scholarship in the Eberly College of Science**
*Established by: Trygve Freed
*Amount: $50,000
*Purpose: Provide financial assistance to undergraduate students who have demonstrated need for funds to meet their necessary college expenses.

**Kay D. Mooney Trustee Scholarship in the Eberly College of Science**
*Established by: Kay D. Mooney ('89 B.S. Math)
*Amount: $50,000
*Purpose: Provide financial assistance to undergraduate students who have demonstrated need for funds to meet their necessary college expenses. First preference shall be given to students from the eligible pool who are majoring in or planning to major in mathematics, or successor degree program.

**F. Matthew and Edan Rhodes Trustee Scholarship in the Eberly College of Science**
*Established by: F. Matthew ('79 B.S. Phys) and Edan Rhodes
*Amount: $50,000
*Purpose: Provide financial assistance to undergraduate students who have demonstrated need for funds to meet their necessary college expenses.

**Wilson Family Trustee Scholarship in the Eberly College of Science**
*Established by: Robert F. Wilson, Jr. ('73 B.S. PreMed) and Betsy V. Wilson
*Amount: $100,000
*Purpose: Provide financial assistance to undergraduate students who have demonstrated need for funds to meet their necessary college expenses.

*deceased
Because of you...

90 new endowments
3,033 science recipients
$14 million in student awards
$6.3 million in academic program support

A total of 9,450 donors contributed to the Eberly College of Science during For the Future: The Campaign for Penn State Students from July 2008-June 2014.

Because of you...

The college created 90 new endowments, bringing our total to 344 endowments, providing 3,033 students awards for a total of $14,004,288 and academic program support of $6,343,804.

33 new Trustee Matching Scholarships were created during the campaign to support the students with the highest financial need in the college. The need for scholarship support continues, and so will the Trustee Matching Program. Inspired by the program’s success, Penn State has renewed its commitment with a new poll of matching funds, and there is still an opportunity to become the University’s partner in creating Trustee Scholarships for the college. To learn more, please visit giveto.psu.edu or call Rob Mothersbaugh, director of alumni relations and development for the Eberly College of Science at 1-800-297-1429.

We are grateful for your commitment to Penn State Science.
Penn State Science Celebrates Close of Campaign

THE EBERLY COLLEGE OF SCIENCE CELEBRATED the end of For the Future: The Campaign for Penn State Students at an event held on April 11 at the Willaman Gateway Bridge. Hosted by Dean Dan Larson, alumni, donors, faculty, staff, and students enjoyed the evening listening to live jazz, capturing memories in a photo booth, and gathering to hear the dean’s remarks on the campaign, as well as recognizing three Distinguished Faculty Awards.

The goal for Penn State was to raise $2 billion to advance the frontiers of learning at the most comprehensive, student-centered research university in America.

The college raised over $90 million to advance science education, research, and public service, and helped Penn State surpass its $2 billion goal, raising $2.158 billion by the close of the seven-year campaign on June 30, 2014.
Dear Alumni and Friends of Penn State Science,

Congratulations and thank you! This year Penn State Science received 4,523 gifts totaling $14,385,220 from individuals and organizations that share our vision of excellence and opportunity in science, education, research, and outreach.

We are also celebrating the conclusion of For the Future: The Campaign for Penn State Students, a seven and a half year University-wide campaign. With your support we raised over $90 million dollars for Penn State Science and $2.158 billion for Penn State, surpassing the goal of $2 billion.

Highlighted below are the benefits the Eberly College of Science and its students are reaping from this campaign:

**Ensuring Student Opportunity**
$24.7M
From the need-based Trustee Matching Scholarships, to scholarships for our high achievers, to scholarships focused on certain areas of study, we are in a much stronger position to support our students.

**Enhancing Honors Education**
$2.3M
The Eberly College of Science has the highest percentage of students in the Schreyer Honors College and these funds support these students.

**Enriching the Student Experience**
$6.3M
The focus for this area is the renovation of Ritenour for the Science Student Academic Achievement Center. Renovations will begin the summer of 2015.

