the SPS Observer

Volume LVII, Issue 1

SPRING 2023

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the SPS Observer

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ON THE COVER

Sisyphus: Momentum of the Photon is an acrylic painting by Valeria Viteri-Pflucker, a PhD student in optics at the University of Rochester. The work depicts Sisyphus, a famous figure from Greek mythology, pushing a crystal ball up a mountain. Sisyphus is a macroscale representation of the force exerted by light as it is used in optical traps. The goal of the work is to make viewers think about how the momentum of the photon, though small, lets scientists explore the microworld, investigating the details of error correction during DNA transcription or of the behaviors of molecular motors. *Sisyphus: Momentum of the Photon* won Best in Show in the Physics Phine Art Contest at the 2022 Physics Congress.

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Reflections on the 2022 Physics Congress

by Aidan Keaveney, Associate Zone Councilor Representative, 2022–23 SPS Executive Committee, Appalachian State University

TOP: Aidan Keaveney introduces former U.S. representative Dr. Rush Holt, a plenary speaker at the 2022 Physics Congress.

ABOVE: Deanna Marshall, Zone Counselor of zone 17, and other attendees participate in the MetaArt Project at the PhysCon Phestival. Photos courtesy of SPS.

The Physics Congress is the triennial gathering of undergraduate students, faculty, and professionals in the physics and astronomy community to celebrate our love of physics and astronomy, discuss the culture of our fields, and learn from each other. At PhysCon, we reconnect with old friends and make new ones. We present our research and hear from others. We dine with Nobel Prize winners, NASA engineers and scientists, or even members of Congress. And, of course, we take selfies with the life-size cutout of Brad Conrad, the director of SPS, in a spherical cow costume. PhysCon is exhilarating, educational, inspiring, and silly in equal measure. PhysCon is physics and astronomy at its best.

The 2022 Physics Congress was held in Washington, DC, last October. By almost every metric, this PhysCon was the best one yet. In attendance were 950 students and 166 faculty members from a total of 257 schools. Another 60 local scientists and engineers joined us for lunch one day. We had the *Avengers: Endgame* of academic conference panels in the Centennial Plenary, where Drs. John Mather, Jim Gates, Jocelyn Bell Burnell, and Eric Cornell shared their perspectives on the future of physics and astronomy. We also had arguably the most *ph*un closing event yet: the Physics Phestival.

Perhaps the best way to convey the unique nature of PhysCon is by sharing some of my own experiences.

The first time I spoke to Dr. Jim Gates, some of us students on the SPS Council were taking the centennial speakers to dinner at a nearby Indian restaurant. I walked up to introduce myself and thank him for coming to PhysCon, but I didn't get past "Hi, Dr. Gates" before he interrupted me. "No no, I'm not Dr. Gates, I'm Jim." Now I'm from North Carolina, where the appropriate response is "Okay, sorry about that, Dr. Jim," but Jim was having none of my southern mannerisms. I don't think he would have let us go to dinner until I called him Jim. Calling such an accomplished scientist by his first name made the experience feel much more relaxed and collegial. Our group had a lovely evening.

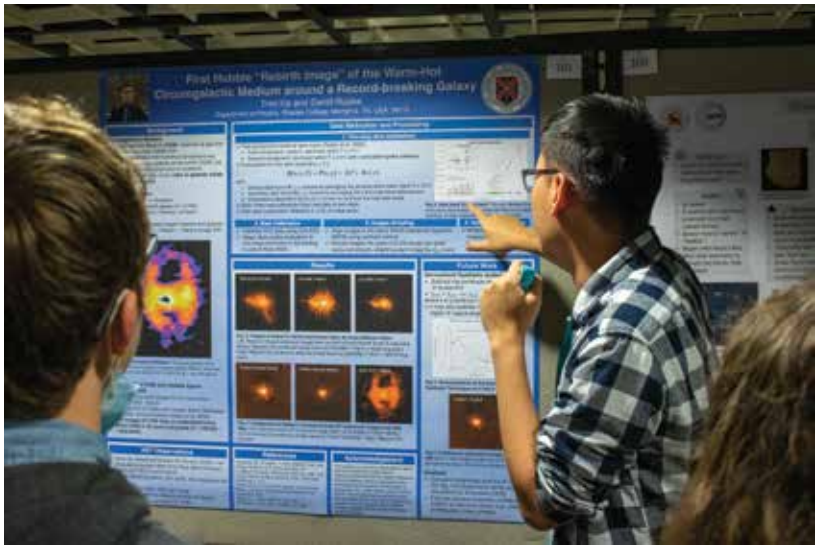
Last summer I did an SPS internship on science policy, and I presented a poster on this work at PhysCon. I've presented it at other conferences, and I'm usually the only one discussing science policy. But at PhysCon,

I was one of several. During the poster session I spoke to all kinds of attendees, from students who'd never considered science policy as a career, to Dr. Michael Moloney, the CEO of the American Institute of Physics and a former diplomat who worked on the very issues covered in my poster. SPS, almost by definition, attracts students who are compelled to impact their communities positively. Presenting at PhysCon connected me to students doing similar work to advance our field and address the scientific problems of our generation.

One of the best parts of PhysCon was celebrating physics and astronomy with old—and new—friends. I spent an evening discussing undergraduate research while relaxing in a hot tub with a high school classmate and a handful of other SPS council members. Another time, I got coffee with someone who created a platform for Iowa voters to see the science policy positions of candidates running for office. I spent the Physics Phestival reconnecting with SPS interns from last summer, passing around cardboard boxes like yearbooks for all of us to sign. I cheered as friends won awards for their research and artwork. SPS does many things well, but perhaps nothing better than bringing people together in physics, *ph*riendship, and *ph*amily.

On Saturday night I was lucky enough to share a dinner table with Dame Jocelyn Bell Burnell and a few friends. At one point she told us, "Someday, you'll be the ones naming telescopes after people. I hope you'll choose to name a thing or two after women." I then asked what she would want to be named after her. She initially responded with her classic Irish wit, "Well, honestly, I think I'd rather not." But she went on to explain that she'd used the money from her Breakthrough Prize in Science Award to establish the Bell Burnell Graduate Scholarship Fund, which encourages greater diversity in physics by assisting physics PhD students from underrepresented groups in the United Kingdom, and she'd choose something like that. Lo and behold, the next morning—in my first vote as a new member of the SPS Executive Committee—we approved a new name for the SPS Leadership Scholarship: the Jocelyn Bell Burnell SPS Leadership Scholarship, in recognition of her years of service to SPS.

The Physics Congress isn't just a series of speakers, workshops, and poster sessions, although it has all those things. It's the place where the physics and astronomy communities come together, from Nobel Prize winners to first-year undergraduates, to learn from each other. Even I, a starry-eyed senior from the heart of the UNC-Duke basketball rivalry, can call Dr. Jim Gates—a man TurboTax labeled a "genius" in one of its commercials—by his first name, discuss nuclear nonproliferation with a former diplomat, and have dinner with the woman who discovered pulsars—and for whom one of SPS's highest honors is now named.



TOP: Students participate in the Physics for Humans: Entrepreneurship with Physics and Astronomy workshop.

ABOVE: An undergraduate student presents research at the 2022 PhysCon poster session. Photos courtesy of SPS.

But perhaps most importantly, at the Physics Congress I connected with some of the best and brightest of the first generation to grow up with social media; the generation that will put humans on another planet; the generation that went to college on Zoom; and the generation that will be on the business end of climate change. We face problems that, left unexamined, will reshape humanity for the worse. PhysCon reminded me, and I hope this reminds all of you, that no generation is better equipped to face those problems than ours. And as physics and astronomy students, we are well positioned to face these challenges and find solutions. I look forward to being reminded of that once again in Denver, Colorado, for the 2025 Physics Congress. I hope to see you there. //

Celebrating Science with a Fantastic Festival

by Carlee Garrett, SPS Member, Texas A&M University

The physics and astronomy department at Texas A&M University runs one of the largest physics outreach programs in the nation, and our SPS chapter is the backbone of these activities. The SPS team brings physics demonstrations to where the people are: First Friday Street Festivals in downtown Bryan, Heritage Days, and Texas A&M's popular football games. SPS members also volunteer for the Physics Show, another popular free program in which thousands of K-12 students are bused to campus from all over Texas to explore fun, interactive physics experiments they don't see in their classrooms.

On top of all that, our chapter plays a prominent role in the largest annual science outreach event at Texas A&M—the Physics and Engineering Festival. Over the weekend, the event attracts more than 7,000 visitors from the local community, the state, and all over the country.

