

the SPS Observer

Volume LIII, Issue 4

WINTER 2020



Up Your Momentum

Take Your SPS Chapter to the Next Level

- + Finding Inspiration in the Quirks and Creativity of Our Chapters
- + Berkeley Chapter Focuses on Health, Inclusion, and Community

- + Outreach in the Arctic: SPS's Northernmost Chapter Goes to Extremes

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ON THE COVER

A collection of unique SPS chapter logos from Cleveland State University, the University of Wisconsin, Stony Brook and Henderson State University. Courtesy of the SPS National Office.



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Mikayla, SPS Intern 2018,
Gettysburg College



SPS DOESN'T HAVE ALL THE ANSWERS, BUT WE CAN HELP YOU WITH WHAT HAPPENS AFTER GRADUATION.



Physics — The Swiss Army Knife of the Sciences

by Steve Mackwell, Deputy Executive Officer, American Institute of Physics

Being a physics undergraduate is very different now than it was for me; the revolution in communication and connectedness has opened so many opportunities to engage globally and make the world a better place. I grew up in New Zealand in the 1960s and 70s and did my undergraduate work at the University of Canterbury in physics and mathematics. There were probably a dozen of us in my year in the physics department, mostly men but several women.

It was an exciting time in physics. We had several outstanding scientists at Canterbury who were at the cutting edge of their fields, doing seminal research on black holes and in quantum mechanics and electromagnetism. Despite being a small department, we had visits from many luminaries, including Murray Gell-Mann, Edward Teller, Paul Dirac, and Dick Feynman. It was hard not to be inspired.

Most of my fellow undergraduate students went on to graduate degrees, some staying at Canterbury, others in the United States or Europe. For my part, I was particularly fascinated by astrophysical research and decided to complete a master's degree, performing spectroscopic observations of main sequence stars. This involved long cold nights in an observatory dome sitting atop a mountain near Mt. Cook, the tallest mountain in New Zealand.

Stepping out of the dome as the sun rose over the high mountain peaks was unbelievably spectacular. Of course, working at a small observatory was more than just observing; we had plenty of opportunities to exercise the skills we learned in our physics classes,

repairing mechanical and electronic systems and performing routine activities such as operating the local weather station.

Despite my fascination with astrophysical research, I became increasingly interested in what was happening in geophysics. It was at the peak of the plate tectonic revolution, and our understanding of our planet was being turned on its head. While we didn't have any geophysical research at Canterbury and I had never taken classes in geology, I decided to pursue a PhD in that field. Thus began my physics world tour, as I moved to the Australian National University to complete my PhD in experimental geophysics. Through the course of that research, I found myself continuously referring back to the training I received and skills I learned as an undergraduate in physics.

Physics is like that. I think of physics as the Swiss army knife of the sciences. You can take what you learn in undergraduate classes and labs and apply it in all aspects of your life and career. I took those skills and used them first in astrophysics, then geophysics, materials science, mineral physics, and planetary sciences.

I have been exceedingly lucky to have had a career in physics, as a student, postdoc, professor, institute director, and now as the deputy executive officer at AIP. I have met amazing people of all ages and demographics and have worked in institutes and programs around the world. Of my various roles and despite my love of research, teaching and spreading the joy of the sciences to the younger generation has been the most fulfilling.

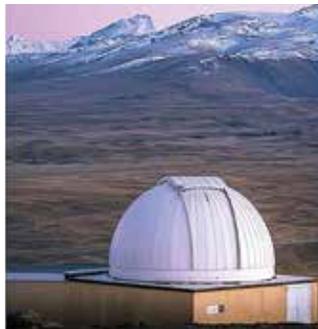
As members of SPS chapters in the United States and around the world, you are on a path to make fundamental contributions not only as researchers but also as mentors and teachers. In this way, you can bring inspiration to those who will form the scientific and technical workforce of tomorrow. And through your connections to your classmates and the broader SPS community, you'll build relationships and extend your physics family across the globe.

Communication, engagement, and outreach are such key parts of what we do as scientists, as physicists. The training you are receiving through your undergraduate degree will forever make you a physicist. Through SPS and your departments, there are opportunities to lead in areas such as education and public engagement, in building an environment where diversity, equity, and inclusion are the norm and people of all genders, ethnicities, and socioeconomic backgrounds feel a sense of belonging.¹ SPS, through its chapters and your personal involvement, provides you with the skills to achieve much more than just a degree.

As I have met with SPS students and faculty around the country, I am impressed by the enthusiasm and commitment to make the world a better place. Working together as members of the global SPS community, we can make it so that it's not just luck that gets everyone through. //

References:

1. spsnational.org/about/governance/statements/sps-statement-diversity-inclusion-ethics-and-responsibility



FAR LEFT: Steve Mackwell among the planetary globes in the library at the Lunar and Planetary Institute in Houston.

LEFT: Astronomical dome on Mt. John at dawn against the backdrop of the Southern Alps, New Zealand. Photos courtesy of Steve Mackwell.

Energy and Agency: How You Can Speak Up and Help Your Community

by Jeremiah O'Mahony, 2019 SPS Summer Intern and SPS Member, Sarah Lawrence College

Jessica Esquivel, a neutrino physicist at Fermilab, spent a portion of an August weekend last year in a purple cape and a high, feathered collar, with white dots around her eyes. She was in costume as Shuri, Wakanda's resident tech genius, at Chicago's Black Panther-inspired Afro-futuristic convention, WakandaCon.

How did she get herself and her colleagues there? By knowing how to say “yes” strategically. She also credits knowing where to put her energy, a habit she's developed over years of being in demand. “As you may know, being a black, LatinX, lesbian woman, people will pull you in every which way,” says Esquivel, who's offered research and outreach projects related to both her credentials and her identities. “Add the fact that you are able to distill down complicated subject matter and be accessible in a variety of populations, and people come knocking!”

That, and she studies neutrinos as a postdoc research associate at Fermilab. No biggie.

Back when she was starting out, she accepted every project she was offered. It got draining. She didn't know where to direct her energy. So Esquivel tried accepting only those projects at which she knew she'd excel and that brought positive visibility to her communities.

“I know there is a lack of underrepresented minorities in STEM, especially black and brown women in physics,” she says. “That's what I want to change.”

With that goal in mind, Esquivel built a reputation as someone who could both do complex science and explain it to several types of audiences. Then she flipped the script and started to hold other people and projects to account. “I now am able to ask targeted questions about



■ ABOVE: A snapshot of Fermilab's participation at WakandaCon in Chicago, Illinois. Photo courtesy of Fermilab.

what populations this event would be reaching out to, how accessible this event will be, is it coming from an intersectional lens?" she says.

You don't have to be a neutrino physicist to help out your community. Esquivel shares the following advice: Know your skills, take projects that you know you'll ace, and show the leading folks in your department what you can do. Once on their radar, you can do a lot to improve your community.

"And now when I go to the Office of Education/Communication here at Fermilab with a harebrained idea," Esquivel says, "the powers that be listen!" Esquivel's proudest harebrained idea paid off in 2018 when she brought Fermilab to WakandaCon.

Esquivel's own journey to Wakanda began with her lobbying for better lab conditions. This is especially important for students from communities that don't traditionally get a platform in physics.

In its last issue, the *SPS Observer* ran an article on concrete ways you can make your physics space more inclusive. Tanmoy Laskar, a queer astrophysics postdoc at the University of Bath, stressed that it's up to each of us to carry forward the promise of flags and ramps. "It is the people who use that space who must first be willing to accept and encourage diversity, tolerate and champion inclusivity, and understand and promote equity," Laskar says.¹

That's a tall order. Nicole Cabrera Salazar, a PhD astrophysicist who tackles outreach issues in physics, has a solution: Speak up for yourself and your friends. Listen to each other's stories (the *SPS Observer* article has some tips on how), and share your needs with lab and department heads. "I advise my students to band together and petition their departments for change," Cabrera Salazar says. "There's a lot of power in community organizing—in coalition building." Apart, you're frustrated students. Together, you're the next generation of physicists.

Be ready for pushback—especially if, Cabrera Salazar says, you're an underrepresented student. A reform that helps underrepresented groups "may be seen as a niche issue," she says. Just remember that helping even a few people in the community helps the *entire* community.

You don't have to do it alone. Take advantage of the mentors your department provides. Lean on them, pick their brains, ask them how they got where they are. Some mentors, like Esquivel's in undergrad, turn into lifelong friends who can advocate for you.

Laskar, who co-authored *LGBT+ Inclusivity in Physics and Astronomy: A Best Practices Guide*, explicitly asked for and sought out mentors—both professors and older students—who shared identities with him and were where he aspired to be during his career.

There will be a time when you can mentor a younger student. Last summer, Esquivel took a grad student and high schooler under her wing, passing on lessons she had been grateful to receive in her college days. She emphasized showing her interns how to exercise their agency in a physics setting. "I told them how important it was to advocate for themselves," she says. The interns helped plan for and present at Fermilab's booth at WakandaCon, and Esquivel eventually stepped aside and let the graduate student assume a mentor role for the high schooler. "I just wanted to impart my belief that you can affect change at any stage in your career."

A big part of becoming a mentor for students who share your identity or identities is becoming and staying visible. For some students it's unavoidable, but students in the LGBT+ community don't always wear their sexual orientation or gender identity on their sleeve.



ABOVE: Tanmoy Laskar presents his work at a 2019 conference in Japan. Photo courtesy of Tanmoy Laskar.

Depending on the school and the country, physics often isn't a welcoming place to do so. Laskar travels all over the world to present his research, and sometimes he's loudly out. At the Lino 2019 conference in Germany, he advertised a networking session for queer attendees over Twitter. At other conferences, he keeps his identity to himself. Similar periods of silence are temporary for some of his colleagues, but for others the return to the closet is more permanent. "I know people who left their identity behind," Laskar says.

"The decision about coming out is extraordinarily individual," says Diana Parno, who studies neutrinos at Carnegie Mellon and co-authored the *Best Practices Guide* alongside Laskar. If you're not out, or questioning, or are only out to certain people or groups, you have all the time in the world. If you are out, you might want to help other students you know feel more comfortable expressing their LGBT+ identity. "The best way to do that is to be a role model," Parno says. "Not to drag or pull anyone. Show a good example."

Being an example isn't anyone's default setting, and it can be exhausting. The key to recuperating, according to Parno, is finding ways to build community outside of classrooms and labs. Cabrera Salazar joined a LatinX organization on her campus in grad school. Parno suggests bringing up nonphysics topics during SPS chapter meetings, like your favorite outdoor activity or Netflix show.

Esquivel found her escape in bringing her Fermilab co-workers to WakandaCon. They hosted a booth with demonstrations and held a panel on weathering the complexities of doing physics while black. Esquivel discussed her experience as only the second black woman to attend and complete Syracuse University's physics graduate program.

