

# the SPS Observer

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WINTER 2021

## The Many Facets of SPS

- + Physics in the Time of Corona
- + Creative Tools for Connecting and Supporting SPS Members
- + Building Bridges through Chapter Leadership Training
- + Creating Virtual Spaces for Chapters: SPS Virtual Colloquium Series
- + Creating Opportunities for Growth



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**ON THE COVER**

University of San Diego SPS chapter members hike in the Laguna Mountains outside of San Diego. Photo courtesy of the chapter's 2019-20 chapter report.



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- American Physical Society
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- AVS: Science & Technology of Materials, Interfaces, and Processing
- The Optical Society
- The Society of Rheology

**Other Member Organizations:**

- Sigma Pi Sigma physics honor society
- Society of Physics Students
- Corporate Associates

# Involvement Leads to Networking

by Kourtney Adkisson, Associate Zone Councilor Representative, SPS Executive Committee, Central Washington University

**P**ersonal support networks adapt with the seasons of life. In high school I was passionate about music and running, leading to my participation in band, cross country, and track and field. These activities led to my first real networking opportunities. I discovered incidentally that my cross country coach not only shared my passion for running but also taught our AP physics course. My parents were always telling me that I should take a physics class since I loved mathematics (a trait that seems to be rare, though maybe not as rare to physicists). I figured that with a great teacher and support from my family, I might as well try.

That same year, our physics class was visited by a physics recruitment officer from our local college, and we were made aware that the SPS chapter there needed volunteers for its annual “Savvy Science Spectacle,” affectionately known as  $S^3$ . I jumped at the opportunity, unaware of the community that I would gain from such a lighthearted decision. During the event, I got to shoot off a ping-pong ball cannon (after proper safety training) that crushed aluminum cans like they were made of paper. There were more intriguing demonstrations, including a Van de Graaff machine, and another showing angular momentum while spinning. Participating in these demonstrations also taught me how to describe physics phenomena to others of a young age.

By taking the opportunity given to me in high school, I wound up in the physics department at Central Washington University (CWU). After my first year, I got involved in CWU SPS. I started small, serving as the representative to our school senate, a twice-a-month obligation that opened my eyes to all the opportunities—and funding—available to our club. During those first years, I was involved in many more demonstration nights for the community, and I heard about other club members’

experiences at national conferences and on local trips. My third year in SPS, I was elected local president, which enabled me to organize field trips to places like LIGO Hanford and the Museum of Flight in Seattle. My momentum and excitement built, but there was still something missing. With membership in our local club came membership in SPS National, but I didn’t really know what that meant. I soon found out more.

I was coming off of a busy year, having just completed our electromagnetic theory courses, the differential equation series, and quantum mechanics, all while working three jobs. Let’s face it, being a physics major is hard. However, that same physics recruitment officer from high school, Deanna Marshall, encouraged me to run for the position of the complementing associate zone councilor (AZC) to her zone councilor (ZC) in the upcoming SPS National Council election. The AZC supports all the chapter officers within a zone and connects them with resources from the National Office, and the ZC supports the chapter advisors. How could I say no?

Since then, each year I’ve read chapter reports, met new people, improved my elevator speech, helped rejuvenate inactive chapters, presented at national conferences such as the 2019 Physics Congress, and more than anything, built and maintained a network of individuals who have supported me in my pursuits. Even after completing my undergraduate work, I have the opportunity to influence other undergrads in the same way that others helped me. Not to mention, my network helps me stay involved in the physics community.

I encourage anyone who is looking for both friendships and professional connections to search for ways to become involved, even in a small fashion. This issue of the SPS Observer highlights some of the great work done by the SPS community over the last year. I invite you to check out the efforts described here and find



**ABOVE:** Kourtney Adkisson. Photo courtesy of SPS National.

some tips or inspiration to propel your chapter’s endeavors.

The network you build throughout your academic and professional life will become the base from which you move forward. Meeting your local chapter president or your AZC are two great ways to get started. //

Are you interested in representing the SPS students and chapters in your zone at a national level? Run for the National Council this spring! Learn more at [spsnational.org/nominate](https://spsnational.org/nominate).

**NOMINATIONS ARE DUE MARCH 15.**

# Outstanding Chapter Advisor and Outstanding Chapter Awards

## 2019–2020 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 themselves, their chapter, and their department. The winner will be officially recognized at the Winter 2021 AAPT Meeting. Learn more at [spsnational.org/awards/outstanding-chapter-advisor](https://spsnational.org/awards/outstanding-chapter-advisor).