The festival is a fantastic time for science lovers. We have hundreds of hands-on demonstrations for visitors that explore different areas of physics. Visitors also get to hear from guest speakers who are prominent in the field. Past speakers include Stephen Hawking, Brian Greene, and renowned astronaut Nancy Currie-Gregg. And, of course, the event ends with a bang—five barrel liquid nitrogen depth charges, explosions powerful enough to shoot water three stories high! You can see a test run on our YouTube channel at youtu.be/LjW81NCfjI0.

Our SPS members work tirelessly over the festival weekend to share physics demonstrations and our passion for science with attendees. But our involvement isn't limited to the festival itself. We also help build some of these demonstrations through the Discover, Explore, and Enjoy Physics and Engineering (DEEP) program. Through this program, SPS members work alongside other physics and engineering students to construct or improve demonstrations in small teams led by graduate students. We get valuable, hands-on experience and improve our teamwork skills in the process, and also develop good presentation skills when we showcase our demonstrations.

To reach as many people as possible with our most popular demonstrations, some SPS members starred in a YouTube video series called Real Physics Live. The videos were put to use during our 2021 festival, which was virtual due to the COVID-19 pandemic. Our festivals are in person again, but we've maintained the virtual component to continue impacting a global audience. To keep the community engaged with physics, the department has also recently enhanced its social media presence by posting videos of memorable demonstrations on the department's YouTube, Instagram, Twitter, and TikTok accounts. We'd love for you to connect with us at linktr.ee/tamuphysastr, and we hope to see you at a future festival! //

TOP: The grand finale makes an impression! Photo by Tim St. Martin.

MIDDLE: A family learns about buoyancy as bubbles float over dry ice. Photo by Geoffrey Franceschi.

ABOVE: A volunteer throws a frozen racquetball during a festival demonstration. Photo by Tim St. Martin.

Seeing Past the City Lights

by Erin McGee, Jordan Cory, and Anastasia Pergament, SPS Members, Stevens Institute of Technology

Living close to New York City has its advantages, but stargazing is not among them. Nighttime light pollution and a lack of open space make sure of that! Despite the challenges, our SPS chapter at Stevens Institute of Technology has found that city skywatching is possible, and it's a great excuse to get outside and build community while appreciating the universe.

In November we invited SPS members, astronomy students, and our physics department to gather just after dark at Pier C Park, located right on the Hudson River walkway across from New York. At that time of year, it was dark enough in the early evening to see Jupiter and Saturn at the same time, even with a full moon.

The event, run by professor Ting Lu, made use of telescopes from the physics department and our SPS chapter. We had two main goals: show astronomy students the objects they were studying in real life, and grow interest in space in the general community.

"No matter how many times you've seen the rings of Saturn or the colored bands of Jupiter and its moons, you'll be amazed all over again every time you peek through the eyepiece," says Professor Lu.

One of the goals of our SPS chapter is to build community, and events like this one help connect students who share an interest in physics and astronomy, no matter their major. It sparked a deeper curiosity in many attendees, and it was a fantastic leadership and mentoring opportunity for the upper-level physics students who ran the telescopes and shared their astronomy knowledge.

For those seeking to get involved in skywatching, urban or otherwise, the best place to look is often right in your own community. For example, our area has great resources, including the Amateur Astronomers Association of New York, which hosts observing events and free planetary science classes open to the public. Many are held at parks and observatories in the city. They also publish "skylights"—moon phases and constellations to look for each month.

TOP: The SPS chapter at Stevens Institute of Technology poses for a group photo during one of their semesterly camping trips.

ABOVE: A Stevens Institute of Technology student peers through a telescope during an astronomy night. Photos courtesy of Stevens Institute of Technology's SPS chapter.

Our chapter plans to continue helping people be inspired by the night sky. We also enjoy it as a chapter—each semester we go camping, away from city light pollution, to observe and photograph the planets and stars through telescopes. This semester we're going farther than usual—to Cherry Springs State Park, a dark sky park in northern Pennsylvania.

Whether you have an avid interest in astronomy or just enjoy getting outside, there is something to be gained from looking up—even in a city. "I think people are drawn to astronomy because of the vastness of space and all the fascinating objects out there," says Professor Lu. "Even within our solar system, there are objects with strikingly different properties. Not to mention that our solar system is just one of the billions of star systems in our galaxy, and there are so many other galaxies in the universe!" //

Rekindling Curiosity with a Cosmic Cafe

"Don't fear the mystery!"

by Noah Mitchell, Past SPS Chapter President, and Colby Smith, SPS Chapter Vice President, Abilene Christian University

Our SPS chapter at Abilene Christian University (ACU), like many others, has faced some hardships over the last few years. SPS meetings wound down to a couple of cabinet members, nothing more. But our recent Cosmic Cafe reminded us that our chapter can put on fantastic events that engage our members and campus community.

In the past, we've held Cosmic Cafes at a local coffee shop. There, an invited speaker talked to students and the local community about a physics topic, and usually research and internship opportunities as well. But with the closure of our local coffee shop, followed by the pandemic, our chapter hadn't held a Cafe for some time. In the 2021–22 school year, we made it our mission to start hosting this event again.

It is safe to say that this Cosmic Cafe did not want to come to fruition. We had issues booking a location and juggling the logistics of drinks and snacks since we weren't in our usual spot. We ended up hosting the event in our school library, which has quite a different atmosphere from the coffee shop. But we made our own atmosphere!

The day arrived, and what we thought would be a casual physics talk started. Dr. Jim Drachenberg, a professor at ACU, talked about what physicists do and how they go about trying to understand the confusing world of physics. He discussed work he had done at Brookhaven National Lab, specifically at the Relativistic Heavy Ion Collider (RHIC). Dr. Drachenberg then talked quite a bit about spin, keeping it light enough for undergraduates to grasp.

This seemed like a talk Dr. Drachenberg had given many times before, but about halfway through it took an unexpected turn. Most speakers explain as much as possible in their allotted time. Dr. Drachenberg was different. He came to a slide asking us, the audience, why spin mattered. He invited us to think past the *how* and into the *why*. And to be honest, no one had any idea how to answer the question.

Dr. Drachenberg continued by asking us why the stars matter, why we matter, and why the arts matter. The audience was enthralled as he kept going at a breakneck pace, talking about things seemingly far from the sciences. It was thrilling. Then he asked us again why studying spin matters. His answer? It's the same reason we look at the stars. Spin elicits wonder, and is worthy of studying for the sake of studying. "The world is pretty surreal down there," Dr. Drachenberg said, "but don't fear the mystery!" There is something beautiful about studying these awe-inspiring objects and concepts in our universe.

While we have hosted Cosmic Cafes in the past, and will continue to host them in the future, there was something different and important about this event. The audience could feel this, thanking Dr. Drachenberg with a standing ovation. It felt like we had relit the embers of our club. We had rekindled a love for discovery. And we had most certainly returned to the roots of what made our chapter of SPS our own. //

FAR LEFT: The ACU SPS chapter's first Cosmic Cafe in three years is a roaring success.

LEFT: There's nothing like enjoying a good cup of coffee during a good physics talk. Photos courtesy of Rinni Finley.

The Physics Research Journey:
Upper-Level Students Offer Words of Wisdom

by Pavani Jairam, SPS Chapter President, Duke University

When starting their physics journeys, students who wish to pursue research may be daunted by questions of how to get started and what field to pursue. To ease these anxieties among students at Duke University, five of our upper-level undergraduates presented their research and offered advice to fellow physics students.

1 GET STARTED—YOU DON'T HAVE TO KNOW EVERYTHING

First up, senior Elliott Kauffman discussed his research projects in high-energy physics. He walked us through the basics of the ATLAS experiment at the Large Hadron Collider (LHC), then summarized his Duke research on emerging jets at ATLAS. He also told us about his off-campus experience using machine learning to predict the origin of particle collisions in LHC experiments.

To inspire audience members to start their own research journeys, Kauffman talked about how and why he got involved. He explained that research is a good way to develop more skills and that students may be compensated for their work. Among his recommendations for finding research opportunities, he suggested emailing professors with a request to join their labs.

2 BE INDEPENDENT, BUT ASK QUESTIONS!

Next, senior James Shen dove into supernova neutrinos by talking about his research with Duke's High Energy Physics Group and Fermilab's Deep Underground Neutrino Experiment. Shen studies the directionality of supernova neutrinos, which reveals where supernovae are located in the sky. As a physics undergraduate, Shen focused on classes and developing skills during his first two years, along with small-scale personal projects. He learned how to code, which became especially useful when he started doing research his junior year. Notably, he also spent time getting to know his professors and later reached out to those connections to find research opportunities.