The convention was, she says, rejuvenating. "It was like going to church. All the good parts of church. All your blackness fell away, and you could focus on everything else you're interested in." //

References:

1. O'Mahony, Jeremiah. "Fostering Inclusive Spaces." *The SPS Observer*, V LIII, 3. Fall 2019.

Why You Should Host a Pumpkin Drop— And How to Make It Happen #SPSplat

by Deanna Marshall, SPS Advisor and Zone Councilor, Central Washington University

Calling all SPS chapters: Are you looking for a fun way to raise funds, promote your chapter, reach a wide audience, and demonstrate physics and math in real time? Hosting a pumpkin drop will accomplish all four and answer these burning questions for spectators:

- What happens when parachutes, wings, or fins are added to a pumpkin?
- Will a pumpkin with fins fall at the same rate as a pumpkin with a parachute?
- How much bubble wrap is needed for the pumpkin to bounce once, twice, or not at all without breaking?
- What happens if the pumpkin is injected with liquid nitrogen?
- Does gutting a pumpkin change the volume or tone of its splat when it hits the ground?

Gather your friends near and far, and then challenge other departments, dorms, or clubs to see whose pumpkin...

- Makes the loudest splat
- Is most artistic
- Has the best decoration

Boost the difficulty by including an engineering design challenge. Be creative!

- Who can design an apparatus or housing that protects their pumpkin from the fall?
- Who can design a container that receives the pumpkin undamaged?
- How accurately can a pumpkin be dropped?

HOW TO HOST A PUMPKIN DROP IN FOUR EASY STEPS

Step 1: Find the tallest building on campus.

Step 2: Get a bunch of pumpkins.

Step 3: Get access to the roof of the tallest building on campus.

Step 4: Drop pumpkins off the roof or from a window.

AND NOW FOR THE HARD PART:

Set the date. Where possible, partner with another campus group's event. This will increase the draw for both events, generate buzz, and broaden the pumpkin drop's reach.

Secure a location. Since a lot of the fun of a pumpkin drop is watching and hearing each pumpkin fall from above, try to host your pumpkin drop from the highest point possible in your physics department or on campus. Be sure your landing area will allow a safe distance from the splat zone for your viewing audience.

Get the support of campus administration. Depending on your campus' administration, you may need input and approval from facilities, security, and/or your department.

Rules and regulations. The rules and regulations for your pumpkin drop should encompass everything your participants need to know in order to satisfy safety requirements and ensure a fair event.



TOP LEFT: Up-close image of a pumpkin as it makes impact with the ground! #SPSplat

ABOVE: Pumpkin Drop site at Central Washington University. Photos courtesy of Rachel George.

Registration. Encourage participants to preregister. One way to entice individuals and teams to register early is to offer a limited, time-sensitive early registration fee or special offer. For example, offer two pumpkins for \$10 if registration is received two weeks before the event.

A word about money handling. Check with your school to find out how registration fees are to be recorded. Does your college allow organizations to accept funds via online payment tools like Venmo? Most schools have very specific rules governing how campus organizations receive and disburse monies. Follow those rules.

BYOP or purchase on site. Your registration form, rules, and regulations should specify if pumpkins are included in the registration fee, if entrants can bring their own pumpkins, or if they'll be available for purchase on the spot. Local stores or farms may donate pumpkins or offer discounts for promotional consideration.

Create a Pumpkin Drop promotional description. This one- to two-paragraph blurb will be very helpful when talking with reporters, requesting donations, working with campus administrators, and keeping your chapter members on track. Be sure to include the six W's (who, what, when, where, why, and website) and provide contact information.

Sample

The Pumpkin Drop is an annual fundraising event sponsored by CWU's Society of Physics Students (SPS). The Pumpkin Drop features pumpkins being dropped from the roof of Discovery Hall. Individuals and teams from on or off campus are invited to participate. Preregistration is recommended; however, walk-up registrants are welcome. Individuals and teams preregistering by October 5 will receive a special two-for-the-price-of-one rate of \$10 per category. After October 6, each pumpkin will be \$10 per category.

The event will begin at 4 p.m. on Saturday, October 19, 2019, and run until the last pumpkin falls. Prospective students and their parents attending the Fall Open House are encouraged to stay for the Pumpkin Drop and join in the fun! Attendees can test their knowledge with trivia and check out brief science demonstrations between drops. Pumpkins will be dropped into the southwest courtyard of Discovery Hall. Funds from this event will be used to send students to PhysCon, an international physics conference, and to support other chapter events and activities. Additional details, rules, and a preregistration form can be found online at cwu.edu/physics/PumpkinDrop. Email sps@cwu.edu with questions.

Promote your event. Create a poster and hang it around campus. Here's your chance to showcase your artistic flair and graphic design skills. Post it on your chapter's social media pages. Remind your chapter members to share it on their personal sites and pages with the #SPSplat tag. Don't forget to contact your school's newspaper or radio station, as well as local media outlets. If you've partnered with another event or have a sponsor, include their information on your poster and promotional materials. //

Outstanding Chapter Advisor & Outstanding Chapter Awards

2018–19 SPS OUTSTANDING CHAPTER ADVISOR

The SPS Outstanding Chapter Advisor Award is the most prestigious recognition given each year by SPS. The following SPS advisors were nominated by their students, colleagues, and departments in recognition of their dedication to furthering the mission of SPS. The winner receives a total of \$5,000 for him or herself, their chapter, and their department. The winner will be officially recognized at the Winter 2020 AAPT Meeting. Learn more at spsnational.org/awards/outstanding-chapter-advisor.

Winner

Alina Gearba-Sell, *United States Air Force Academy*

Runner-up

Peter Sheldon, *Randolph College*

Nominees

Cristian Bahrim, *Lamar University*

Shannon Clardy, *Henderson State University*

Michael Dowding, *South Dakota School of Mines and Technology*

Larry Isenhower, *Abilene Christian University*

Ronald Kumon, *Kettering University*

Mark Siemens, *University of Denver*

Jason Slinker, *University of Texas at Dallas*

Wayne Trail, *Southwestern Oklahoma State University*

Cecilia Vogel, *Augustana College*

Matthew Wright, *Adelphi University*

Tamera Young, *University of Utah*

2018–19 SPS OUTSTANDING CHAPTER AWARDS

The SPS Outstanding, Distinguished, and Notable Chapters are determined each year by the National Council through careful review of the photos and information provided through SPS chapter reports. Designations are made based on chapter involvement in local, zone, and national SPS meetings, participation in SPS programs, outreach efforts, student recruitment, and interaction with their department and department alumni. To earn these designations, SPS chapters are encouraged to stay active and engaged by participating in an array of activities. Sample activities can be found through the SPS Information Handbook – spsnational.org/about/governance/sps-information-handbook.

Outstanding Chapters

Abilene Christian University (Zone 13)	Gustavus Adolphus College (Zone 11)	Siena College (Zone 2)	University of New Mexico (Zone 16)
Adelphi University (Zone 2)	Harvard University (Zone 1)	South Dakota School of Mines & Technology (Zone 11)	University of North Carolina, Asheville (Zone 5)
Allegheny College (Zone 7)	Haverford College (Zone 3)	South Dakota State University (Zone 11)	University of North Carolina, Chapel Hill (Zone 5)
Appalachian State University (Zone 5)	Henderson State University (Zone 10)	Southwestern Oklahoma State University (Zone 12)	University of Northern Iowa (Zone 11)
Augustana College (Zone 9)	High Point University (Zone 5)	Stephen F. Austin State University (Zone 13)	University of Oregon (Zone 17)
Augustana University (Zone 11)	Illinois Institute of Technology (Zone 9)	Suffolk University (Zone 1)	University of Pittsburgh (Zone 7)
Austin Peay State University (Zone 8)	Ithaca College (Zone 2)	Syracuse University (Zone 2)	University of Puerto Rico, Mayaguez (Zone 6)
Bethel University (Zone 11)	James Madison University (Zone 4)	Texas Lutheran University (Zone 13)	University of Rochester (Zone 2)
Boston University (Zone 1)	John Carrol University (Zone 7)	Texas Tech University (Zone 13)	University of Southern Mississippi (Zone 10)
Bridgewater State University (Zone 1)	Johns Hopkins University (Zone 4)	The City College of New York (Zone 2)	University of Texas at Dallas (Zone 13)
California State University, Chico (Zone 18)	Juniata College (Zone 3)	The College of New Jersey (Zone 3)	University of the Sciences (Zone 3)
California State University, Fresno (Zone 18)	Kettering University A (Zone 7)	The College of Wooster (Zone 7)	University of Utah (Zone 15)
Carthage College (Zone 9)	Kettering University B (Zone 7)	The University of Central Arkansas (Zone 10)	University of Virginia (Zone 4)
Central Washington University (Zone 17)	Lamar University (Zone 13)	Truman State University (Zone 12)	University of Washington (Zone 17)
Cleveland State University (Zone 7)	Luther College (Zone 11)	University of Alaska Anchorage (Zone 17)	University of Washington, Bothell (Zone 17)
Coe College (Zone 11)	Lycoming College (Zone 3)	University of Alaska Fairbanks (Zone 17)	University of Wisconsin – River Falls (Zone 9)
Colorado School of Mines (Zone 14)	McMurry University (Zone 13)	University of California, Berkeley (Zone 18)	US Air Force Academy (Zone 14)
Davidson College (Zone 5)	Minnesota State University (Zone 11)	University of Central Florida (Zone 6)	Utah State (Zone 15)
Drew University (Zone 3)	Missouri Southern State University (Zone 12)	University of Florida (Zone 6)	Virginia Tech (Zone 4)
Embry-Riddle Aeronautical University (Zone 16)	Missouri Southern State University (Zone 12)	University of Illinois at Urbana Champaign (Zone 8)	Washington State University (Zone 17)
Emory University (Zone 6)	Moravian College (Zone 3)	University of Kentucky (Zone 8)	Wayne State University (Zone 7)
Florida International University (Zone 6)	Mount Holyoke College (Zone 1)	University of Louisville (Zone 8)	Western Illinois University (Zone 8)
Florida Polytechnic University (Zone 6)	New College of Florida (Zone 6)	University of Maryland, College Park (Zone 4)	Wheaton College (Zone 9)
Georgia Institute of Technology (Zone 6)	North Carolina State University (Zone 5)	University of Memphis (Zone 10)	William Jewell College (Zone 12)
Grove City College (Zone 7)	Randolph College (Zone 4)		
Guilford College (Zone 5)	Rhodes College (Zone 10)		
	Roanoke College (Zone 4)		
	Rowan University (Zone 3)		
	Rutgers University, New Brunswick (Zone 3)		