### Winner:

**Robert McTaggart**

*South Dakota State University*

### Runner-up:

**Ronald Kumon**

*Kettering University*

### Nominees:

**Kristopher Bunker**

*University of Colorado Denver*

**Alyssa Hamre**

*Bethel University*

**Bjorg Larson**

*Drew University*

**David Newman**

*University of Alaska Fairbanks*

**Adele Poynor**

*Allegheny College*

**Erick Roura**

*University of Puerto Rico,  
Mayagüez*

**Peter Sheldon**

*Randolph College*

**Jency Sundararajan**

*Missouri Southern State  
University*

**Cecilia Vogel**

*Augustana College*

## 2019–2020 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 the 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](https://spsnational.org/about/governance/sps-information-handbook).

### Outstanding Chapters

#### Zone 1

Mount Holyoke College (MA)  
Suffolk University (MA)  
Yale University (CT)

#### Zone 2

Adelphi University (NY)  
City College of New York  
CUNY (NY)  
Ithaca College (NY)  
Manhattan College (NY)  
Siena College (NY)  
St. John's University (NY)  
Stony Brook University (NY)  
University of Rochester (NY)

#### Zone 3

The College of New Jersey (NJ)  
Juniata College (PA)  
Lycoming College (PA)  
New Jersey Institute of Technology (NJ)  
Rowan University (NJ)  
Rutgers University, New Brunswick (NJ)  
Saint Joseph's University (PA)  
University of the Sciences (PA)

#### Zone 4

The College of William & Mary (VA)  
The George Washington University (DC)  
Randolph College (VA)  
University of Maryland, College Park (MD)  
University of Mary Washington (VA)  
University of Virginia (VA)  
Virginia Tech (VA)

#### Zone 5

Appalachian State University (NC)  
Furman University (SC)  
High Point University (NC)  
University of North Carolina at Asheville (NC)  
The University of North Carolina at Chapel Hill (NC)

#### Zone 6

Emory University (GA)  
Florida International University (FL)  
Georgia Institute of Technology (GA)  
New College of Florida (FL)  
University of Central Florida (FL)  
University of Florida (FL)  
University of Puerto Rico, Mayagüez (PR)  
University of West Florida (FL)

#### Zone 7

Allegheny College (PA)  
Cleveland State University (OH)  
The College of Wooster (OH)  
Grove City College (PA)  
Kettering University A (MI)  
Kettering University B (MI)  
Marshall University (WV)  
Wayne State University (MI)

#### Zone 8

University of Kentucky (KY)  
University of Louisville (KY)  
University of Tennessee - Knoxville (TN)

#### Zone 9

Augustana College (IL)  
Ball State University (IN)  
Carthage College (WI)  
University of Wisconsin-River Falls (WI)  
Wheaton College (IL)

#### Zone 10

Dillard University (LA)  
Henderson State University (AR)  
Hendrix College (AR)  
Rhodes College (TN)

#### Zone 11

Coe College (IA)  
Luther College (IA)  
South Dakota School of Mines & Technology (SD)  
South Dakota State University (SD)  
University of Northern Iowa (IA)

#### Zone 12

Missouri Southern State University (MO)  
Truman State University (MO)  
Washington University in St. Louis (MO)

#### Zone 13

Abilene Christian University (TX)  
Southern Methodist University (TX)  
Texas A&M University (TX)  
Texas Lutheran University (TX)  
Texas Tech University (TX)  
The University of Texas at Dallas (TX)  
The University of Texas at San Antonio (TX)

#### Zone 14

Colorado School of Mines (CO)  
United States Air Force Academy (CO)  
University of Colorado Denver (CO)

#### Zone 15

University of Utah (UT)

#### Zone 16

Embry-Riddle Aeronautical University - Prescott (AZ)  
The University of New Mexico (NM)

#### Zone 17

University of Alaska Fairbanks (AK)  
University of Oregon (OR)  
Washington State University (WA)

#### Zone 18

California State University, Chico (CA)  
California State University San Marcos (CA)  
Sun Yat-sen University (China)  
Pomona College (CA)  
Sacramento State University (CA)  
Santa Clara University (CA)  
University of California, Berkeley (CA)  
University of California, Merced (CA)  
University of Hawaii at Manoa (HI)  
University of Nevada, Reno (NV)  
University of San Diego (CA)