Along the way, Shen learned the value of communicating with professors. It's important to ask questions, he said, but conducting research also requires personal responsibility and independence. As Shen summed it up, "Learn how to learn by yourself!"

ABOVE: The speakers pose for a photo after their presentations. Photo courtesy of Chris Vilorio.

3 BE PASSIONATE

Following Shen was senior May Mei. Mei's research with Duke's Neutrino and Cosmology Group involves working with the Supernova Early Warning Systems (SNEWS). SNEWS is a network of supernova neutrino detectors that, when it sees early signals of a supernova, alerts the astronomy community and advises them where to look. In her current research on power electronics, Mei studies the control and optimization of lattice converters. As this is more of an electrical and computer engineering project, she showed us that physics skills can apply to research projects in different areas!

After presenting her research, Mei provided links to current research opportunities. A student with a passion for research, she said, will be able to find a professor to work with. She suggested reaching out to many people—advisors, deans, mentors, and even other departments. When it comes to preparing for research, Mei said to "learn, learn, use." She advised attendees to absorb as much as they can from classes so they can utilize that knowledge later, in research.

4 TRY DIFFERENT FIELDS

Senior Ari Bechtel presented his research on three different projects. In the first, he studied methods for detecting supernova neutrino event rate signatures with the Neutrino and Cosmology Group. Currently, he's researching ^{129}Xe hyperpolarized gas MRI, which falls under the medical physics umbrella. In addition, he has an independent research project that entails establishing a hemoglobin correction and structural limit for the RBC:barrier metric.

As Bechtel explained, his research journey didn't follow a straight path. He started doing research in oceanography before college, then went on to study neutrinos, and finally ended up doing research in medical physics. This served as a valuable lesson for those who may not know what they want to pursue. "Don't pigeonhole yourself. Try new things," he said.

5 VENTURE OUTSIDE OF YOUR UNIVERSITY

The final presenter was junior Pavani Jairam, who has had multiple research experiences. With Duke and the Neutrino and Cosmology Group, she currently studies the black hole formation stage from core-collapse supernova neutrinos. She has also worked on applying deep learning computer vision techniques to Dark Energy Survey (DES) data. Working with another undergraduate student and a master's student on the DES project, Jairam utilized two methods to flag transient artifacts in the data. She has also analyzed high-energy physics data with the SLAC National Accelerator Laboratory.

Her advice to underclassmen echoed that of previous presenters, but Jairam added that students could and should look for opportunities to work with people and institutions outside of Duke.

After the presentations, students asked about which classes to take and how to prepare for research, requested tips for sending cold emails to potential research advisors, and learned about labs they could join on campus. The speakers each chimed in to provide advice. One message was clear: The research journey at Duke is an exciting one, filled with support from fellow students. //

SPS RESEARCH AWARDS AND OPPORTUNITIES

Get money for chapter research

SPS Chapter Research Awards provide up to $2,000 for physics and astronomy research projects deemed imaginative and likely to contribute to the strengthening of the SPS program. Applications are due November 15. For details visit spsnational.org/awards/chapter-research.

Present your research

SPS Travel Awards offer partial travel support for SPS members to attend and present their research at a national meeting of an AIP Member Society. Applications are accepted on a rolling basis. Learn more at spsnational.org/awards/travel.

Publish your research

The *Journal of Undergraduate Reports in Physics* (JURP) is a peer-reviewed publication of the Society of Physics Students that consists of papers by undergraduate physics and astronomy researchers. Manuscripts are accepted on a rolling basis but must be submitted by March 15 for print consideration. Learn more at spsnational.org/jurp.

SPS Award for Outstanding Undergraduate Research

These awards recognize exceptional physics or astronomy research by an undergraduate. Winners receive $1,800 in travel funding to present their research, $500 for themselves, and $500 for their SPS chapter. Applications are due March 15. Learn more at spsnational.org/awards/outstanding-undergraduate-research.

SPS-AAPT-ALPhA Undergraduate Award for Outstanding Laboratory Development

These awards recognize physics undergraduates for outstanding work on developing a lab apparatus or experiment. Awardees receive an invitation to present at an American Association of Physics Teacher's meeting, travel funding, and both a personal and departmental honorarium. Applications are due November 15. For details see spsnational.org/awards/outstanding-lab.

The Researcher's High: Building an Undergraduate Research Group

by Arian Dovald, SPS Chapter President,
Southern Adventist University

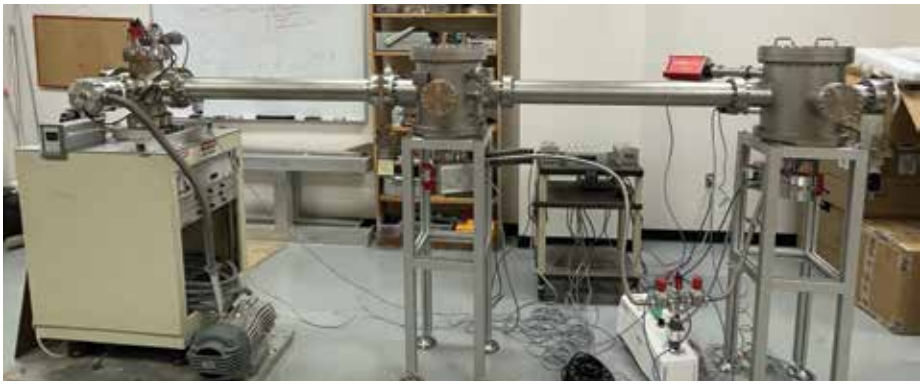
I arrived, alone, at Oak Ridge National Lab (ORNL). My classmate Tim Suzuki and our professor, Dr. Vola Andrianarijaona, would be arriving soon. As I tried to figure out which building to enter and who to contact, my nervousness grew. What was I doing here? I was no researcher.

Professionally dressed experts walked from building to building, important members of the science machine that is ORNL. I felt that slight sense of estrangement that plagues undergrads everywhere, the feeling that maybe science wasn't for me. Did I belong in this place, surrounded by real scientists? Having finished only my second year of physics, I was certain I wasn't prepared for this summer internship. Fortunately, my worries wouldn't make it past that day.

Tim and I were tasked with preparing an ion beam line—which had various issues after being moved from one lab to another—for experiments. It was up to us to get things running again and improve the system.

Over the summer we tested the massive beam line for leaks, achieved ultrahigh vacuum, replaced faulty gaskets between anodized steel tubes, developed better beam-chopping control, and more. Every task moved us closer to a greater goal, every solved problem a step toward making science happen. During the daily drives to our hotel, we talked about how fun, interesting, and fulfilling our day had been. You may be familiar with the runner's high—the feeling of calm euphoria after a good workout. Tim and I were experiencing the researcher's high, and we couldn't get enough.

As summer ended and the semester began, Tim and I looked for a way to satisfy our desire to do more research. This was, fortunately, not difficult. Dr. Vola had begun getting the parts to build an ion beam line on campus for student research, and we were on board with making it happen. The research goals were, and still are, broad. They vary from measuring the energies of molecular hydrogen ions to antimatter production. Getting the beam line ready for experiments would be a long process, requiring weeks of theory and construction. We would need the help of many students to get there. Tim and I saw this as an opportunity to use our SPS leadership positions to share the joy of research.



TOP: Students work with Dr. Vola to unload the Faraday cage for the ion source.

ABOVE: Engineering and physics students put together supports for vacuum chambers.

LEFT: The current beam line at SAU. Two large vacuum chambers are connected to an ion source at the far left. Two floor pumps and three turbo pumps create the ultrahigh vacuum. Photos courtesy of the Southern Adventist University SPS chapter.

After some discussion with Dr. Vola, we made a plan to start a research group. First, we set a specific time to work on the beam line: every Friday at 2 PM, since most people would be done with class by that time. Then we told friends, SPS chapter members, and classmates about the amazing research we were working toward. If they expressed interest, we invited them to join us. Everyone was welcome, regardless of their major or background. After two weeks, only five or so students had expressed a desire to participate. I was afraid we wouldn't have enough help.

When the day came to unload, open, and organize boxes of high-end equipment, Tim and I showed up early. To our surprise, there were over a dozen physics, engineering,

chemistry, and computer science students waiting to help! Dr. Vola couldn't believe we had so many eager people. A job that would've taken a couple of days instead took two hours. Our plan to share our excitement was a success, and we now had a powerful group of students engaging in research.