Distinguished Chapters

Agnes Scott College (Zone 6)	Green River College (Zone 17)	Pennsylvania State University (Zone 3)	University of Michigan (Zone 7)
Angelo State University (Zone 13)	Hendrix College (Zone 10)	Pittsburg State University (Zone 12)	University of Minnesota (Zone 11)
Auburn University (Zone 6)	Houston Baptist University (Zone 13)	Ramapo College (Zone 3)	University of Nevada, Reno (Zone 18)
Augusta University (Zone 6)	Howard Community College (Zone 4)	Randolph College (Zone 4)	University of North Carolina at Greensboro (Zone 5)
Ball State University (Zone 9)	Howard University (Zone 4)	Saint Joseph's University (Zone 3)	University of North Florida (Zone 6)
Baylor University (Zone 13)	Idaho State University (Zone 15)	Saint Michael's College (Zone 1)	University of South Carolina (Zone 5)
California Lutheran University (Zone 18)	Indiana University Bloomington (Zone 8)	Salisbury University (Zone 4)	University of Tampa (Zone 6)
Christian Brothers University (Zone 10)	Kenyon College (Zone 7)	Sewanee: The University of the South (Zone 10)	University of Tennessee (Zone 8)
Clemson University (Zone 5)	LaGuardia Community College, CUNY (Zone 2)	Simpson College (Zone 11)	University of Texas at El Paso (Zone 13)
College of William and Mary (Zone 4)	Lehigh University (Zone 3)	Smith College (Zone 1)	University of Texas at Rio Grande Valley (Zone 13)
Colorado Mesa University (Zone 14)	Louisiana State University (Zone 10)	Southern Methodist University (Zone 13)	University of Texas at San Antonio (Zone 13)
Creighton University (Zone 11)	Louisiana Tech University (Zone 10)	Stevens Institute of Technology (Zone 3)	University of West Florida (Zone 6)
DePaul University (Zone 9)	Manhattan College (Zone 2)	Stony Brook University (Zone 2)	University of Wisconsin – Eau Claire (Zone 9)
Dillard University (Zone 10)	Marquette University (Zone 9)	Temple University (Zone 3)	University of Wisconsin – La Crosse (Zone 9)
Drexel University (Zone 3)	Marshall University (Zone 7)	Texas A&M University – Commerce (Zone 13)	University of Wisconsin – Parkside (Zone 9)
Duke University (Zone 5)	Metropolitan State University of Denver (Zone 14)	Towson University (Zone 4)	Wake Forest University (Zone 5)
Duquesne University (Zone 7)	Miami University (Zone 7)	University at Buffalo, SUNY (Zone 2)	Washington University in St. Louis (Zone 12)
East Central University (Zone 12)	Mizzou – University of Missouri (Zone 12)	University of Colorado Denver (Zone 14)	West Virginia University (Zone 7)
Fairfield University (Zone 1)	Murray State University (Zone 8)	University of Dayton (Zone 7)	Worcester Polytechnic Institute (Zone 1)
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Georgetown University (Zone 4)	Ohio Wesleyan University (Zone 7)	University of Maine (Zone 1)	
Georgia Southern University (Zone 6)			
Gonzaga University (Zone 17)			
Grand Valley State University (Zone 7)			

Notable Chapters

Bridgewater College (Zone 4)	New Mexico Institute of Mining and Technology (Zone 16)	Stockton University (Zone 3)	Vanderbilt University (Zone 8)
Buffalo State College (Zone 2)	Northern Illinois University (Zone 9)	Sun Yat-sen University (Zone 18)	Wallace Community College (Zone 6)
California State University, Long Beach (Zone 18)	Northern Virginia Community College (Zone 4)	SUNY Albany (Zone 2)	West Virginia Wesleyan College (Zone 7)
Concordia College (Zone 11)	Oklahoma State University (Zone 12)	SUNY Potsdam (Zone 2)	Westminster College (Zone 15)
Eastern Michigan University (Zone 7)	Old Dominion University (Zone 4)	Tarleton State University (Zone 13)	Xavier University of Louisiana (Zone 10)
Hartnell College (Zone 18)	Oregon State University (Zone 17)	The Ohio State University (Zone 7)	Youngstown State University (Zone 7)
Hofstra University (Zone 2)	Point Loma Nazarene University (Zone 18)	Trinity University (Zone 13)	
Hope College (Zone 7)	Pomona College (Zone 18)	University of California, Merced (Zone 18)	
Institute of Engineering & Management, Kolkata, India (Zone 18)	Roberts Wesleyan College (Zone 2)	University of Dallas (Zone 13)	
Lawrence Technological University (Zone 7)	Sacramento State University (Zone 18)	University of Nebraska – Lincoln (Zone 11)	
Longwood University (Zone 4)	Sam Houston State University (Zone 13)	University of North Alabama (Zone 6)	
Nebraska Wesleyan University (Zone 11)	St John's University (Zone 2)	University of San Diego (Zone 18)	
		University of Wyoming (Zone 14)	
		Utica College (Zone 2)	

Director's Recognition

The Director's Recognition is awarded to those chapters that have made tremendous strides in their local chapter, zone, and national activities over the last academic year.

Boston University (Zone 1)	Johns Hopkins University (Zone 4)	Siena College (Zone 2)	University of Tampa (Zone 6)
Coe College (Zone 11)	Oklahoma State University (Zone 12)	University of California, Berkeley (Zone 18)	Wheaton College (Zone 9)
Colorado School of Mines (Zone 14)	Rutgers University – New Brunswick (Zone 3)	University of Northern Iowa (Zone 11)	
High Point University (Zone 5)			

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UNA Alumnus Receives Presidential Award for Scientific Work, Outreach

by Kendyl Hollingsworth, Staff Writer for the *TimesDaily*. Reprinted with permission from the *TimesDaily*.

The White House this summer announced the most recent recipients of the Presidential Early Career Award for Scientists and Engineers, and among them is an alumnus of the University of North Alabama.

Martin Heimbeck, a 2006 graduate in physics, is one of only two recipients from Alabama in this latest round.

Heimbeck said he first learned he was nominated for the award about three years ago.

"I found out in June that I was one of the recipients, with the invitation to basically go up to Washington, D.C., two weeks later to receive the award," he said. "For me, it was great to be recognized, and obviously, my organization — they were proud of having that accomplishment within their organization."

The PECASE award was established in 1996. It is "the highest honor" the United States government gives to scientists and engineers in the beginning stages of their independent research careers. It is given to those who show "exceptional promise" for leadership in science and technology, according to the White House.

Heimbeck works for the Army CCDC Aviation and Missile Center at Redstone Arsenal in Huntsville. He joined several other science and technology professionals from across the nation at DAR Constitution Hall to receive the award.

According to a press release, his research on terahertz radiation — the region between microwaves and infrared waves — contributed to his nomination by the Department of Defense.

"It has properties that can see through certain materials, like opaque plastics, non-destructively and provide information about them, to see if there is any damage to the interior structure," he explained. "This technology can be applied to composite materials, which are of high strength but of low weight, used on helicopters, so that we can see any defects in the structure before they can lead to failure. It's analogous to X-rays we use to look at our bones."

This kind of scientific exploration, as well as leading projects and collaborating with others, are all factors in the selection process, according to Heimbeck.

Volunteer work and outreach are also essential factors.

Originally from Germany, Heimbeck said he knew he wanted to be a physicist since high school. He earned a degree in physics as an undergraduate student at UNA before furthering his education at the University of Alabama in Huntsville, where he later taught physics.

While at UNA, Heimbeck said he enjoyed the experience of a small campus and playing Frisbee golf with friends.

"My girlfriend — who is now my wife, Amber — was also a physics student there," he said. "And I had a great professor, Dr. Brian Thompson, who was a mentor to me."

Thompson, chairman of UNA's Department of Physics and Earth Science, said he still remembers Heimbeck for his accomplishments and contributions to the department.



ABOVE: Heimbeck (left) receives the Presidential Early Career Award for Scientists and Engineers (PECASE) from Kelvin Droegemeier, Director of the United States Office of Science and Technology Policy, during a ceremony in July 2019.

"I most enjoyed working with Martin over the two semesters of his directed research project in experimental optics," he recalled in the release. "He showed attention to detail through repetitious measurements, dedication to work through failures, and the intuition to try new ideas."

Thompson also touted Heimbeck for his example as president of the Society of Physics Students, as well as his efforts in organizing and winning a grant for an outreach project with fourth graders.

Heimbeck and other students would visit fourth-grade classes and present small science experiments.

"We continued some of that at the local Physics Club at UAH, but it all started at UNA with one of my professors there," Heimbeck said.

The goal, he explained, was to make science more interesting for students as they start deciding whether they like or dislike the subject.

"Hopefully, we kind of sparked the interest for them to keep going and keep science and these subjects in their mind as they're going through school," he added.

That project would later contribute to Heimbeck's PECASE win.

Today, Heimbeck said he enjoys working to develop new methods and technologies for the Army, even when the research doesn't go as expected.

"I enjoy what I'm doing right now, and I see myself continuing my career in the technical field and collaborating with universities, and leading projects that follow the mission of the Army's organization here and hopefully be beneficial to the men and women in uniform in the future," he said.

"It's important to fund this kind of work and take the risks, because we're better to have failed and go in a different direction than to not try and never know." //

Dunk Tank Physics

by Brad R. Conrad, Director of SPS & $\Sigma\pi\Sigma$, Toni Sauncy, Department Chair and SPS Advisor, and the Texas Lutheran University SPS Chapter

“When I meet God, I’m going to ask him two questions: Why relativity? And why turbulence? I really believe he’ll have an answer for the first.” — Werner Heisenberg

Each fall, our SPS chapter at Texas Lutheran University raises money for student trips to conferences and coffee for the physics lounge with a big splash. Several splashes, actually, thanks to an 800 L dunk tank. Nothing helps students support their chapter like the opportunity to dunk a favorite professor, or the one who assigned a bit too much homework last week . . .

A dunking booth, or dunk tank, is a simple machine that’s usually set up outside. A person sits on a board suspended above a large container of water. The board is held in place by a latch. Passersby purchase the chance to throw a ball at a target that’s connected to the latch—hit the target and the latch gives, dropping the person straight into the chilly water below. Then rinse and repeat.

Anyone with experience can attest to how unpleasant it can be to sit above the tank. Not just because it’s nerve-wracking, but also because it gets so cold! But, is it really *that* cold up there? Does it even matter how many times you get dunked?

To answer this, we need not only thermal physics but also some fluid dynamics that *to this day* has not been solved completely. So, I challenge you to puzzle out:

How much energy does a dunked person need to keep warm?