## Distinguished Chapters

### Zone 1

Harvard University (MA)  
 Massachusetts College of Liberal Arts (MA)  
 Massachusetts Institute of Technology (MA)  
 Smith College (MA)  
 University of Maine (ME)

### Zone 2

Syracuse University (NY)  
 Roberts Wesleyan College (NY)  
 New York University (NY)

### Zone 3

Ramapo College of New Jersey (NJ)  
 Seton Hall University (NJ)  
 Stevens Institute of Technology (NJ)  
 Messiah College (PA)  
 Moravian College (PA)  
 Stockton University (NJ)  
 Drew University (NJ)  
 Drexel University (PA)  
 Bryn Mawr College (PA)  
 The Pennsylvania State University (PA)  
 Haverford College (PA)

### Zone 4

Towson University (MD)  
 The Johns Hopkins University (MD)  
 Old Dominion University (VA)  
 Georgetown University (DC)

Northern Virginia Community College (VA)

### Zone 6

Florida State University (FL)  
 University of Tampa (FL)  
 University of South Florida (FL)  
 Florida A&M University (FL)  
 Agnes Scott College (GA)  
 Georgia Southern University (GA)  
 University of North Alabama (AL)

### Zone 7

University of Dayton (OH)  
 Lawrence Technological University (MI)  
 Kenyon College (OH)  
 John Carroll University (OH)  
 Grand Valley State University (MI)  
 West Virginia University (WV)  
 Miami University (OH)  
 Duquesne University (PA)  
 University of Pittsburgh (PA)  
 Youngstown State University (OH)

### Zone 8

Austin Peay State University (TN)  
 University of Illinois at Urbana-Champaign (IL)

### Zone 9

University of Wisconsin-La Crosse (WI)  
 DePaul University (IL)

### Zone 10

University of Southern Mississippi (MS)  
 University of Mississippi (MS)

### Zone 11

Creighton University (NE)  
 Minnesota State University (MN)  
 University of Minnesota (MN)  
 Augustana University (SD)  
 Bethel University (MN)

### Zone 12

William Jewell College (MO)  
 Southwestern Oklahoma State University (OK)

### Zone 13

McMurry University (TX)  
 Stephen F. Austin State University (TX)  
 Texas A&M University-Commerce (TX)  
 Trinity University (TX)  
 University of Dallas (TX)  
 University of Texas Rio Grande Valley-West (TX)  
 University of Texas Rio Grande Valley-East (TX)

### Zone 14

University of Denver (CO)  
 Metropolitan State University of Denver (CO)

### Zone 15

Westminster College (UT)  
 Idaho State University (ID)

### Zone 16

Arizona State University (AZ)  
 Universidad Autonoma de Ciudad Juarez (Mexico)

### Zone 17

University of Washington-Bothell (WA)  
 Central Washington University (WA)

### Zone 18

Point Loma Nazarene University (CA)  
 California State University, Northridge (CA)  
 California State University, Long Beach (CA)

## Notable Chapters

### Zone 1

Boston University (MA)  
 Brown University (RI)  
 Fairfield University (CT)  
 Saint Anselm College (NH)  
 Saint Michael's College (VT)

### Zone 2

Hamilton College (NY)  
 Buffalo State College (NY)

### Zone 3

Saint Peter's University (NJ)  
 Temple University (PA)

### Zone 4

James Madison University (VA)  
 Howard Community College (MD)  
 Salisbury University (MD)  
 Longwood University (VA)  
 Randolph-Macon College (VA)

Goucher College (MD)  
 Radford University (VA)

### Zone 5

North Carolina State University (NC)  
 Wake Forest University (NC)

### Zone 6

Troy University (AL)  
 Tuskegee University (AL)

### Zone 8

University of Evansville (IN)  
 East Tennessee State University (TN)  
 Western Illinois University (IL)  
 Murray State University (KY)  
 Vanderbilt University (TN)

### Zone 9

University of Wisconsin-Eau Claire (WI)

### Zone 10

Louisiana Tech University (LA)  
 Louisiana State University (LA)  
 University of Central Arkansas (AK)  
 Christian Brothers University (TN)