The group continued to meet every week, making consistent progress and building community. At one point only paperwork was holding us back (making me truly feel like a scientist). Now, over a year later, we have received and inventoried all our equipment, had an entire wall torn down, and built a large portion of the beam line. Having achieved ultrahigh vacuum, we are a few components and troubleshooting sessions away from making measurements and progressing physics research.

We are often asked how we managed to form our research group. There are various factors we believe led to its success: We created a low-pressure, comfortable environment, with no expectations for participants beyond a desire to explore and learn. We invited students to show up when they had time and ask questions without the pressure that's often present in the classroom. To build a strong group of undergraduate researchers, we've found that it's critical that they don't feel overly burdened or pressured by the commitment. Some group members show up every two weeks, others once a month, but there have always been a few that feel the researcher's high and seek more involvement. It's also important to have good communication and be consistent. Every Friday we send out an email to all who want a reminder, and we make sure to let people know when plans change. And finally, it's important to build a space where students feel comfortable connecting with others and are able to grow as individuals in a community.

As a result of this project, many students have gained valuable experience and made connections that will benefit them throughout their careers. More have done internships, written research papers, and conducted experiments than before we had the beam line. Group members have participated in the APS March Meeting and other physics conferences. As a bonus, we've seen our SPS numbers grow as more people have joined in our SPS chapter's activities. Most importantly, students have learned not to be afraid of physics research—that it's something to be excited about and share with the world. I believe every SPS chapter should find ways to participate in research, sharing its joy with others and growing stronger as a result. //

Apply for a Travel or Reporter Award!

Travel and reporter awards can be used for zone meetings, regional meetings, national conferences, and now national labs and observatories!

Travel Awards

Awarded to undergraduate members of the SPS national organization to present their research at a conference or travel to a national lab for professional development.

Applications for the SPS Travel Award must be submitted at least 10 business days before the first day of the meeting.

Apply at **spsnational.org/awards/travel**.

Reporter Awards

NEW: National Labs and Observatories!

SPS offers partial support, up to $300 for an individual reporter and $250 per person for chapter reporters, for SPS members to travel and report on national physics meetings for SPS publications.

Your article could be used in SPS publications such as the *SPS Observer*, *JURP*, or *Radiations*!

Applications for the SPS Reporter Award must be submitted at least 10 business days before the first day of the meeting.

Apply at **spsnational.org/awards/reporter**.

FEATURE

THE 2022 PHYSICS CONGRESS

Change
Belonging
Inspiration
Community
Opportunities

Washington, DC, October 6–8, 2022

What happens when 1,500 physics and astronomy undergrads and their mentors gather for three days of inspiring talks, interactive workshops, fascinating tours, and a one-of-a-kind physics festival?

Photo by the SPS reporters from the University of Wisconsin - River Falls.

EXPERIENCE—OR RELIVE—THE 2022 PHYSICS CONGRESS

- Read about the highlights on pages 14-21 and in future issues of the *SPS Observer* and *Radiations*.
- Watch plenary talks on the SPS YouTube Channel, youtube.com/@PhysicsStudentsAIP/streams.

ALL: Photos by SPS unless otherwise noted.

SAVE THE DATE! October 30–November 1, 2025

2025 PHYSICS CONGRESS
DENVER, CO

FEATURE

WHERE WILL PHYSICS AND ASTRONOMY BE IN 100 YEARS?

The 2022 Physics Congress Centennial Plenary

by Joe Hall, Philip Laduca, Nasir Perera-Olivio, Smita Rajan, and Ekin Secilmiis, SPS Reporters, Brown University

The ballroom is humming with the activity of over a thousand physics students, professors, and professional scientists. We're in the same room for the first time since the 2019 Physics Congress, and the sense of awe and gratitude is palpable. But the room is filled with even more excitement than you might expect because of what's coming next. You don't get to see something like this every year, maybe every 100 years.

In a special centennial plenary to celebrate the 100th birthday of Sigma Pi Sigma, the physics and astronomy honor society, the Physics Congress hosted four of the most distinguished faces in physics and astronomy today, all on stage at the same time. They span a variety of disciplines, backgrounds, and perspectives. The room fell silent as SPS director Brad Conrad and members of the SPS Council introduced the panel members.

First up was honorary chair Dame Jocelyn Bell Burnell, an accomplished astrophysicist and advocate perhaps best known for discovering radio pulsars as a graduate student. Next was Dr. S. James (Jim) Gates, Jr., a renowned theoretical physicist and former science and technology advisor to President Barack Obama. Then came Dr. John Mather, Physics Nobel laureate and senior project scientist on the James Webb Space Telescope (JWST). Completing the panel was Dr. Eric Cornell, an AMO (atomic, molecular, and optical) physicist who won a Physics Nobel Prize for synthesizing the first Bose-Einstein condensate.

Each speaker had 10 minutes to answer the same question: Where will physics and astronomy be in 100 years?

Speaking first as honorary chair, Dame Burnell discussed the past and future of astrophysics. She talked about being the only woman in her physics classes at the University of Glasgow and how the isolation and discrimination motivated her to create more opportunities in science for young women. She proudly noted that in 2019, the cutting-edge Vera C. Rubin Observatory in Chile became the first major telescope named after a woman (in 2020, NASA's Nancy Grace Roman Space Telescope became the second). Dame Burnell concluded by discussing promising directions for astrophysics, notably particle astrophysics, neutrino physics, dark matter, and dark energy.

Dr. Gates began much differently—by showing the crowd a photo of himself at age five. He discussed his love of science fiction as a child, saying that even then, he considered science a "way to have fun." Dr. Gates also spoke about the need for greater diversity in physics. He expressed his hope that physics will not only consist of a more diverse group of people in 100 years but will also have more diversity of thought and creative problem-solving. He cited the rise of computer science and computational physics as examples of new techniques becoming available to physicists. Finally, Dr. Gates highlighted the importance of communicating and engaging with the public as scientists, drawing on his experience at the White House.

Dr. Mather began by sharing his fascination with the origin of life. He mentioned early in his talk that space exploration and astrobiology will be valuable facets of physics and astronomy in the future, and he encouraged everyone in the audience to "build something nobody's ever built before." As the senior scientist on the JWST, he talked about how the success of future experiments will depend on large-scale collaborations across countries and fields of study. Dr. Mather pointed to quantum optics and information as new frontiers, and he reiterated the exciting opportunities ahead in the search for life outside of Earth.

Dr. Cornell looked to physics' past to predict its future. At the beginning of the talk, he confidently stated that in 100 years, physics will be "very, very different, but pretty much the same." What does this mean? He explained that the core principle of physics, which distinguishes it from other sciences, is that it can "explain a lot with a little." He argued that broad principles such as relativity, conservation, and symmetry are fundamental to physics. He noted that some of the biggest research subjects of the last 100 years, including supersymmetry, semiconductors, and quantum mechanics, had their heyday, but interest gradually waned as scientists answered many of the major questions in those areas. He reminded the audience that a desire to explain the world is all you need to be a physicist, and the crowd cheered back at him when asked to repeat the words, "I AM AN AWESOME PHYSICIST!"

TOP LEFT: Panelists John Mather, Jim Gates, and Jocelyn Bell Burnell listen to questions during the Q&A. Panelist Eric Cornell is not pictured. Photo by SPS.

TOP: The Physics Congress crowd shows their appreciation for the speakers in the Centennial Session. Photo by SPS.

ABOVE: Brown University's SPS reporters. Photo courtesy of the reporters.

After the last speaker, the room erupted with questions. Hundreds of hands raised, their owners hoping for answers and the opportunity to talk to their heroes. During the Q&A, the speakers shared refreshing, unique predictions for the future, but several key themes emerged. All the panelists underlined the importance of having diverse people and diverse thought in physics and astronomy. While acknowledging that the fields are becoming more inclusive, "We're still not there yet," according to Dame Burnell. The panelists also agreed that communicating science to the public is vital. Doing so supports a healthy community and opens physics and astronomy to new perspectives. Additionally, Dr. Cornell noted the rise of many interdisciplinary fields, such as climate physics, while Dr. Mather pointed to the fundamental value of collaboration across institutions and borders. Together, these four leaders envision a time when physics and astronomy will be inclusive, outward reaching, and interdisciplinary, no matter what amazing scientific discoveries the future holds. //

FEATURE

IMPOSTER SYNDROME, THE JOYS OF PHYSICS, AND WHAT MAKES A GOOD RESEARCHER

A conversation with Eric Cornell, plenary speaker at the 2022 Physics Congress

by Sarah Lampreich, SPS Reporter, Temple University

Dr. Eric Cornell is an adjoint professor at the University of Colorado Boulder and a fellow of JILA, formerly the Joint Institute for Laboratory Astrophysics. He received a Physics Nobel Prize in 2001 for synthesizing and characterizing the first Bose-Einstein condensate.