This is a complicated problem, so consider a related question. If you were sitting in a dunk tank for an hour, would you prefer being dunked just once and slowly drying off or being plunged into the water continuously? Which has a greater cooling power?

Let’s look at each case.

When you’re plunged into the water for the first time, you get completely submerged. If the water were the same temperature as a human, 37 °C, you might not mind too much, but heated dunk tanks aren’t really a thing. Groundwater temperatures are fairly constant throughout the year, so if the tank were just filled, it would probably be a little chilly.¹ The temperature varies with location and latitude, 5 °C – 25 °C being a fair range, so we’ll pick the value for Washington, DC: 11 °C (53 °F). That’s pretty cold! Also remember that water can absorb and store a lot of energy per degree change, a fact reflected in its high specific heat:

$$4186 \frac{\text{Joule}}{\text{kg} \cdot ^\circ\text{C}} = 1 \text{ calorie}$$

which is significantly higher than that of steel (420 J/kg °C), wood (1760 J/kg °C), or even sand (830 J/kg °C).² Very few common materials have a higher specific heat.

From introductory physics, we can calculate the heat flow between two materials:

$$Q = m \cdot c \cdot \Delta T = m \cdot c \cdot (T_F - T_I)$$

where Q is the heat flow, m is the mass of the material in question, c is the object’s specific heat (material dependent), and ΔT is the material’s temperature change from T_I to T_F . Given enough time, two materials with arbitrary mass and specific heats in thermal contact will eventually reach a thermal equilibrium if they start at different temperatures T_1 and T_2 , assuming no additional heat sources and a closed system. This gives us

$$m_1 \cdot c_1 \cdot (T_1 - T_F) = m_2 \cdot c_2 \cdot (T_F - T_2)$$

where the superscripts reference the different initial conditions. If a person was dunked and stayed in the water (or was dunked a *lot*), we could even solve for the final temperature:

$$T_F = \frac{m_1 \cdot c_1 \cdot T_1 + m_2 \cdot c_2 \cdot T_2}{m_1 c_1 + m_2 c_2}$$

but this process would take a long time, and most people are in the water for only a few seconds. Since humans are mostly water and have a volume on the order of 70 L, the 800 L (200 gallons) of cold water won’t warm up very much with repeated dunks, but the person will relatively cool down more and more each time. **What would the final temperature be?** Luckily, people can last for long periods in the cold water well before they get too cold, because the human body generates a lot of heat and stays at about the same temperature!

Now let’s come up with an order-of-magnitude estimate. Note your answer; we’ll need it later.

The Joule (or watt-second) replaced the erg as the accepted unit of both magnetic and mechanical energy. The unit is named after James Prescott Joule (1818-1889).

If the water and person did come to thermal equilibrium and it took about an hour (much less than a day but more than a few minutes), how many kJ would the human body have contributed to make up the difference?⁴

Now recall our thought experiment: Would you get colder sitting on the dunk tank board drying off or being repeatedly dunked? To answer that, we need to consider what happens after you get out of the dunk tank.

To simplify the problem, let's assume it's a very slow day at the dunk tank and the person getting dunked gets dropped only once and that it's at the start of the hour. When you climb out, you're coated in about 1 L of water thanks to your clothes and hair. Let's assume that after an hour you're bone dry, this time thanks to evaporative cooling³. While your body will radiate heat through black body radiation, conduct heat onto surrounding matter, and lose heat through convection (motion of air around your skin), evaporation of water is most likely the primary way you'll lose heat to the surrounding environment. Just as if it's a very hot day, taking a quick dip in a pool or even sweating causes people to cool off quickly. On very hot occasions, people can sweat well over 1 L per hour!⁵

The amount of energy you'll lose as 1 L of water evaporates at room temperature can be measured using the heat capacity and the heat of vaporization for water. It turns out to be about 2400 kJ/kg at room temperature.⁶ Thus, if someone had 1 L of water coating them (about 1 kg) and it evaporated, the water would need about 2400 kJ of energy to vaporize. While this isn't the only cooling process, it's fair to consider this a lower limit because radiation, conduction, and convection will cool you even more. That's a lot of energy . . .

Comparing the energy you'd lose by warming the water for an hour with the energy you'd lose by evaporation over an hour, we can see that they are order-of-magnitude

comparable. While neither case includes lots of details, both processes are cooling the person in the dunk tank considerably! We'd need better models to determine which situation would actually cool you faster, but I would argue that whether you are being put in the water continuously or just once, both sound like pretty unpleasant experiences on all but the hottest days of the year.

This line of reasoning raises another question that we'll leave you to reason through. A person falling into cool water will add gravitational energy, which is then transferred into thermal energy through complicated turbulence processes, thereby heating the water. The person will also warm the water for every unit of time they are submerged.

How many dunks would it take to measurably increase the temperature of the water? //

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TOP: An attendee gets ready to send the dunk tank volunteer for a swim.

ABOVE: A Texas Lutheran SPS volunteer explains the dunk tank rules to an attendee. Photos courtesy of the SPS chapter of Texas Lutheran University.

A "PHYSICS DUNK TANK" PHYSICS PROBLEM

A fun physics edition of the dunk tank game might involve throwing a ball that hits a lever and releases another lever that holds up the seat. There are lots of physics principles at work here, including conservation of momentum, application of force, levers, and much more. But for now, consider the physics of the fate of the dunked subject. From the thermodynamics of this system, we can see that the dunked individual cools with each cycle. Describe the ultimate temperature of the dunked individual over time.

Assumptions:

- The throwers are spot on and the timing is such that the dunked person is out of the water for the same amount of time as they are in the water.
- The time to crawl out of the tank and resume the position on the chair is negligible, i.e., we can consider only submerged time and unsubmerged time.
- The surrounding air is moving with some reasonable breeze speeds. (This influences the cooling rate of the wet individual during the out-of-water time.)
- The in-and-out cycle happens at a regular interval.
- It's a sunny, warm day, about 85 °F, and the water has reached equilibrium with the temperature of the surrounding air.

Building a “Prehistoric” Pendulum to Promote Curiosity

by Julio López Ibarra, Fernando Daniel Hidalgo, Raúl Quiñones Quellar, Gabriel Murguía Morales, Adrian Menchaca Martinez, Dr. Abdiel Ramírez-Reyes, and Dr. Sergio Flores, SPS Members at Universidad Autónoma de Ciudad Juárez, with Kendra Redmond, Editor

Elementary school students are told that the Earth rotates on its axis. However, internalizing information like this requires a conceptual understanding. We believe that physical demonstrations, such as Foucault pendulums, can help people develop cognitive processes that will help them better interpret and understand information.

The SPS chapter at the Universidad Autónoma de Ciudad Juárez received a 2019 SPS Chapter Research Award to design and construct a Foucault pendulum with trajectory-tracking sensors and a data display. Our goal is to develop this pendulum for our local science museum, La Rodadora. This will help raise scientific curiosity in the Juárez community and generate data to analyze in physics classes.

Introduced in 1851 by Michael Foucault as experimental proof of the Earth’s rotation, the Foucault pendulum consists of a large mass suspended from a cable. The top of the cable is attached to a fixed point two or more floors above the mass. As the pendulum swings back and forth, its plane of oscillation rotates clockwise in the Northern Hemisphere, demonstrating the rotation of the Earth. The full motion of the Foucault pendulum reflects the coupling of the rotation of the Earth and the oscillation of the pendulum, leading to a precession. The motion is affected by different conditions, such as air circulation and friction in the support, that can sometimes lead to nonperiodic motion.

Most studies consider the mass to move only in the horizontal plane and not in the vertical plane due to its low-amplitude oscillation. In this case, the motion depends primarily on gravity, tension, and the Coriolis force and is usually solved analytically. Once our pendulum is operational, we would like to contrast theoretical pendulum models based on classical mechanics with actual data to get a deeper understanding of the variables involved in its motion.

We have made great progress on the design and learned a lot about design software along the way. The pendulum mass consists of a steel shell surrounding a lead mass (in the form of pellets) and finished with a chrome coating. A wireless position sensor will be attached to the mass, and data will be collected and displayed in real time on an LED screen. The pendulum arm will be a stainless steel cable approximately 20 meters long, supported by an existing dome inside the museum. The pendulum will be surrounded by a security structure. The projection plane will feature a paleontology-themed design.

We have a prototype of the pendulum mass and a functional prototype of a Foucault pendulum for student data calculations. We are working very hard on the tracking system and hope to have it ready soon. We are also making changes to our support structure design, informed by the results of a test run. The final steps will include designing the informative module that will be displayed with the pendulum and then installing, calibrating, and sharing the pendulum with our community.

The pendulum will be housed in the Dome of Paleontology at La Rodadora. One of the biggest challenges so far has been modeling the displacement of the system to determine the appropriate height and mass for our pendulum, given our allotted space. In addition, we had to consider the aesthetics of our system and develop an artistic concept that integrates the paleontology theme. We look forward to completing this project and having a physics demonstration that we can share with the city of Juárez along with data that we can analyze. //



TOP: Team members collaborated with design students at their university to develop a paleontology-themed design concept.

CENTER: Julio López Ibarra sands a mass in preparation for testing.

ABOVE: Team members pose with the pendulum mass. Back row: Adrian Menchaca, Fernando Hidalgo, Abdiel Ramirez, and Julio Lopez. Front: Raul Quiñones. Photos courtesy of the Universidad Autónoma de Ciudad Juárez SPS chapter.

Finding Inspiration IN THE QUIRKS & CREATIVITY OF OUR CHAPTERS

by Korena Di Roma Howley, Contributing Editor

Time-traveling scientists. Mechanical mysteries. Journeys above the Arctic Circle. These are just some of the stories that caught our attention as we surveyed the landscape of the Society of Physics Students for this month's chapter-themed issue. Bringing our focus back to the work on the ground—to individual contributions and chapter-wide efforts—serves as a reminder of how the society is enhancing the physics community, improving science literacy, and supporting local communities one activity at a time.

Since its formation in 1968, SPS has grown to more than 800 chapters in 18 zones around the country, plus international chapters. And while the overall mission and purpose are the same across the organization, each chapter puts a unique spin on outreach and member activities, influenced by current participants, location, and type of school, among other factors. When chapters share their successes—and failures—they inspire other groups to adapt ideas, grow their programs, and learn from mistakes.

How do chapters discover what others are doing? By attending zone meetings, connecting at professional physics meetings like PhysCon, reaching out to groups that share similarities, or even reading this publication, which profiles chapters in action every quarter. And if your chapter has met with a particular success—whether with recruitment, trivia nights, or interdepartmental collaboration—don't be afraid to share what you've accomplished and expand the scope of your awesome idea.