### Zone 11

University of Nebraska-Lincoln (NE)  
 Simpson College (IA)  
 Nebraska Wesleyan University (NE)

### Zone 12

University of Tulsa (OK)  
 Oklahoma State University (OK)

### Zone 13

Baylor University (TX)  
 Tarleton State University (TX)  
 University of Houston-Clear Lake (TX)

### Zone 14

Fort Lewis College (CO)  
 Colorado Mesa University (CO)

### Zone 17

Oregon State University (OR)  
 Highline College (WA)

### Zone 18

California Lutheran University (CA)  
 University of La Verne (CA)  
 Hartnell College (CA)  
 California State Polytechnic University-Pomona (CA)



# Meet the 2020 SPS Outstanding Chapter Advisor: Dr. Robert McTaggart

by Kendra Redmond, Editor

The SPS Outstanding Chapter Advisor Award is the most prestigious award given by SPS, bestowed annually on the basis of the leadership, student leadership development, support, and encouragement the advisor has provided to their chapter. For his leadership and guidance of the SPS chapter at South Dakota State University, Dr. Robert Taggart is the 2019–20 SPS Outstanding Chapter Advisor.

**As an undergrad at West Virginia University, Robert McTaggart spent time working in Professor Mark Koepke's plasma physics lab. McTaggart looks back with fondness. "I appreciated the comradery there. Pizza on Fridays was always the best. It sounds simple, but sometimes just being included matters."**

Being included matters a *lot*, as McTaggart's students at South Dakota State University (SDSU) attest. In a letter nominating McTaggart for the Outstanding Advisor Award, one student noted, "Dr. McTaggart always encouraged us to participate in all physics, astronomy, and nuclear-science-related activities on and off campus during our freshman year. As a result, almost all of the students in our freshman physics seminar class joined the SPS club."

Under McTaggart's leadership, SPS has become one of the most active and visible student groups at SDSU. Among other recent accomplishments, in 2018 the chapter hosted a Zone 11 meeting for the first time in 25 years, with great success. The chapter has grown increasingly active in SPS nationally and is currently studying lithium-ion battery technology under a 2019–20 SPS Chapter Research Award. Planning is already underway to get students from South Dakota to Washington, DC, for the 2022 Sigma Pi Sigma Physics Congress—no easy feat for a chapter without a history of fundraising.

McTaggart has an open-door policy that's reflected in the SPS chapter. "[SPS provides] a welcoming place where you do not have to apologize for being who you are, and others understand the issues you are dealing with," McTaggart says. He doesn't say that from a safe distance—he's been on the road trips. "You learn a lot about your students when you travel with them to a regional SPS meeting. That is always worth it, and we laugh a lot."

After graduating from West Virginia University, McTaggart earned a PhD in particle physics at Penn State. He jumped into teaching even before graduating, filling an emergency opening while completing his thesis. From there he took a lecture position, then a visiting assistant professorship, and then a tenure-track position at SDSU. "I have tended to go where physics has taken me," he explains.

In addition to teaching and mentoring, McTaggart is coordinator of nuclear education at SDSU, overseeing a minor in nuclear engineering. He studies the irradiation of materials and devices and is working on the simulation of a space-based neutrino detector. McTaggart also oversees several undergraduates working on health physics and medical physics research projects.

When he's not doing physics, you're likely to find McTaggart cheering on the SDSU wrestling team or working in his prairie garden. He enjoys the communal aspect of wrestling, the excitement and school spirit it promotes, and aims to foster that spirit within the SPS chapter. Gardening offers a way to experience the natural world and absorb what it has to offer. In some ways, McTaggart's approach to working with students is similar to the way he approaches a new prairie plant. "Put it in a nice spot, where it gets some sun, some rain, and it just takes off." //



**ABOVE:** McTaggart prepares for class. Photo courtesy of South Dakota State University.

## "OUTSTANDING" ADVICE

To students, McTaggart says, "There are so many leadership opportunities available in SPS to develop a really strong and unique resume. If the title of a desired job includes 'engineering,' you should definitely apply to it as a physics major who has shown leadership in SPS."

To advisors, "The chapter report is an undervalued asset. It is a great opportunity to communicate all of the good things the chapter has done to the department head, dean, and the administration, if not the public."