At the 2022 Physics Congress, Dr. Cornell was a superstar. At times there were lines of students waiting to meet him, snap a picture, and get an autograph. To many physics students, a Nobel laureate is larger than life—the type of person you aspire to be but never dare imagine is possible. But as we settled into a small conference room for this interview, Dr. Cornell was soft-spoken, humble, and relatable. When I asked if there was anything outside of his physics identity he would like to tell fellow SPS members about himself, he nodded. There was a brief silence.

"There is a lot that people might not know about me," he said from across the table. "I am a proud father of two daughters," he noted first. He also loves reading novels and hiking in the mountains of Colorado. And he's an amputee, having lost his left arm and shoulder. "I think that had the amputation come earlier in life, it could have been a pretty significant disability for a career in experimental physics. But as it turned out, I was mostly in the phase of my career where I tell other people to do things, so it turned out not to matter very much," he said.

I asked Dr. Cornell how winning the Nobel Prize changed his career. He said that the biggest impact came not from the 2001 prize but from publishing the research that led to the prize. "Before then, I was an obscure young assistant professor, talking at the backwater sessions of the American Physical Society meetings. After the publication, I was the keynote. In terms of change in my life, that was a bigger moment," he said.

He laughed while adding, "Some things didn't change that much. You might think that my grant proposals are always approved now. Well, no. I was on a cold streak where I had like three grant proposals in a row turned down."

I asked Dr. Cornell if he struggled with imposter syndrome during this accelerated career advancement. "In some sense, it just moved the scale," he said. "You may no longer feel like an imposter as a physics professor, but you might feel like an imposter as a famous physics professor." He then shared this story. "I remember when I was a graduate student, talking—almost fighting—with a tenured physics professor from Harvard University. I was thinking, 'He is all I could possibly hope to be,' and it was weird to realize that he was kind of insecure and threatened by something I had said. At the time, I wondered how that could be. Now I completely understand it."

ABOVE: Sarah Lampreich. Photo courtesy of Lampreich.

Our conversation then pivoted to the joys of physics. Dr. Cornell smiled as he said, "A lot of the joy of doing physics is other physicists. I find working together with other people toward a common goal to be very enjoyable.

The social aspect of the business is a big part of it; that's a part that I love."

Regarding physics as an intellectual pursuit, Dr. Cornell cited elegance as a particular attribute that brings him joy. "There is this economic approach to ideas. One of the things I liked about being a physics major is that it was very difficult, but there weren't a lot of things to remember. I liked that out of all the majors, this had probably the fewest facts that you needed to know," he said. “The elegance of being able to understand all these different things with just a small number of basic ideas—that's part of the joy of physics," he said.

In closing, I asked Dr. Cornell what trait he believes is most valuable in a research career. "It really helps to have a sense of perspective," he said.

He explained that perspective is on a sliding scale, like a fancy camera where you twist the lens one way to zoom in and the other way to zoom out. In research, you sometimes need to zoom all the way in on a particular obstacle and say, "I'm going to focus on this one thing, and if I have to bash it down with my forehead, I will." But he noted that at other times you need to zoom out and say, "I will just take a little break here, see what I really care about—what really matters—and where all this is going." That change in perspective might lead to a solution or help you realize that the brick wall you've been fighting doesn't even matter in the long run, he said. //

Some responses have been edited for clarity.

TOP: Eric Cornell shares his thoughts with PhysCon attendees. Photo by SPS.

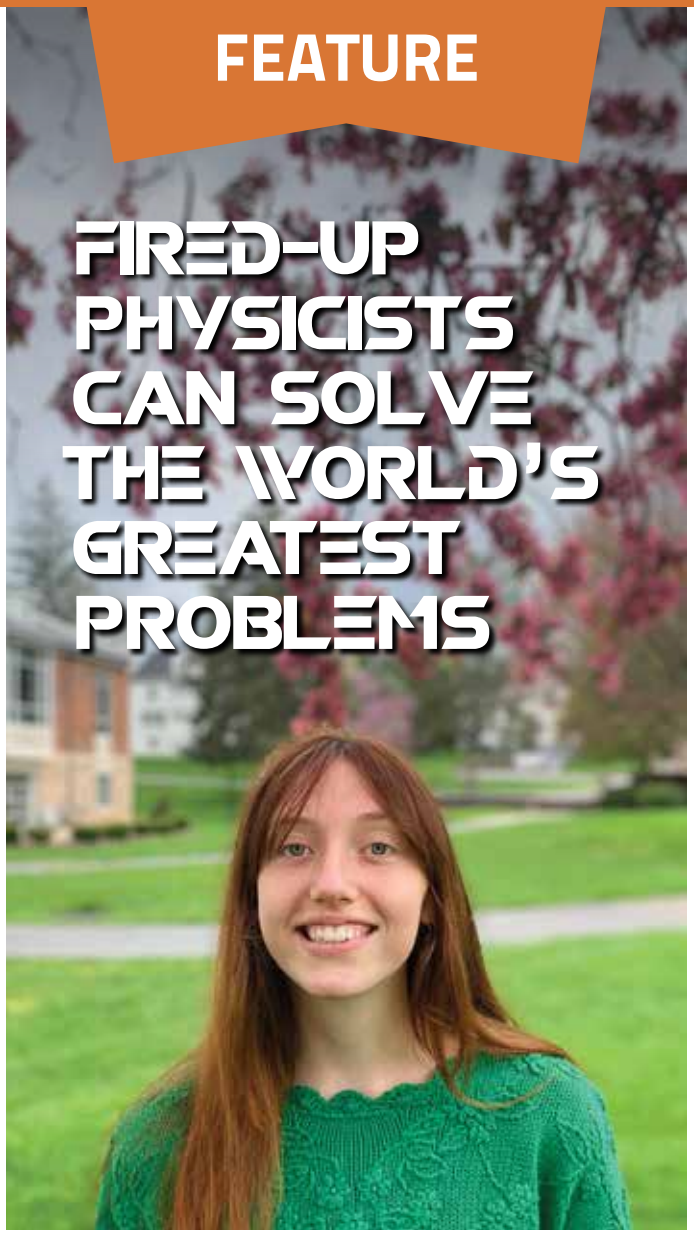
ABOVE: Eric Cornell poses with author Sarah Lampreich at the Physics Congress. Photo courtesy of Lampreich.

WHO WILL YOU RECOGNIZE FOR OUTSTANDING SERVICE TO SPS?

SPS Outstanding Service Awards acknowledge outstanding chapter leaders—students, faculty, and staff—who further the mission of SPS and aim to support the health of the organization and the broader community through service. Chapter members can nominate candidates at any time. For details see spsnational.org/awards/service.

FEATURE

FIRED-UP PHYSICISTS CAN SOLVE THE WORLD'S GREATEST PROBLEMS



by Allison Helferty, with Annika Stare, Marta Celebic, and Lucy Corthell, SPS Reporters, Juniata College

I felt panic. In just an hour, my team would have to dream up and prototype a device to solve one of the world's greatest problems. Our workshop moderator, Dr. Randy Tagg from the University of Colorado Denver, had just told us how students in his lab had been oscillating and stimulating gelatin in preparation for building a device to detect oral cancer. It seemed so inventive, using a squishy dessert to model the mouth!

But how were we supposed to address something like cancer without PhDs on our side? How could my experience with coupled pendulums or solving the hydrogen atom's wave function be relevant to this exercise? Even with my hands-on lab experience, I couldn't design a relevant experiment or piece of equipment—could I?

Thankfully, Dr. Tagg soothed my fears. His 2022 Physics Congress workshop, Physics for Humans: Entrepreneurship with Physics and Astronomy, addressed how a physics or astronomy education equips us to create life-changing methods and products. It's about problem-solving.

In homework and in the lab, physics and astronomy students build models, devices, and experiments; navigate failures; analyze results; and develop an intuition for what works and when. And once we solve enough problems with the work–kinetic energy theorem or Gauss' law or Schrödinger's equation, we can solve all of them—at least in certain cases. We also learn how to make educated guesses with approximations, mathematical models, and integration techniques. When designing solutions or products, our knowledge and experience give us somewhere to start. For example, we know that we can visualize electrical signals with oscilloscopes and convert times into frequencies with interferometers.