The chapters featured in the following pages exemplify the spirit and mission of SPS. Whether they take creative approaches to public engagement or spearhead activities that foster internal inspiration (or both), they set an example for other chapters to follow, including those that are just getting started. And they prove that, no matter the weather, plummeting pumpkins and the Pleiades will always draw a crowd. //

Is your chapter doing amazing things? Spread the word by emailing us at sps-programs@aip.org with your news and accomplishments.



ABOVE: Images from the 2019 Physics Congress. Photos courtesy of the SPS National Council and office.

Drawing Physics:

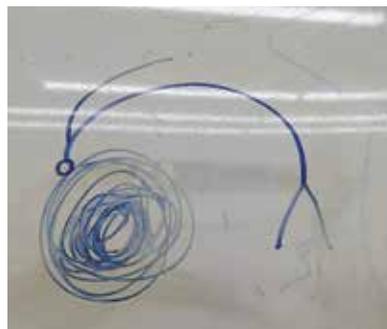
ILLINOIS TECH CHAPTER BUILDS COMMUNITY THROUGH Pictionary

by Alexandra Detweiler, SPS Chapter President, Illinois Institute of Technology

Physics is hard. It's so hard that it's easy for students to burn out if they're constantly focusing on lectures, readings, assignments, and projects. One of the most important things about SPS is that it brings physics students together, building community and reminding students that they're not alone. At Illinois Institute of Technology, our chapter is always looking for new ways to achieve this. Recently, some of our most successful attempts at bringing the physics department community together socially have been games of physics-themed Pictionary.

Here's how it works: Our chapter first sends out a form on which anyone can submit physics topics for the game. These submissions might include famous physicists (Niels Bohr), physical objects (quasars), laws or theorems (BCS theory), physical processes (photoelectric effect), or concepts (spaghettification). Everyone has different areas of specialization and interest, so the suggestions always span a wide variety of topics.

Just before the event, the topics are printed, cut out, and placed in a hat. Participants are then split into two teams—undergraduates (who get their own team because their attendance is usually much larger) and not-undergraduates (i.e., graduate students and department faculty). The rules are simple: Teams alternate picking a volunteer to select a topic from the hat. The volunteer then has one minute to assist their team in guessing the topic by drawing on the whiteboard. If the team guesses the topic within one minute, a point is earned. If not, the other team has 30 seconds to guess correctly and “steal” the point. We've added a few additional rules as well. For instance, if a volunteer picks a topic and doesn't know what it means, they have the option of either googling it or putting it back and drawing a second. Also, when the volunteer is drawing on the board, no speech, letters (Latin, Greek, or otherwise), or numbers are allowed.



TOP LEFT: A student's artistic portrayal of “spaghettification.”

OTHER PHOTOS: Members of the Illinois Tech physics department face off during a game of physics Pictionary. Photos courtesy of the Illinois Tech SPS chapter.

We've found this game to be a great way of introducing new students to the department (especially when the event is held a few weeks into a new academic year); creating some friendly competition, which heightens engagement; and inspiring lots of laughs. The looks on volunteers' faces when they've picked a topic they know will be tricky to draw, the objectively awful visual interpretations that are somehow still guessed correctly, and the sound of crickets as a volunteer enthusiastically points to their drawing again and again never fail to spark laughter. We hope that this article inspires your chapter to give our favorite game a try; we expect that it will positively affect your department as it does ours! //

Community (Technical) Service:

SUN YAT-SEN STUDENTS OFFER FREE APPLIANCE REPAIRS

by Zhiyao Ning, SPS Chapter Chairman, Sun Yat-sen University



TOP: Villagers brought a variety of electrical appliances to the event, including electric tea kettles, rice cookers, and DVD players.

FAR LEFT: Club members collaborate on a difficult repair.

LEFT: Club members put their electronics skills to good use during the two-day event. Photos courtesy of Sun Yat-sen University's Electrical Appliances Maintenance Voluntary Club.

The sun was scorching like a flame, but the heat wave could not diminish our enthusiasm for serving the community. As members of the Electrical Appliances Maintenance Voluntary Club at Sun Yat-sen University in China, we were out providing villagers with free technical assistance, repairing their broken electrical appliances—induction cookers, computers, rice cookers, and much more. The service helps to ease the economic burden of the villagers, improve the community's recognition of our school, and enhance our own technical skills and abilities while giving back to our community and country.

The club's main activities include repairing broken appliances in our activity room and organizing electrical appliance maintenance activities on campus, in local villages, and in remote areas. New club members are trained by experienced seniors and tutors at the beginning of the year. With hands-on guidance, members collaborate on problem-solving, searching for relevant data, and practicing repairs to gradually improve their professional skills and ability to

work independently. This lays a solid foundation for the annual volunteer activities. Several club members are physics students who are also part of our SPS chapter.

On this particular day, filled with brilliant sunshine, we were helping people from several remote mountain villages around the city of Qingyuan. When we arrived, we were surprised to find villagers already waiting with expectant faces. Many broken electrical appliances had been accumulated already, and villagers continually brought in more. There was an electric kettle that couldn't boil water, an electric cooker that didn't heat, DVD players that didn't work, and even a broken electrical foot tub. We kept busy registering and checking the state of each appliance, collecting owner information, distributing tasks, and arranging the workflow methodically. We carefully disassembled, tested, replaced, repaired, and retested.

The foot tub and three broken DVD players gave us the most trouble, because we hadn't repaired these kinds of appliances before. We didn't know what to do, so the team members in charge of these items asked the seniors for help through an online chat. Under their guidance,

we found internal structure drawings of the DVD players online and then dismantled them, looking for problems. Finally, we found a rusted slide on one of them and worn out limit switches on the other two. We fixed the problems and the DVD players worked! As for the ineffective foot tub, we dismantled the baffle and checked each of the circuit components using a multimeter. Finally, we found that the mainboard had shorted out because it was flooded. After we dried out the mainboard and replaced the broken components, the electrical foot tub worked normally! Everyone was very excited.

During this two-day event, our team worked on more than 50 electrical appliances and repaired more than 60 percent of them. Although we were tired and the environment was challenging, the experience was meaningful and beneficial. We learned how to repair several kinds of devices that we hadn't worked with before. The villagers were grateful and happy, which made us happy. We appreciated the opportunity to give back to society and look forward to sharing our experience with future club members, preparing them for this responsibility. //

Revealing the Magic:

RHODES CHAPTER TAKES A THEATRICAL APPROACH TO SHARING PHYSICS

by Alden Raymond, SPS Chapter Treasurer, Rhodes College

During our chapter's 2017 pumpkin drop, I unexpectedly took up the position of emcee, improvising to the best of my ability. I kept a rotating crowd entertained with jokes, random facts, and personality as fellow physics undergraduates dropped pumpkins frozen in liquid nitrogen from the roof of Rhodes Tower, the home of the physics department at Rhodes College. The extreme freezing from liquid nitrogen causes the pumpkins to become highly brittle and shatter spectacularly when they hit the ground. It's an event that our SPS chapter has done for years. That pumpkin drop was an unexpected hit, even in the face of a severe cold front, with around 300 attendees.

When I organized the 2018 pumpkin drop, I wanted to push the emcee angle again, push the showmanship of the science we were featuring. But I needed help. Thankfully, our chapter president that year, Josh Ortega, was a physics and theater double major. Together, we outlined what we wanted the 2018 pumpkin drop to be: a showcase of demonstrations with a more theatrical presentation. We wanted to entertain people.

To this end, we did a few things differently. First and foremost, we changed how we trained our volunteers. Instead of giving them brief tutorials on the demos, we had in-depth training days in which we taught volunteers how to operate and explain demonstrations while entertaining people walking by.

We also amped up the most visible parts of the night—the jokes, the surprise, and the suspense of actually dropping the pumpkins. I again served as emcee for the evening but this time engaged in some orchestrated conflict with the SPS members dropping pumpkins. I would announce a drop and get the crowd to count down with me, but the droppers would release the pumpkins early. Or late. When I would act frustrated, the droppers would laugh. We would make jokes and argue with each other.

When I promised the audience we would be dropping our biggest pumpkin next, the droppers



instead released a pebble. That got a big laugh. The theatrics helped the event become more than just a night where we dropped pumpkins. It became a night where people had fun (and hopefully learned a thing or two in the process).

Mixing science with a high dose of entertainment became our guiding philosophy last year. We pushed ourselves to find more entertaining ways to explain science during our other events. We got audiences more involved, such as through a hovercraft build funded by an SPS Future Faces of Physics Award, in which local students built their own miniature hovercrafts out of bottle caps, balloons, and CDs.

This philosophy also guided our plans for the 2019 drop. We continued the training days and, as this year's event was scheduled for the weekend after Halloween, we added Halloween-themed décor and “spookified” some of our demos. Attendees saw smoke rings burst into flames and floating pumpkins.

The biggest thing we learned from all of this is that it's often not enough to explain what's going on. If your audience doesn't care, they won't listen. But if you get them interested first, by entertaining them, for example, they'll want to know how the demo works. It's like a magic trick, except instead of keeping the “how” a secret, we want to show people the mechanisms at work. //

TOP: Rhodes Tower, from the roof of which chapter members dropped pumpkins frozen in liquid nitrogen.

CENTER: Rhodes SPS chapter advisor Dr. Brent Hoffmeister tries out a prototyped hovercraft demo. It's four feet wide; he's just very tall.

BOTTOM: 2018 Rhodes SPS chapter officers and event organizers (L-R) Rodd Lofton, Josh Ortega, and Alden Raymond. Photos courtesy of Doni Thomas.

Prioritizing Well-Being:

BERKELEY CHAPTER FOCUSES ON HEALTH, INCLUSION, AND COMMUNITY

by Nicholas Rui, SPS Chapter President, and Yonna Kim, Projects Co-Coordinator, University of California, Berkeley

On a weekday, the University of California, Berkeley's LeConte Hall is a vibrant hive of physics students. Outside of class, they gather to discuss physics problems with enthusiastic peers in LeConte's Reading Room, a front-and-center glass enclosure full of chalkboards and the occasional leftover pizza from an SPS faculty-student lunch. Between lectures (and sometimes at 2 a.m.), students stop and grab food at the Snack Shack in Room 184, headquarters for Berkeley's chapter of the Society of Physics Students and a popular undergraduate resource in the department.

The department comes to a standstill at 5 p.m. on Fridays—zero hour for turning in physics problem sets and also when a welcome chime from the Campanile tower ushers in some well-earned weekend relaxation. All's quiet on the western front until a new week dawns, and with it a new, unique set of deadlines and exams.

A group unified by curiosity about the universe and a love for ice cream sandwiches, the Berkeley SPS chapter makes it a priority to complement the school's academic rigor with an emphasis on health, inclusion, and community.