**Building Faculty Strength and Capacity**
$13.5M
This allows us to endow several chairs and provide career professorships throughout the college.

**Fostering Discovery and Creativity**
$28.6M
Gifts in this area allow us to continue to be on the cutting edge of research and allow our students to gain experience in some of the top labs in the country.

**Sustaining a Tradition of Quality**
$15.6M
This category provides the college funds to maintain flexibility and address needs as they arise.

We are pleased to present the following list, alphabetically by gift level of the individuals and organizations that supported us financially this past fiscal year (July 1, 2013—June 30, 2014). All of these gifts contributed to the overall success of For the Future: The Campaign for Penn State Students. Thank you for investing in the Eberly College of Science and making Penn State a world-class institution.

With sincere appreciation,

Robert L. Mothersbaugh, CFRE, ’87 Bus Senior Director of Alumni Relations and Development
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Alfred P. Sloan Foundation
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American Cancer Society
American Chemical Society
American Heart Association
Art Guild, Inc.
Bayer USA Foundation
Bill and Melinda Gates Foundation
Bio-Logic USA, LLC
Boeing Company
Burroughs Wellcome Fund
Carnegie Mellon University
Case Western Reserve University
Coy Laboratory Products Inc.
Damon Runyon Cancer Research Foundation
Delta G., Co.
Dow Chemical Company
DPRA Inc.
Eidgenössische Tech Hochschule
ExxonMobil Corporation
Fidelity Investments Charitable Fund
Howard Hughes Medical Institution
IC Laser Eye Care PC
IHI Research Institute
INDIGO Biosciences, Inc.
International Healthspan Institute
Irving and Edythe Grossman Foundation
JDF Pharmaconsulting, LLC
Jewish Communal Fund
John Templeton Foundation
Morris Animal Foundation
New England Biolabs Inc.
Northeastern Chemical Association
Northern New Jersey Plastic Surgery, LLC
Ohio State University
Oregon Foundation for North American Wild Sheep
PA Breast Cancer Coalition
Pittsburgh Foundation
PPG Industries Foundation
Princeton University
Penn State Alumni Association
QIAGEN, Inc.
Research Corporation for Science Advancement
Restek Corporation
RNA Society
Shell Oil Company
Simons Foundation
Society of Biological Inorganic Chemistry
Spastic Paraplegia Foundation, Inc.
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United Way of Delaware
United Way of Washtenaw County
UnitedHealthCare Services, Inc.
US-Israel Binational Science Foundation
VWR International
Wells Fargo Advisors, LLC
Xerox Corporation USA
Zaccheus Daniel Foundation

$10,000 and more

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Harry and Noreen Allcock
Jane L. Apple
Christine W. Ayoub
Robert and Holly Baltera
Paul and Mildred Berg
Michael Brin
Stephen Brumbach
David Cech and Mary Schwartz
Barbara J. and Glenn D. Dalton
Mary E. DeVries
Jack and Pauline Dickstein
Edmund and Josephine Elder
Maria Finn
Barrett C. and Luanne Breuer Fisher
Trygve Freed
Kolin Good
Richard A. Gottscho
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Cada R. and Susan Wynn Grove
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David L. and Theresa Rowan Shupp  
John G. and Barbara D. Vandenbergh  
Louise Wartik  
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Upcoming Events

January 11
• Mathematics and Alumni Reception at JMM Conference/San Antonio, Texas

February 21
• Deadline to submit nominations for Alumni Board

February 28
• Science Alumni Mentoring Dinner and Workshop, University Park, Pennsylvania

March 3
• Physics and Alumni Reception at APS

April 17–18
• Dean’s Advisory Board Meeting
• Alumni Board Meeting
• Campaign Committee Meeting
• Alumni Board Networking Event
• Blue/White Football Game
• Mount Nittany Society Dinner

June 5–7
• Traditional Reunion Weekend
• Science Brunch (June 5)

For more information on any of the events listed above, visit science.psu.edu/alumni/events.