During the workshop we looked at a poster detailing physics subfields, common physics tools and methods, and product areas that help humans. There was so much overlap! Nuclear, thermal, and geophysics are all relevant to energy. Information and communication rely heavily on optics, wave mechanics, and acoustics. I began to realize that we do have the skills to solve huge problems, especially in a team.

Ultimately, my team focused on wildfire detection. We considered the landscape changes during a fire—tree and air temperature, smell, air's refractive index, and chemical changes in the burning wood. After much discussion, we landed on a detection system based on changes in the trees. A camera-carrying drone could give us the tree population, and a tensiometer could measure the water in the soil. We could extrapolate that to get the amount of water in the trees.

Next we constructed a simple model of our drone-tensiometer system. At the end of the hour, we shared our problem and solution with other teams and fielded their questions. We also had the chance to see what they designed. Not bad for an hour's worth of work!

This experience helped us realize that the value of studying physics and astronomy isn't solely the content we learn; it's also the unique way of thinking. With our problem-solving skills, solid foundation in what can be detected and quantified, and insatiable curiosity for why things are the way they are, there is nothing we can't do. //

TOP LEFT: Allison Helferty. Photo courtesy of Helferty.

LEFT: In our model the drone (shown propped up on cups) flies above the forest (made of paper and block trees). The tensiometer hangs from the drone, collecting soil samples. In reality the drone would fly closer to the ground and intermittently collect soil samples. Photo courtesy of the Juniata College SPS reporters.

SPS Chapter Report

Submission Deadline: **June 15**

Importance of Chapter Reports

- Share your chapter's efforts and best practices with other SPS chapters
- Update your chapter contact and leadership information
- Provide guidance for future SPS members in your chapter
- Determine your chapter's strengths and areas for improvement
- Receive feedback and SPS recognition

Qualify for National Recognition

- SPS Outstanding Chapter Awards
- Blake Lilly Prize
- Features in SPS publications, such as the *SPS Observer, JURP,* or *Radiations.*

For more information on chapter reports, visit **www.spsnational.org/chapter-reports**

Has your leadership changed since your last chapter report?
Update your contact information with the SPS anytime at
www.spsnational.org/chaptercontacts.

AIP

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SPS

WHAT'S YOUR IDEAL SUPERPOWER?

by Blake Heckenlaible, Mason Fuller, and Aydan Gibbs, SPS Reporters, Appalachian State University

Everyone wants to be a superhero, but what kind of powers would you like to have? We surveyed SPS members at the 2022 Physics Congress, and here are their top answers.

1. FLIGHT
2. TELEPATHY
3. TELEPORTATION
4. TELEKINESIS
5. KNOWLEDGE
6. ICE POWER
7. MORPH

HONORABLE MENTION

FILL A CUP WITHOUT SPILLING

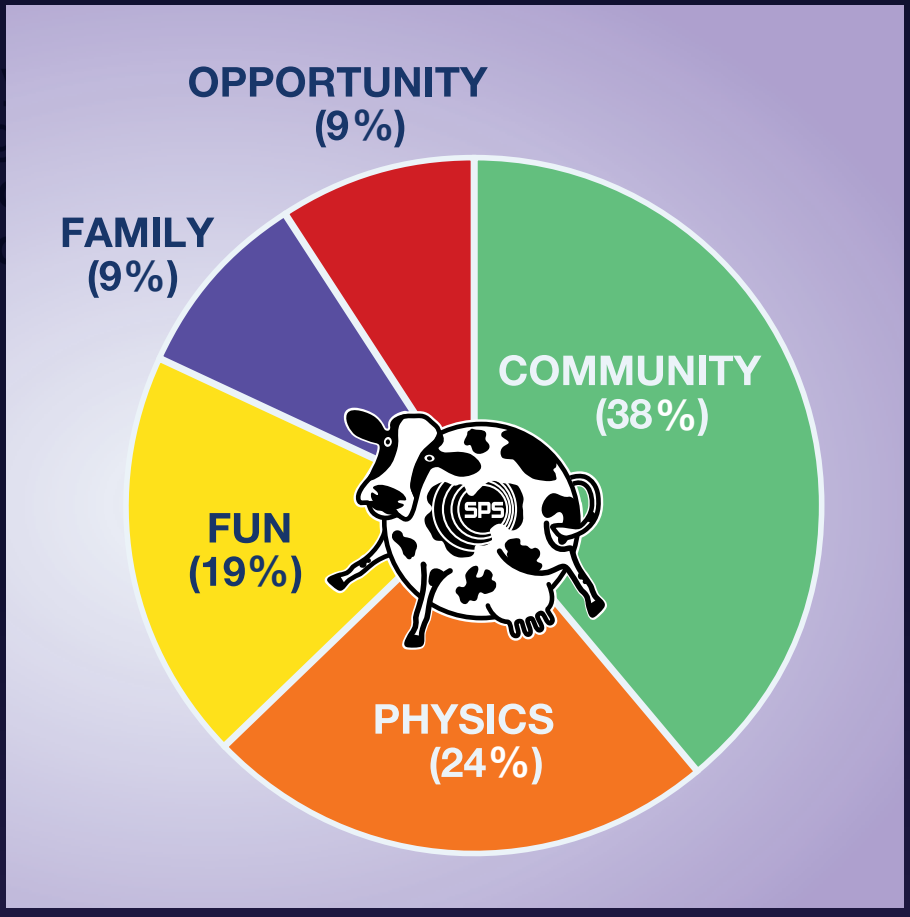
WHAT IS SPS?

by Zahin Ritee, Matthew Gootman, Kyle Cash, Evan Moore, and Kylie Goldade, SPS Reporters, Adelphi University

At the 2022 Physics Congress, we asked people from nearly 125 chapters, "What is SPS for you, in five words or less?"

SPS is a sense of family and belonging to a student from the University of Wisconsin - River Falls who loves science and wants to inspire kids to go into STEM. To a member from the University of Puerto Rico, SPS is an inclusive and supportive community. A biophysicist from the University of Maine sees SPS as a local network for physics undergraduates, while two students from Rhode Island mentioned that SPS means "being a shark and a spherical cow." A Randolph College student thinks of SPS as a place to find fun, friends, and inspiration. A student interested in space physics from Memphis, Tennessee, says that SPS means "Go big or go home." Many students called SPS a supportive community, and many called it home. And, of course, some said that it's a group of funny, nerdy physicists.

Their answers show that SPS is not just an organization; many people think of it as a family. The fun facts or struggles that other people don't usually get—everyone here gets them. SPS is not just a place to share your work, it's a place to share love and life. A student from the George Washington University gave a wise answer, saying "SPS is everything to me!" //



RIGHT: Adelphi University's SPS reporters. Photo courtesy of the reporters.

Watt's Up JWST?

by Brad Conrad, Director of SPS and Sigma Pi Sigma

You've likely seen some of the record-breaking pictures taken by NASA's new James Webb Space Telescope (JWST). This telescope is not just a replacement for the much older Hubble Space Telescope (HST); in many ways it's a successor.[1] Some like this term because while Hubble captured some of the most iconic pictures of deep space ever taken, when placed next to JWST images, the difference in detail is striking.

When the JWST and HST images are side by side, the JWST is considered by many to be a better telescope. What makes the difference?

A little digging on NASA's website reveals that JWST has a much larger primary mirror than HST. HST's is 2.4 m in diameter, while JWST's is 6.5 m—that's about 6 times the area or 2.5 times the diameter of HST.[4] As the surface that is collecting light, the area of the mirror is important.

There is another very important difference—the two telescopes sample light across different ranges of wavelengths: HST goes from 0.8 μm to 2.5 μm in wavelength, while the JWST was designed to observe 0.6 μm to 28 μm. For reference, visible light for most people is about 0.38 μm (violet) to 0.7 μm (deep red).

Even though humans can't see infrared light (unlike mosquitoes), the JWST can observe in the infrared wavelengths with an unprecedented sensitivity. At these longer wavelengths, astronomers will be able to observe developing planetary systems and the first galaxies that formed after the big bang. Longer wavelengths also go through dust clouds more effectively.

"You can't really see blue light with a yellow mirror!"

– Dr. John Mather, Physics Nobel Prize winner and senior project scientist on the JWST

Figure 1: An image called Cosmic Cliffs, part of the Carina Nebula (NGC 3372), taken by the Hubble Telescope (top) and by the James Webb Space Telescope (bottom).[2,3]

TOP: Photo courtesy of NASA, ESA, and The Hubble Heritage Team (STScI/AURA); ack. N. Smith (University of California, Berkeley).