# Physics in the Time of Corona

by Alexander Mikulich, SPS Member, Colorado School of Mines

**T**he first thing we're told as freshmen physics majors at the Colorado School of Mines is that physics is a team sport. Initially, though, this didn't seem as apparent as it does now. The heavy mathematical focus in our chosen major usually helped us breeze through the introductory classes, but as sophomore year rolled around, we found ourselves spending late nights in our campus's physics building. Collaboration became almost essential to our success, and the campus had the perfect place for it: the physics lounge.

The lounge consisted of a computer lab, sink, refrigerator, microwave, and plenty of couches—everything we needed to foster a community. Some of us would spend the whole day there, and many of our professors took notice. One devoted some of her lecture time to emphasizing the importance of sleep on mental health. Another secured \$500 a month to provide food, and knowing that many of our students can become too busy to eat regular meals, we filled the cupboards with enough healthy snacks to keep them going. We also made sure that there were textbooks on the

shelf related to the physics curriculum, as well as computer science and GRE prep.

As our classes expanded and the club welcomed new members, we made some changes to become more inclusive as a group. We amended the bylaws to include they/them pronouns, collaborated with our local Society of Women in Physics chapter to host talks about imposter syndrome, and expanded our advertising to nonphysics buildings in an attempt to recruit students from other majors. Our chapter was also active in the community, hosting weekly meetings with various guest speakers who talked about their research. We were fostering a community like never before.

Then COVID-19 hit campus. As students tested positive, classes moved online and our community drifted apart. Most of us only saw each other in our Zoom classes, and the weekly SPS meetings went on a hiatus. Over the summer, the new vice president of outreach engaged with youth centers, and we organized weekly physics demonstrations.

As the fall semester began, SPS meetings resumed, and we tried to shift our focus to raising awareness for research opportunities.

We brought on our university's research advisor to give a presentation about how to get campus funding for projects and how to join other teams as researchers. Our vice president of outreach was one of the 2020 SPS interns and invited the head of the SPS intern program to give a talk about the opportunities they offer to undergraduates. We also tried to focus on mental health and morale, setting up Kahoot sessions for our weekly meetings. Some nights we even hosted movie-viewing parties and games over Discord. This was the only time many of our students saw each other, so we did what we could to keep spirits up.

SPS still thrives in our community, and we're doing our best with what we have. We look forward to an even stronger bond between our physicists when this is over. It has taken the combined efforts of everyone—undergraduates, graduate students, and professors—to bring us together. The past few years have brought more inclusion and diversity of thought into our club, and we know that this will grow and develop as time goes on to better foster our sense of community as a chapter. //

**TOP LEFT:** SPS chapter president Josh Lewis demonstrates pressure by laying on a bed of nails while a cinder block is crushed on his chest using a sledgehammer. All photos courtesy of Colorado School of Mines SPS.

**TOP MIDDLE:** SPS volunteer Ashley Howard conducts a thermal physics demo using pressure differentials to crush a can.

**TOP RIGHT:** SPS chapter outreach coordinator Austin Holmes conducts an optics demo at a local youth center.



# Nerf Wars:

## An Untraditional Approach to Physics Outreach

by Samantha Garza, SPS Chapter President, University of Dallas

**O**ne stereotype of students who study physics, and dare I say major in it, is that they spend much of their time in dark or quiet places—like basement labs. At the University of Dallas (UD), the stereotype is somewhat true since our department is in the lower level of our science building, or “the dungeon” as many have called it. As a result, our UD SPS chapter has made it a mission to change the community’s perception of physics and its members through friendly matches of Nerf Wars.

At least once a semester we hold an epic battle where we invite anyone on campus to join in on the festivities. Once we have a sufficient number of participants for the night, we break into two teams (red and blue), allow members to pick a Nerf gun from among our 20 small blasters, and begin a number of tactical games.

In our most common game, each group takes over a main stairwell and waits. At the appropriate time, the teams are released into the basement and begin exploring the battlefield. For these special occasions, club members and volunteers help to transform the entire lower level of the science building into a quasi-obstacle course full of overturned chairs and tables, used as makeshift forts, and dark rooms that can hide an entire scout squadron. Despite the twists and turns of the building, it isn’t long until members of opposite teams find each other, shooting commences, and the last team standing is declared the winner.

Another popular game is “Capture the Flag,” where several items from the student lounge are hidden throughout the obstacle course, such as gourds from our fall decorations. After the items have been hidden, members of each team must find and bring back as many items as they can before getting shot by their opponents. In another game, we hide the guns and ammunition, and students must find them in order to wipe out the other players and claim victory.