Last spring, we invited members of the Department of Nutritional Science and Toxicology to a weekly SPS meeting to discuss healthy eating habits. Along with hummus, carrots, and a stack of quick and healthy recipes, Miyuko Niwa and Jessie Lan shared accessible strategies for eating healthfully on a budget and under prohibitive time constraints.

For the 2019–20 academic year, we've extended our advocacy of healthy living through biweekly "DeStress with SPS" meetings (sagely scheduled after 5 p.m. on Fridays), organized by project co-chair Yonna Kim. De-stressing activities vary from playing Frisbee and soccer together in the glow of the setting sun to painting majestic mountain landscapes while following Bob Ross's soothing instructions.

As students' well-being depends on mental health, our SPS chapter encourages students to be supportive of each other and of themselves. To this end, 2018–19 co-president Mayia Vranas spearheaded an initiative to spread awareness of imposter syndrome—a general feeling that one is a fake or a fraud—through a workshop that detailed the all-too-common experience and addressed effective ways to combat it.

During another general SPS meeting, members from the Society of Women in the Physical Sciences (SWPS) detailed the history of women in STEM and ways in which people can help make fields such as physics more open and inclusive. Both the imposter syndrome and SWPS presentations were praised across the undergraduate population for their accuracy and boldness in tackling difficult subjects that aren't common discourse in physics departments.

The care with which our SPS chapter fosters community and inclusivity extends to freshmen and new transfer students as well. Throughout the years, the Berkeley SPS mentorship program has connected upper-division students with freshmen and new transfers in part by organizing fun teambuilding exercises such as a department-wide scavenger hunt.

This year, the program received a dramatic overhaul championed by co-secretary Aini Xu. The new program matches groups of 3–4 mentees with pairs of mentors and is accompanied by Physics 5A Study Hall, a study time hosted by SPS outreach coordinator Charlie Cummings, with departmental support intended to guide freshmen through Physics 5A, the first intended lower division physics class at Berkeley.

The study hall has already seen immense success, with participating students often moving to the Reading Room afterward to continue fruitful physics discussions with newfound friends. The mentorship program and 5A Study Hall have proven to be invaluable introductions to the physics department for new students.

Each fall semester comes to a close with a "secret Schrödinger" gift exchange, the spring semester with a festive SPS promenade. Then the weekly grind comes to a temporary halt, followed by the respective winter and summer recesses. These breaks mark much-needed respites from a demanding academic curriculum—breaks made bittersweet by the SPS friends heading their separate ways for a season. //



TOP: SPS co-vice president Erika Hathaway (front, left) and Carter Turnbaugh (front, right) out for a wholesome lunch with their mentorship group.

CENTER: SPS members enjoy a Friday afternoon DeStress with SPS event.

ABOVE: SPS outreach coordinator Charlie Cummings (left) assists a freshman student during 5A Study Hall. Photos courtesy of the University of California, Berkeley's SPS chapter.

The Physics Show:

WHEN SCIENCE AND PERFORMANCE COME TOGETHER

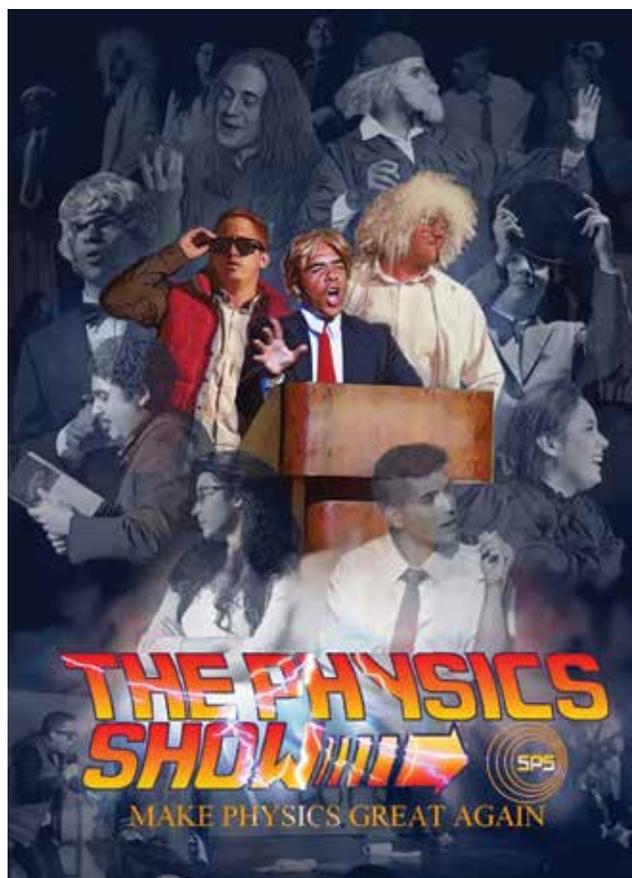
by Christian Nieves, SPS Member, University of Puerto Rico, Mayagüez Campus

Two time travelers join forces with the president of the United States to visit some of history's greatest scientists and help them save the world from an imminent catastrophe . . . Sounds crazy, right? Well, that's the plot of "The Physics Show: Make Physics Great Again," which we presented three times for the students and faculty at University of Puerto Rico at Mayagüez during the Spring 2019 semester.

When Manuel Lozano, the newly elected president of the SPS UPRM chapter, approached me in 2017 with the idea of making a physics show, it did seem a bit far-fetched. Originally, the idea was to do something similar to what two of our professors, Dr. Erick Roura and Dr. Pablo Marrero, did while they were members of SPS in the 1990s—perform entertaining physical science demonstrations for an audience. But we wanted to spice things up, add a bit of theatricality. However, after Hurricane María the show kept getting delayed, which allowed the concept to slowly evolve. What started as a straightforward presentation ended up as a full theatrical play with a 70-page script. I knew it was probably a bad idea to write such a long play, but at the same time, Manuel and I knew we were creating something people had never seen before. Why not give it a try?

We wanted to expose the audience to a little bit of the history of physics and its evolution. In the play, our time travelers go back to 1693, 1860, 1911, and 1953. They visit well-known scientists like Newton, Galileo, and Einstein, and others not so well known by the general public, such as Marie Curie, Michael Faraday, and J. Robert Oppenheimer. Each scene explores a different area of physics—classical mechanics, electromagnetism, and relativity (with a bit of quantum mechanics). We also wanted to highlight the struggle women have historically encountered to gain recognition for their work in physics.

Once we had a good story, we had to find the right people. There were no auditions. Instead, we looked for people excited about science throughout our campus. We ended up with nine physicists, three mechanical engineers, a mathematician, and two English majors. Most didn't have any acting experience. We rehearsed once or twice a week for six months. It was important to me that the actors had great chemistry and were familiar with the physical concepts that were being demonstrated. As we all know, things often go wrong during physics demonstrations, and if they did, we wanted the actors to feel comfortable enough to know what to do without breaking from their roles.



ABOVE: Promotional poster. In the center, from left to right: Manuel Lozano (Martín MacFlai), Christian Nieves (the president), and Derrick Ferrér (Dr. Emeterio Braun). From the bottom left, clockwise: Ariana Reyes (Mileva Maric), Hilario Torres (Albert Einstein), Eric Pabón (Michael Faraday), Manuel Ferrán (Isaac Newton), Edgar Albelo (Galileo Galilei), Herionexy Mounier (James C. Maxwell), Génesis Suárez (Marie Curie), and Félix Rivera (J. Robert Oppenheimer). Photo courtesy of Christian Nieves.



The play was almost two hours long. By drawing on theatre, film, and music courses as well as the talents of our team members, we filled the show with unique elements to engage the audience—video, sound effects, comedy, original music, and audience participation. We even wrote and recorded a four-minute theme song that, although it may not win any Grammy Awards, provided a fun ending to our show. Arguably the most exciting element of our show was the comedy. When developing the script, I knew I had to be careful to use jokes that everybody could understand, something that can be hard for physicists. At the end of the day, we wanted the show to be something unexpected, and judging by the reaction of the audience, we were successful.



So, why would physics students spend so much time making a play about physics? For many years, I've seen physics students slowly distance themselves from nonscientific people. But at some point in all of our lives, there was a moment when we saw something or someone that inspired us to study physics and made us think, "This is what I want for me!" We made "The Physics Show" to be that inspiration. Science is not only for scientists just as art is not only for artists. Mixing science with performance allowed us to break that silly barrier and, more importantly, helped us share knowledge with others as we learned a little bit ourselves. //



TOP: Newton alongside Galileo (second from left), giving a demonstration about pressure to the time travelers with a bed of nails.

CENTER: The main characters performing the show's theme song.

BOTTOM LEFT: Maxwell speaking about the polarization of light.

BOTTOM RIGHT: Manuel Lozano (left) and Christian Nieves (right), creators of "The Physics Show." Photos courtesy of Christian Nieves.



Making an Impact:

GUSTAVUS CHAPTER PROMOTES SCIENCE AND SUSTAINABILITY

by Shelby Klomp, SPS Chapter Co-President, Gustavus Adolphus College

The sound of young kids shouting with excitement isn't common on college campuses, but it's a welcome sound on the second floor of Olin Hall during our annual Science on Saturday event. This is when local elementary school students crowd into classrooms and labs to witness all the mind-blowing spectacles that the Gustavus Adolphus College physics department has to offer. From the shocking Van de Graaf generator to the explosive ping-pong vacuum cannon and the impressive light shows made from optics equipment, there's something to capture each child's imagination in our extensive physics demonstration collection.

Science demonstrations are integral to the Gustavus physics community, and outreach events are the primary way that we serve the surrounding communities. We love sharing physics with others. During the fall semester we put on a science and nature camp for first through fifth graders, and in the

spring we host multiple events for elementary and middle school students from local schools.

"Teaching and engaging with younger students can inspire them to embrace learning in a new light and foster a lifelong curiosity of the natural world," says junior physics major Espen Fredrick, a member of our outreach team who has participated in many of these events.

Last year, our Society of Physics Students chapter also showcased physics demonstrations during our Give to Gustavus Day livestream event, which helped to raise funding for scholarships. The crowd was blown away when we lit up our flaming oscilloscope and made the fire dance to the frequencies of the function generator.

Science demonstrations also serve as a great way to connect with Gustavus students who might not otherwise be involved in science on campus. Our SPS chapter collaborates with other science-based organizations on campus to host an annual STEM SNL (Saturday Night in Lund). This

event brings Gustavus students together on a Saturday night for a fun-filled evening of science-themed demos. Last year's highlight was Professor Darsa Donelan exemplifying the dizzying effects of an angular momentum conservation platform.

SPS also sponsored a Gusties After Dark event for students on campus last year. The event challenged students to use science and engineering to construct a spaghetti tower and build a container that would keep an egg safe during a plunge from a second-floor balcony. Junior physics major Lawrence Hiquiana loves how being involved in these events helps him improve his own physics understanding. "It gives me an opportunity to try and explain something complex to someone that has no background in the field," he says.