BOTTOM: Photo courtesy of NASA, ESA, CSA, and STScI.

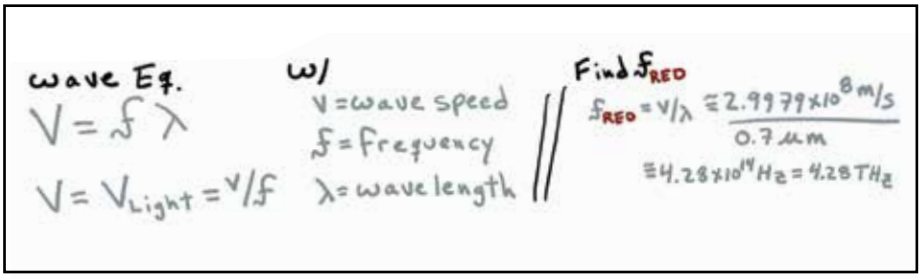


Figure 2: An illustration of the wave equation. Image by Brad Conrad.

In short, JWST can see much farther into the infrared (these are longer wavelengths than visible light), and the telescopes have different sensitivities at different wavelengths. We can see exactly how they differ by looking at a super-cool plot from the Space Telescope Science Institute.

Figure 3 compares the minimum flux different telescopes can measure at a given wavelength for the same amount of time, in this case 10,000 seconds. It lets us directly compare estimates of how sensitive each telescope is to different wavelengths. For example, the HST is much less sensitive than JWST at longer wavelengths, as is evident by the increasing flux needed to detect a point source (dark blue line). When compared to Hubble, we can see that JWST has a much lower noise floor and is hence much more sensitive near 2 μm. (If you are really excited about this, NASA has very cool tools that let you explore the sensitivity of JWST in various modes of operation.[6])

What's flux again? See Fig. 4. Now, back to the puzzler.

From the plot, how much more sensitive is JWST to the deep red visible light than HST?

Given that, if we wanted a telescope 10 times more sensitive than JWST and all we could change was the size of the primary mirror, how much larger would we need to make it? //

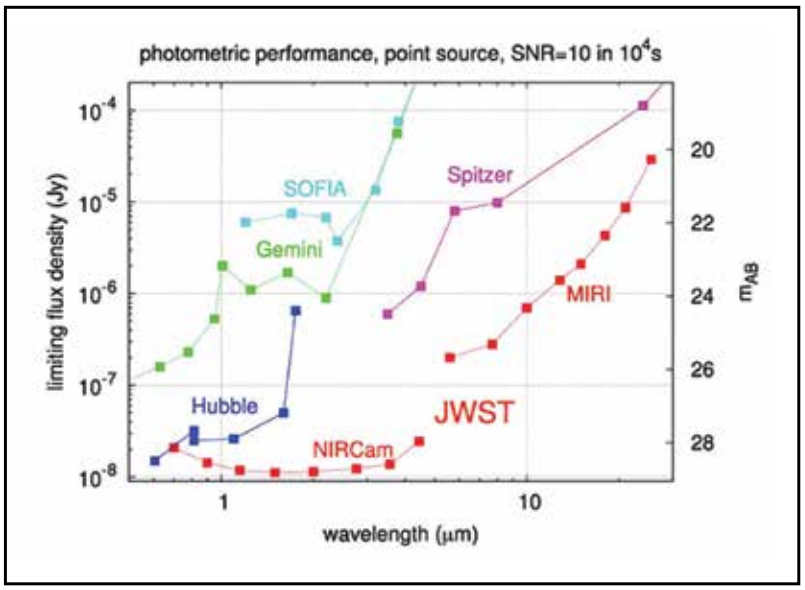


Figure 3: This plot shows the faintest flux of light emitted by a point source that different telescopes can detect, by wavelength. It's measured over 10,000 seconds at a signal-to-noise ratio of 10. On the left axis, flux is given in units of Jansky, where 1 Jy = 10^{-26} Watts per area per wavelength. On the right, flux is given by AB magnitude. Note that two JWST instruments are shown, NIRCam and MIRI, that operate over different wavelengths (red lines). Credit: Space Telescope Science Institute.[5]

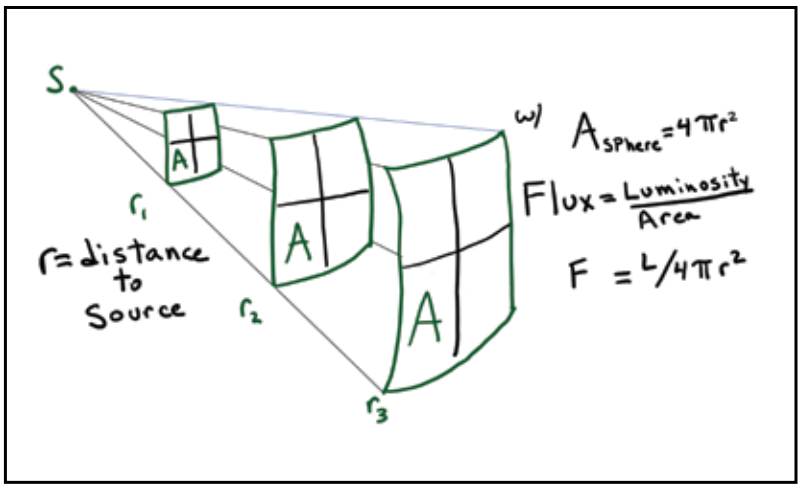


Figure 4: Illustration of flux and an expanding sphere. Image by Brad Conrad.

Credit: xkcd.com.

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Sammi Staskiewicz

BS in Physics, The College of New Jersey
MS in Meteorology and Atmospheric Science, Penn State University

What she does

I'm a science education analyst in the National Science Foundation's Division of Undergraduate Education (NSF DUE). In this role I have three primary responsibilities: outreach, communications, and data/portfolio analysis of a subset of our division's programs. This is a two-year position described to me as a "pick and choose your own adventure" experience. Although I do have a handful of regular job responsibilities, I also am able to explore projects I'm passionate about. Two of my favorite parts of the job are managing our division's newsletter, DU(E-NEWS), and conducting focused analyses of our division's award portfolio.

How she got there

In high school I had an awesome physics teacher who got me interested in the subject. I started out at the College of New Jersey as a physics and secondary education major but realized early on that I didn't see myself teaching in a traditional high school classroom. At the same time, I was introduced to cloud microphysics research through one of my professors, and that inspired me to pursue more of a research-oriented path. I ended up going to graduate school at Penn State University for atmospheric sciences, but while there I realized that I enjoyed being a teaching assistant more than doing research. My back-and-forth interest in science education and teaching was conflicting, so my current job at NSF is a perfect fit: I get to use my analytical and communication skills to make a difference in science education without being a traditional K-12 teacher! I'm also excited to share that this semester I'll be returning to the College of New Jersey as an adjunct physics instructor!

Best part of her job

The best part of my work is learning about the interesting and impactful projects that NSF is funding. Through data analysis and communications efforts, I get to take a deep dive into our division's awards and share the highlights internally and externally.

On-the-job learning

The most challenging part of my work has been getting immersed in the program evaluation space. Because I don't have formal training in education program evaluation, I felt a bit lost at first. However, NSF is very supportive of their employees' professional development, so they enrolled me in a certificate program through Georgetown School of Continuing Studies so I could learn more about how program evaluation is done. I walked away from the course having a much better understanding of evaluation processes and terms, and I feel a lot more comfortable in that part of my job now (although I'm still learning every day!).

Advice to physics students

Acknowledge that the skill set you acquire from working toward a physics degree is widely applicable to a lot of different careers, and use that skill set to find something you're passionate about. Physicists can be data scientists, financial analysts, science outreach coordinators, lab workers, etc. There is no one-size-fits-all path for a physics major. Think about the skills you have and ALL the different ways you can use them. //

ABOVE: Sammi Staskiewicz. Photo courtesy of Staskiewicz.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation is a federal agency in the United States that funds much of the country's scientific research. Through the Division of Undergraduate Education, NSF aims to strengthen STEM education at colleges and universities by funding curriculum development, workforce preparation programs, and efforts to increase diversity in STEM, among other projects.

INTERESTED IN TEACHING PHYSICS?

The American Association of Physics Teachers (AAPT) is a professional physics society dedicated to the pursuit of excellence in physics education. Undergraduate SPS members are eligible for free membership in AAPT. For details visit spsnational.org/about/partnerships.