We have found that these battles are a great way to get non-science majors and freshmen to meet the members of the physics department and get acquainted with the science building in a unique way. Each year students get more enthusiastic about the games, from inviting more friends, to dressing in all black to blend in with the room, to bringing their own Nerf guns to battles. Although Nerf Wars aren’t a traditional form of physics outreach, these events always get people interested in our department and the small community that we are building in “the dungeon.” //



**LEFT:** Members of the University of Dallas SPS chapter hiding behind an obstacle made of an overturned table and chair. Photo by Tessa Rosenberger.

**TOP:** Two UD students prepare for battle. Photo by Gianna Milton.

**ABOVE:** Nerf War participants gather in the physics lounge to prepare for the next game. Photo by Reagan Miller.





# Creative Tools for Connecting and Supporting SPS Members

by Robert Chambers, SPS Chapter Public Relations Officer, Texas Tech University

**W**e call it the *Quark*. Each edition of our monthly, student-run newsletter contains at least four articles.

Two of them focus on science conducted in the world at large—recent discoveries, short reviews of interesting phenomena, op-eds, and the occasional lighthearted article. The other articles are interviews of professors and students in our physics department at Texas Tech.

Professor interviews highlight the scope of research our department conducts and help students connect with researchers in their intended concentration. Student interviews highlight the diversity of backgrounds in our department, demonstrate the research our undergraduates can conduct, and show newer students that it is entirely possible to study physics and have fun with it.

The *Quark* is also a form of advertising for chapter, departmental, and community events. Once we send it out to the department and the chapter, it is uploaded to the departmental web page and chapter website for anyone to read.

The Texas Tech Society of Physics Students chapter has used this unique method to share information since 2017. The *Quark* is run by a small committee under the purview of our

SPS public relations (PR) officer. This committee handles the chapter's public relations with the Texas Tech community, as well as our local community of Lubbock, Texas. Responsibilities include planning and executing outreach programs at local schools, organizing students to help with social events for the chapter and department, and, of course, producing and distributing the *Quark*.

The idea for the *Quark* came from SPS member Sadman Ahmed Shanto. During his time as PR officer, he wanted to increase the chapter's outreach to the Department of Physics and Astronomy. After some brainstorming, he came up with a novel idea: a monthly newsletter that would not only give the department faculty and students news about upcoming events but would also give members of the PR committee a chance to practice scientific writing and boost their resumes. Anyone can write for the *Quark*, and in the years since its inception we've had students who were initially interested in the writing experience later become fully active members of the chapter.

Our chapter had another idea in 2017: help graduating seniors pay for graduate school applications and admissions exams, fees that add up quickly. The chapter's fundraising

**ABOVE:** The Texas Tech SPS chapter on a trip to Cadillac Ranch in Amarillo, Texas. Photo by Alexandria Clark.

committee, headed by the treasurer, already planned events that raised money for chapter events and trips. The chapter leaders decided it was worthwhile to plan a few more fundraisers in order to subsidize the cost of GREs and application fees and reduce the financial stress on its members.

In practice, soon-to-be-graduating members would inform the chapter officers of their fees, and sums would be given directly to them based upon need. The plan has taken some time to develop and is not yet fully implemented, due to some changes in funding structure and the fact that the COVID-19 pandemic has halted all chapter fundraising efforts for now. However, the chapter treasurer is using this time to come up with fundraising events for future officers to utilize.

These committee efforts may be unusual among SPS chapters; however, we are dedicated to keeping our members engaged, up to date, and well equipped for a future in physics. The *Quark* and financial assistance program we've developed enable us to do just that. //

Check out the *Quark* at [depts.ttu.edu/phas/News\\_and\\_Events/Quark](https://depts.ttu.edu/phas/News_and_Events/Quark).



# Building Connections, One Facul-TEA at a Time

by Sarah Wellence, Maggie Hinkston, and Jesse Farr, SPS Members, University of Tennessee, Knoxville

**L**ow-key jazz, a selection of tea, pumpkin bread. Take all the elements of a cozy coffeehouse, add some physics students and professors, and you get Facul-TEA Time, our SPS chapter's answer to forming better connections within the Department of Physics and Astronomy at the University of Tennessee, Knoxville.