The Gustavus Adolphus SPS chapter is dedicated to promoting environmental sustainability in the community. We highlight several demonstrations related to renewable energy and protecting the environment at the annual Discover the Outdoors event at Gustavus, which celebrates Earth Day and encourages people to get outside and enjoy the natural world.

Our chapter's commitment to sustainability is also visible in our regular activities and service projects. The physics department keeps compost bins in our building and tracks energy consumption to promote turning off lights outside of regular hours. Our SPS chapter cleans up a 2-mile section of a local highway twice each year. "Highway cleanup is a great community outreach event, because as we drive to and from St. Peter, we can see the positive impact we made on our community and environment," says physics major Kate McGregor.

Through everything we do—getting people excited about physics, educating the community about the importance of appreciating the Earth, and cleaning up our environment—our SPS chapter strives to make positive impacts on our community. In the process, we've discovered that we grow as stewards of our community and become better equipped to share the importance of science in our world. //



FAR LEFT: SPS members enjoy some sunshine while cleaning up along Highway 169.

ABOVE: SPS members demonstrate the energy generated by a bicycle as part of the Discover the Outdoors event.

LEFT: Physicists-in-training watch a bed-of-nails demonstration during an outreach event put on by the Gustavus SPS chapter. Photos courtesy of the Gustavus Adolphus College SPS chapter.

Outreach in the Arctic:

SPS'S NORTHERNMOST CHAPTER GOES TO EXTREMES

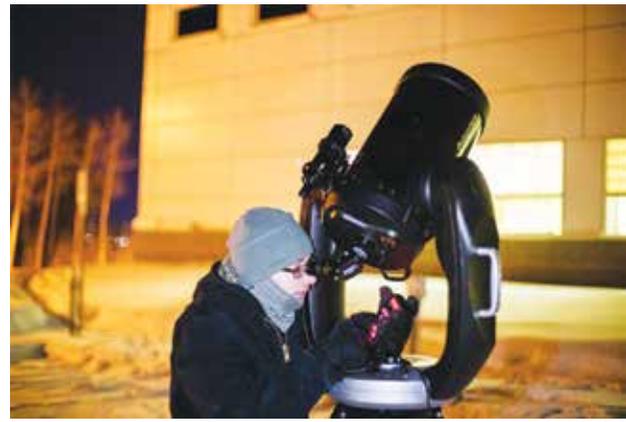
by Evans Callis, Cory McDonald, Austin Cohen, Alexander Gloger, Jacob Torres, Michael Martins, and Devon Gerstenfield, SPS Members of the University of Alaska Fairbanks

How do you hold an outdoor community engagement event at night in subzero temperatures? By providing free hot chocolate, of course! The University of Alaska Fairbanks (UAF) Society of Physics Students is the northernmost SPS chapter in the world. Located only 140 miles from the Arctic Circle, our chapter has had to develop some unique tricks to fulfill our mission of developing professionals and engaging the public via science outreach. While some of our activities are similar to those hosted by other chapters around the world, the extremes of our location require a different approach to conducting them. For example, in December and January, Fairbanks receives an average of only 4.5 hours of daylight each day, with an average high temperature of -17°C (1°F).

Still, we've found successful ways to engage our relatively small community of Fairbanks through public outreach events. Since UAF is strong in the field of space and auroral physics—and operates the only university-owned rocket range in the world (Poker Flat Research Range)—astronomy events are a natural fit. Foremost among these is our biannual astronomy and physics demo night, Astropalooza, when UAF SPS sets up telescopes and invites the public to come and view the Andromeda galaxy, the Pleiades star cluster, and other impressive astronomical objects. Originally started in 2015, Astropalooza has proven so popular with the public that it's now our headline event.

Our community engagement also includes annual participation in the UAF College of Natural Science and Mathematics Science Potpourri, a day of science outreach for the general public. At this event, we conduct physics demonstrations and public lectures for families and students so that they can see physics applied in a hands-on manner. Our chapter was also instrumental in the construction of the UAF Planet Walk, a scale model of the solar system on campus. This permanent installation (and its associated website) allows the Fairbanks community to experience the scale of the solar system firsthand while also learning about the science used to understand it.

UAF SPS has also recently become involved in science outreach to schools outside of our community. With the majority of Alaska having no road access to the rest of the state, opportunities to attend big science events are limited. Recently we were able to send chapter member Michael



Martins to Fort Yukon, a village of about 550 people who are mostly Gwich'in in Alaska Natives. Located north of the Arctic Circle, the village is accessible only

by air and river. Martins spent several days conducting science outreach for students ranging in age from kindergarten to grade 12. Further opportunities have arisen for similar work within other villages throughout Alaska, and we're eager to fill this need.

In addition to physics students, we welcome those with different majors and academic backgrounds to join us at our events. UAF SPS members come from all areas of academic expertise, including engineering, chemistry, and biology. Since physics has strong connections to many fields, finding a bridge between disciplines is never a problem for our members. Everyone is welcome to UAF SPS events—we're very proud of the diversity of our chapter! //

LEFT (TOP TO BOTTOM): UAF SPS treasurer Austin Cohen aligns a telescope on the Pleiades star cluster at Astropalooza 2 in February 2019. Photo courtesy of Tanya Clayton.

UAF SPS member Matthew Wilhelm demonstrates the deflection of charged particles in a magnetic field using a CRT monitor and a magnet at Astropalooza 2. Photo courtesy of Tanya Clayton.

UAF SPS in January 2019. From left to right: Adriana Camacho-Rodriguez, Austin Cohen, Evans Callis, Devon Gerstenfeld, Michael Martins, Chris Peters, and Jonathan Schratte. Photo courtesy of JR Ancheta.

UAF SPS president Evans Callis was featured on the front page of the UAF website following Astropalooza 2 in February 2019. Photo courtesy of the UAF SPS chapter.

Telling Stories and Communicating Science: ComSciCon-AIP 2019

by Abigail Ambrose, SPS National Council, Associate Zone Councilor, The College of Wooster

When I was about five years old, I wanted to write my own book about stars. Even as I read through all of the books in front of me, it still didn't feel like enough information. This is why I chose to go into astrophysics and why I'm now pursuing research in dark matter distribution.

This fall I had the opportunity to attend ComSciCon, hosted by the American Institute of Physics in College Park, Maryland. At this workshop, participants discussed communicating science both with people in science and with a broader audience. Among the programs, we heard research presentations and explored topics like how to effectively use Twitter as a platform for science communication.

One of the things that stuck with me the most was the keynote speech, delivered by David Helfand. As part of the talk, he presented two forms of a research presentation. For the first, he walked in completely disheveled, his hair and clothes a mess. Then he launched immediately into background but didn't define any of the jargon he used. He also couldn't figure out how to use the laser pointer and presented a confusing slide.

For the second presentation, he walked in looking more professional and calmly moved into the subject, explaining any jargon he had to use but trying to avoid as much jargon as possible. More importantly, he began his presentation with a story on the history of the research and why it was of interest. The speaker knew his later slides might be difficult to understand, but he engaged people right from the beginning. He wanted the audience to relate to the research on a personal level before he started talking about the math, and he knew that if he started the talk by saying a word the audience didn't even know, he would lose their attention within 10 seconds and likely never gain it back. This idea of being relatable remained a theme throughout the workshop. If you can make your research—or



ABOVE: Abigail Ambrose. Photo courtesy of SPS National Office.

even yourself—relatable, people will be more interested in the science.

Not long after this talk, I had the opportunity to give a pop talk. A pop talk is a quick, one-minute talk saying who you are and what you study, much like an elevator speech. The twist is that the audience members have two signs, one that says “awesome” and another that says “jargon.” The goal is to use no jargon when you give your talk, and the signs help you keep track. When I got up in front of everybody, I was incredibly nervous. We went in alphabetical order, so I had the misfortune—or opportunity, depending on how you look at it—of being the very first to speak. In the end, it was an amazing experience. I saw people in the room hold up an “awesome” sign for me many times, although I did get the “jargon” sign a few times too.

This experience has helped me talk about science confidently, regardless of who I'm talking to. I now have a better understanding of how to quickly explain my research and why it might be important to anyone, even though it's about concepts that many people have never even heard of before. I even gained the confidence to finally start the science Twitter account I had been thinking about since April. Telling my science story has become an incredible way for me to better understand my science and has helped people to see why it's important. //

SPECIAL FEATURE



New Event Breaks Chapter Boundaries at the 2019 Physics Congress

by Brittney Hauke, 2019 Physics Congress Planning Committee

When the 2019 Student Chapter Engagement Committee first started meeting during the summer of 2017, we were tasked to devise and debut a brand-new event that would focus on connecting chapters across the country. Our goal was to keep over 1000 students engaged by encouraging them to interact and share information in new ways. Two years later, this resulted in two giant banners, boxes of hangers, and dozens of boxes that contained literal pounds of marshmallows, hundreds of markers, and way too many folders for this first-ever Breaking Boundaries event.

The event was split into three different sections: the Chapter Showcase, a T-shirt design contest and exchange, and chapter banners. The T-shirt area included a display of chapter T-shirt designs where attendees could vote for their favorite and also exchange their extra shirts for ones from another chapter (hence the hangers). Two banners were set up on tables where students could mark what school they were from on a zone map, sign their name, and write a message, favorite physics equation, or draw a spherical animal. The largest and most demanding part was the Chapter Showcase—about 45 chapters from across the country had table space to share what made their chapter unique through demos,

posters, videos, T-shirts, games, pins, and much more. All attendees had bingo-style sheets with actions encouraging them to visit the different tables to learn about new outreach activities, strategies for running their own SPS chapter, talk to schools with PhD programs, and get to know SPS National.



ABOVE: Images from the 2019 Physics Congress. Photos courtesy of SPS National Council and office.

Elevator Encounters

by Peter Redl, PhD, Data Scientist, Google



ABOVE: Peter Redl. Photo courtesy of Peter Redl

Most days you will encounter someone you haven't met. You may even see a lot of the same people every day but never talk to them. If so, you could be missing out not only on some interesting characters and fun stories, but also on people who might help you progress your career.

How do you go from complete strangers to professional contacts? Most people are eager to help, but they can't help you if they don't know you. The easiest way to break the ice is with an elevator pitch—a short introduction that conveys enough information about you for the other person to quickly determine how you fit into their network.

I recently had a chance encounter on a train ride. As I settled in for a long ride, I was hoping that the train would be relatively empty and the seat next to me would remain open. That didn't happen, but I kept working, trying out a new version of the machine learning framework TensorFlow.