Honoring Exemplary Service: Gary White and Willie Rockward

by Kendra Redmond, Editor

In recognition of exemplary commitment and service to SPS and Sigma Pi Sigma, the SPS Executive Committee may bestow a rare Worth Seagondollar Service Award on a deserving member. During a memorable moment at PhysCon 2022, the committee presented Seagondollar Awards to both Gary White, editor of *The Physics Teacher* and adjunct physics professor at George Washington University, and Willie Rockward, chair and physics professor at Morgan State University.

GARY WHITE

In high school, Gary White decided against taking physics. Not because of the subject but because the only person certified to teach physics was the principal—who also happened to be his father. And with no classmates opting to take the subject, the class might have tested their relationship a little too much.

Yet, inspired by the sight of the observatory on campus, White decided to major in physics at Northeast Louisiana University. He went on to earn a physics PhD from Texas A&M University and become a physics professor at Northwestern State University of Louisiana (NSU).

At NSU White cultivated an active, growing department and close-knit student community. He credits SPS for some of this success—SPS resources, and leveraging them, opened the door to many opportunities for his rural Louisiana students. White was eventually elected to the SPS National Council and, in 1999, became president of SPS.

In 2001 White became director of SPS and Sigma Pi Sigma, where he expanded opportunities for physics and astronomy undergraduates in the United States and beyond. Under his leadership, SPS established its unique internship program, took the Physics Congress to a whole new level, developed sessions for undergraduate presenters at professional meetings, promoted diversity in physics, and mentored numerous students and faculty members.

Today, White is the editor of *The Physics Teacher*, a peer-reviewed journal of the American Association of Physics Teachers.

He's an adjunct physics professor at George Washington University in Washington, DC, and oversees its vibrant SPS and Sigma Pi Sigma chapters.

WILLIE ROCKWARD

Willie Rockward credits football with getting him into physics. He was a top high school running back in Louisiana, but his mom still made the rules. If he brought home less than a B in math or science, no more football. That motivated him to excel in those subjects.

Rockward dreamed of playing football at Grambling State University. Other schools offered him football scholarships, but Grambling offered only a physics scholarship—which he took. Thanks to a head-on collision with an all-conference linebacker, the physics outlived the football. At Grambling, Rockward joined SPS and was inducted into Sigma Pi Sigma. He eventually earned a physics PhD from Georgia Tech and became a professor at Morehouse College.

Rockward revitalized the Morehouse SPS chapter, often taking students to national and regional physics meetings. During one SPS zone meeting, the large contingent of Morehouse student presenters caught SPS director Gary White's attention. He encouraged Rockward to run for SPS Council, and, after serving two terms, Rockward was elected president of Sigma Pi Sigma in 2014.

As president, Rockward called on honor society members to embrace diversity and look ahead. He encouraged them to invest in the next generation and helped establish a fund supporting student travel to Physics Congresses in perpetuity.

In 2018 Rockward became chair of the physics and engineering physics department at Morgan State University. Today he's strengthening that department, advising the Sigma Pi Sigma chapter, and mentoring the SPS advisor as they seek to reactivate the chapter. //

ABOVE: Gary White and Willie Rockward proudly wear their new Worth Seagondollar Service Award medals. Photos by SPS.

Fall 2022 SPS Chapter Awards

Congratulations to the winners of the Fall 2022 SPS Chapter Awards. These awards are made possible in part by generous contributions from Sigma Pi Sigma alumni. For examples of past award-winning projects, visit spsnational.org/awards/chapter-awards.

FUTURE FACES OF PHYSICS

Future Faces of Physics Awards are made to SPS chapters to support projects that promote physics across cultures and the recruitment and retention of people from groups historically underrepresented in physics.

Rhodes College
Rhodes College Egg Drop
Grace Nehring (Leader)
Brent Hoffmeister (Advisor)

Saint Joseph's University
The Stuff in Space
Joseph Popp (Leader)
Roberto Ramos (Advisor)

Stony Brook University SUNY
Peer Mentorship and Physics Cafe
Evan Trommer (Leader)
Dominik Schneble (Advisor)

University of Central Florida
Advocating for Traditionally Underrepresented Groups in Physics
Madisyn Brooks (Leader)
Costas Efthimiou (Advisor)

University of North Alabama
Future Face of Physics Trivia for Underrepresented Groups
Madison Guth (Leader)
Mel Blake (Advisor)

SPS CHAPTER RESEARCH

SPS Chapter Research Awards support local chapter research activities that are imaginative and likely to contribute to the strengthening of the SPS program.

Benedictine University
The Fundial: Fostering Community Through Guiding Principles of Physics
Jeffrey Korbitz (Leader)
Matthew Wiesner (Advisor)

Calvin University
Our First Radio Telescope
Jenn Feng Lau (Leader)
Paul Harper (Advisor)

Florida Polytechnic University
Photodegradation and Environmental Stability of Microencapsulated Thermochromic Materials for Energy Saving Applications
Daniil Ivannikov (Leader)
Sesha Srinivasan (Advisor)

Old Dominion University
Introductory Astronomy Research
Jonathan Rose (Leader)
Perry Nerem (Advisor)

Rhodes College
From Ideas to Orbit: Fabrication and Assembly of Custom Satellite Hardware
Damien Nguyen (Leader)
Brent Hoffmeister (Advisor)

University of Central Florida
Abnormal Shadow Distributions from Relativistic Light Sources
Olivia Bitcon (Leader)
Costas Efthimiou (Advisor)

MARSH W. WHITE

Marsh W. White Awards are made to SPS chapters to support projects that promote interest in physics among students and the general public. The award is named in honor of Dr. Marsh W. White for his years of service to Sigma Pi Sigma and the community.

Adelphi University
Lab for Kids
Zahin Ritee (Leader)
Matt Wright (Advisor)

Brigham Young University
Physics Demonstrations for Underserved Elementary Students
Matthew Ricks (Leader)
Benjamin Frandsen (Advisor)

Indiana University of Pennsylvania
The Annual IUP Physics Olympics
David Lane (Leader)
Andrew Zhou (Advisor)

Mount Holyoke College
The Observatory Open Hours: Celestial Safari!
Mysha Khan (Leader)
Spencer Smith (Advisor)

Rhodes College
Rhodes College Rites to Play
Grace Nehring (Leader)
Brent Hoffmeister (Advisor)

Saint Joseph's University
Physics on the Move
Kayla Dickert (Leader)
Roberto Ramos (Advisor)

Stony Brook University SUNY
Engaging High Schoolers in Electromagnetism
Christopher Siebor (Leader)
Dominik Schneble (Advisor)

Tarleton State University
Observatory Outreach
Stephen Bardowell (Leader)
Melissa Lewis (Advisor)

University of Central Florida
Electrifying Interest in Physics
Maximillian Daughtry (Leader)
Costas Efthimiou (Advisor)

University of North Alabama
STEM Day
Harmonie Wildharber (Leader)
Mel Blake (Advisor)

University of Southern Mississippi
Promotion of Physics in the Hattiesburg Community
Braden Hudson (Leader)
Michael Vera (Advisor)

University of Virginia
Let the Cat Out of the Box: Charlottesville High School Outreach
Ethan McKeever (Leader)
Jency Sundararajan (Advisor)

SIGMA PI SIGMA CHAPTER PROJECT

Sigma Pi Sigma Chapter Project Awards support inductions or chapter events that include alumni or expand recognition of the society.

Florida Polytechnic University
Inaugural Inductees' Insights Sharing
Daniil Ivannikov (Leader)
Sesha Srinivasan (Advisor)

Saint Joseph's University
Saint Joseph's University Sigma Pi Sigma (ΣΠΣ) Induction Ceremony
Nathaniel O (Leader)
Roberto Ramos (Advisor)

University of Colorado Boulder
Boulder Branch Sigma Pi Sigma 2022-2023 Induction Ceremony
Alexander Fix (Leader)
Keith Ulmer (Advisor)

University of North Alabama
Induction Ceremony
Madison Guth (Leader)
Mel Blake (Advisor)

University of Virginia
Lighting the Way with Lighthouse Instruments: UVA Sigma Pi Sigma Annual Luncheon
Ethan McKeever (Leader)
Jency Sundararajan (Advisor)

GET SUPPORT FOR CHAPTER ACTIVITIES

Have an idea and need funding? SPS can help! Applications and advisor sign-offs are due November 15.

- **Future Faces of Physics Awards: $500 max**
- **Marsh W. White Awards: $500 max**
- **Sigma Pi Sigma Chapter Project Awards: $500 max**
- **SPS Chapter Research Awards: $2,000 max**

For more information and award proposal templates, visit spsnational.org/awards/chapter-awards or contact sps-programs@aip.org.

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