My neighbor noticed what I was doing and asked about my job. I gave my elevator pitch, explaining that I am a data scientist working on artificial intelligence problems. He listened and then gave me his elevator pitch. It turned out that he is also a data scientist, a little further along in his career. We exchanged contact information and went on to enjoy the rest of our train ride. In the movie *Fight Club*, Edward Norton's character calls the people he meets on flights "single-serving friends." But with LinkedIn and other networking tools, it's easy to stay connected to new contacts today.

I've had many chance encounters in my life. Some have progressed my career and others have led to new friends. Most of the time, I've at least gotten to hear an interesting story. I don't know what will come from this particular interaction, but if I take enough train rides, talk to enough people in coffee lines, and ride enough elevators, chances are that my life and career will be positively impacted. At minimum, I'll get to meet a lot of fascinating people and have some good stories to share. //

The room was buzzing with energy and conversation. One student I chatted with said he was so impacted in the first 30 seconds of walking into the exhibit hall that he wanted to run for president of his SPS chapter. My undergraduate research advisor, Steve Feller, stopped me about halfway through the event and said he was very impressed by how everyone was interacting with each other. But by far the most meaningful part of the experience for me was handing the mic over to the SPS chapter from The University of Puerto Rico – Mayagüez so they could share their cultural dance with us. Laughing and dancing with other physics students in a spontaneous conga line is a memory I don't think I or other attendees will forget anytime soon.

Thank you to all of the chapters and volunteers who made this Breaking Boundaries event such a success! We hope that it will inspire future zone meeting hosts to consider including a similar event in their program. //

AN ELEVATOR SPEECH ON THE ELEVATOR SPEECH, FROM THE CAREERS TOOLBOX

An elevator speech is the 30-second version of who you are professionally, what you've accomplished, and where you hope to go in the future. Think of the elevator speech as a short conversation with a purpose—to open the door to a conversation with a new connection.

You should practice your elevator speech several times so that you can easily recall the highlights when an opportunity arises; however, you do not want to sound too rehearsed.

Let's say that you are standing in line for coffee at a meeting, and you notice a Nobel laureate standing next to you. What do you do? Take a selfie? Maybe, but definitely give your elevator speech!

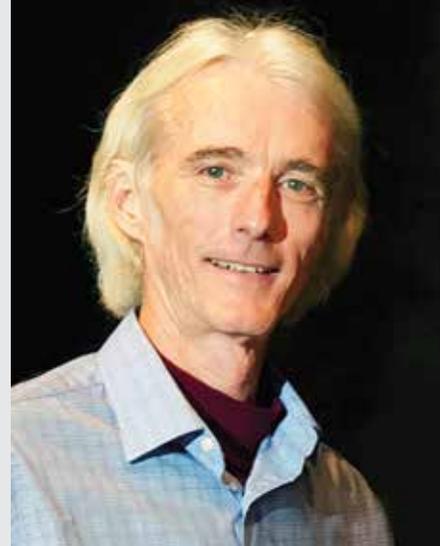
Your elevator speech must explain:

- Who you are
- What you've accomplished
- Where you hope to go
- What you are passionate about

For more, visit the Career Toolbox at spsnational.org/sites/all/careerstoobox/.



The Trip of a Lifetime



by Kendra Redmond, Editor

“I was given a bundle of unopened mail from the SPS National Office and told, ‘If you want to be the SPS advisor here, the job is yours,’” recalls Dwight E. (a.k.a Ed) Neuenschwander, the physics department chair at Southern Nazarene University (SNU) in Oklahoma. The year was 1987, and Neuenschwander was SNU’s newest physics professor. He’s been receiving the SPS mail ever since, with the exception of a two-year leave of absence in the mid-1990s to manage the education division of the American Institute of Physics and SPS.

Like many great stories, Neuenschwander’s SPS advisor tale starts with a road trip. In the fall of ’87, Kansas State University was hosting a zone meeting, so Neuenschwander and several physics students piled into a van and drove 300 miles each way for their first SPS outing. On the long ride home they discussed the research talks given by undergraduates from other schools. When he heard the students say, “We can do that!” Neuenschwander was thrilled. “To cut a long story short, after attending two more zone meetings as spectators, we were giving talks of our own,” he says.

Trips are a key part of the SPS experience at SNU—trips to meetings and conferences, trips to local schools to lead outreach events, and trips to interesting scientific sites. “In the past 15 years or so we have taken field trips to NASA in Houston, twice to Fermilab and Chicago museums, and every other year to New Mexico to visit the Very Large Array, Trinity Site, the Atomic Energy Museum, Los Alamos, and other sights in New Mexico’s interesting landscape,” Neuenschwander says.

The excursions are good professional development opportunities for students, but the van rides are just as important. “That is where we get to know each other as people, talk about life, share our stories and experiences. Those experiences build personal relationships,” Neuenschwander says. “Such relationships are the glue that holds any community together.”

While advising students at SNU, Neuenschwander has supported, challenged, and encouraged thousands of SPS students and alumni at other institutions during his 25 years of service on the SPS National Council, as the editor of SPS publications for many years, and as author of more than 150 articles in the *SPS Observer* and *Radiations* magazines, including the “Elegant Connections in Physics” column. His thought-provoking articles tackle the relations between physics concepts, research results, science history, maintaining mental health amid the stress of studying physics, ethics, and social responsibility.

At the 2016 Physics Congress, Neuenschwander was honored with Sigma Pi Sigma’s Worth Seagondollar Service Award in recognition of his exemplary commitment and service to SPS and Sigma Pi Sigma.

SPS belongs to the students, according to Neuenschwander, but the advisor provides the impulse that starts the ball rolling. “Every active chapter must have



TOP LEFT: During a road trip, SNU student Heather (far left) pretends to have the rest of the gang under arrest on the mesa near Los Alamos as Neuenschwander (second from right) talks with Los Alamos National Lab physicist Leaf Turner.

TOP RIGHT: Dwight E. Neuenschwander.

ABOVE: SNU physics students on a guided tour of the telescope garage at the Very Large Array in New Mexico. In this photo they are inside one of the antenna dishes, some 60ft above the ground. Photos courtesy of Dwight Neuenschwander.

a nucleus of two or three enthused students who are willing to work,” he says. “[Then] others will come along.”

To new advisors, he shares insight from his 30 years of experience. “The three most important things you can do are (1) attend meetings, (2) attend meetings, and (3) attend meetings. And let the students know you as a person.”

A lot has changed in the last three decades. Most SPS advisor mail comes by email now. University insurance regulations make traveling with students more challenging. Many undergraduates can’t afford to take time off from work for conferences. But Neuenschwander isn’t ready to relinquish his SPS chapter advisor role. “I see the education of the undergraduate physicist as an arch with two sides,” he says, explaining that one side is coursework and the other is extracurricular professional development. “SPS is the perfect entrée into the wider physics community,” he says. A physics degree may be the destination, but the real growth happens in the van on the way there. //

A Zone Meeting for the Record Books

by Noura Ibrahim, SPS Member, Embry-Riddle Arizona University (ERAU)

When the Embry-Riddle Aeronautical University's Arizona campus, located in Prescott, was asked to host the 2019 SPS Zone 16 meeting, we had just 17 days to pull it all together. Our campus hadn't hosted a zone meeting in over 10 years, so we were excited to tackle the challenge.

Since the meeting was scheduled to occur just one day before the American Physical Society's annual Four Corners Section (4CS) meeting, it made perfect sense to have the two meetings back-to-back. Fortunately, most of the 4CS attendees had travel plans that allowed them to be in Arizona a day early. We reserved the Jim and Linda Lee Planetarium for a private show and used this as the key event around which we planned all other activities. Luckily, the planetarium resides in the STEM Education Center, which is both the newest building on campus and the most impressive.

As some of our students are trained to give tours of the building's most interesting labs, we made this our opening activity and were able to quickly get people moving and mingling while simultaneously making them more comfortable with their surroundings. After the tour, we all went to the planetarium for a private showing of the awe-inspiring exhibit, *Space Next*. The planetarium was staffed by ERAU SPS officers, which made the experience more intimate and personal. The show lasted about 40 minutes, and by the time it was over everyone was ready for dinner. Italian food never tasted so good, especially after the tiring day we'd all had.

While we enjoyed dinner, we listened to four student talks. The presenters were selected by the SPS officer board based on excellence in their fields and the way they exemplify ERAU's diverse scientific research interests. The first three talks covered electric propulsion, gravitational waves, and sterile neutrino detection efforts.

The last presentation was all about outreach, which served as an appropriate transition into the activities that followed. Meeting participants had the option of either going to see some demonstrations, attending a stargazing event, or doing both. The majority decided on both, so we first went as a group to one of the physics labs for some fun demos. We got to see the 2019 Science Outreach Catalyst Kit (SOCK) in action, which was a first for a lot of us. A craters demo made a fun mess in the lab, and we also showed off some of our more classic demonstrations. It was really interesting to share our outreach experiences with SPS members from other chapters, especially those in departments much larger than ours.

Lastly, we walked outside to the parking lots, where some of our members had set up telescopes directed at the moon and Jupiter. The weather was far too cold, but seeing the lunar terminator and the Galilean satellites made it worthwhile.

This event was a unique experience for our chapter, made possible by the extraordinary efforts of those who participated and volunteered. Also, a special thanks to the ZC, Dr. Leandra Goldflam, and the AZC, Autumn Durham, whose advertising resulted in high meeting attendance. Putting together this event was a rewarding way to spend fall break, and it was well worth the stress and effort that went into making it happen. As we walked from activity to activity, we heard praise from our guests for our facilities and activities, so we can confidently say that the 2019 Zone 16 Meeting was a success, executed in a record time frame of 17 days! //



TOP: Ashley Elliott demonstrating static electricity using a gold leaf electroscope. Photo credit: Noura Ibrahim.

CENTER: Thumbs up for science at the Jim and Linda Lee Planetarium. Photo credit: John Norton.

ABOVE: A research presentation about finding sterile neutrinos by Ashley Elliott and Jonah Greenwood. Photo credit: Noura Ibrahim.

SPS OUTSTANDING SERVICE AWARD

SPS awards faculty and students who exemplify an attitude of service to the discipline of physics and astronomy through actions at the local, national, or international level.

Do you know an SPS or Sigma Pi Sigma member that has had a positive impact on an SPS chapter, a department, or the broader community?

Nominate a member today!

www.spsnational.org/awards/service

Applications are accepted on a rolling basis.



ΣΠΣ OUTSTANDING SERVICE AWARDS

ΣΠΣ is looking to award individuals who have performed meritorious service to the field of physics, to Sigma Pi Sigma, or your department.

Awards can be bestowed by individual chapters.

Nominate someone today!

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Recipients receive national recognition and certificate.