Before the fall of 2019, our chapter hosted events that involved coffee or lunch with professors, but we sensed that many of our peers weren't adequately benefitting from these formats. It seemed possible that nerves—along with the pressure to ask good questions—weren't helped by the addition of caffeine or the awkwardness of interacting over food.

Our executive board wondered if it would be better to conduct interviews with professors and staff and to expand topics beyond research and expertise to include who they are as people, what they do outside of school, and how they became the professors they are today.

As for the format, what could be more relaxing than tea? We offer a variety of blends, keep the music soft, and play a video of a fireplace on a nearby TV to create a calm and welcoming atmosphere.

We invite one faculty member to be interviewed by the SPS chapter president (or, occasionally, by another SPS member) once a month at a weekly meeting. The colloquial interview typically covers the faculty member's background and scientific interests, as well as personal facts about themselves. After we interviewed Dr. Soren Sorensen, who at the time taught honors introductory physics, the professor encouraged many of his students to attend, and we gained three new members.

The interviews always lead to moderated discussions, which bring forth advice from faculty members on a range of topics, including graduate school, the importance of public scientific understanding, and combatting imposter syndrome. This segment

of Facul-TEA Time, a substantial portion of the event, contributes considerably to connections between undergraduates and faculty. Students are alerted to positions for undergraduate research and teaching assistance and are introduced to professors with open-door/safe-space policies. The relaxed format helps to relieve students' initial stress and contributes to a sense of calm that makes it easier to ask questions. Despite most of the events lasting well over an hour and a half, attendance has steadily increased over time.

"I think Facul-TEA Time is an absolutely fantastic addition to our department culture," says Sean Lindsay, a research assistant professor and lecturer. "It . . . allows each group to see each other as people. The welcoming and open style of the meetings are a great way for our department to come together as a community."

Since COVID-19, Facul-TEA Time has been taking place virtually. We now gather with tea over Zoom, and the host shares music and fireplace clips on the screen. We were nervous to see how this would work, since the relaxed atmosphere came partly from sitting casually with the faculty member in our student lounge. But though they look different, our tea times run just as smoothly. In our last event of the fall semester, we learned that it's possible to study acoustics, work in industry, and then earn a doctorate in experimental nuclear physics. Oh, and also that watching paint dry is a real job!

Facul-TEA Time has given us the opportunity to expand our chapter, bolster a sense of community, and form important relationships. It has also helped students find passions within different branches of physics and research opportunities with participating professors, as well as learn about the various paths offered by a physics degree.

In the future, we'd like to have more SPS members moderate the event to practice leading discussions, a skill often overlooked at the undergraduate level. We'd also like to have similar events with graduate students and staff to encourage even more connections within the department. //



**LEFT:** Physics undergrad Hannah Garrett and Professor Miguel Madurga enjoy Facul-TEA Time. Photo by Sarah Wellence.

**ABOVE:** A Facul-TEA Time flyer. Image courtesy of the University of Tennessee, Knoxville, SPS chapter.





by Kayla Stephens, SPS Programs Manager

In early March the SPS National Staff learned we would be working remotely until further notice. Meanwhile, we were constantly receiving news of students having to leave campus due to school closings, as well as the cancellation of zone meetings and outreach events. As we adapted to the new environment ourselves, our primary focus was on how to continue to support our SPS community.

That following week, we hosted the first virtual colloquium with the interim director of the Statistical Research Center at AIP, Susan White. This was an opportunity to maintain the sense of community within SPS during the tumultuous early days of the pandemic.

With the support of SPS alumni, advisors, and friends, the colloquium series has continued throughout the year with topics such as global warming, internships, and the acoustics of ping-pong; an extravagant fire and demo show; and even a senior recognition ceremony! The series will continue into 2021. To view all previously recorded talks, visit our YouTube channel at [youtube.com/user/SPSNational](https://youtube.com/user/SPSNational).



Below are a few other ways students and faculty can stay connected to the SPS community virtually.

- Join the SPS Discord account. Check out channels on topics such as policy, careers, specific course help, physics memes, and more. Also, stay informed on opportunities with SPS, such as award deadlines, colloquium dates, and various resources. Join today at [discord.gg/8tUPsyR](https://discord.gg/8tUPsyR).
- Plan to attend your zone meeting this year. Zone meetings bring together SPS students within geographical zones. They are a fun and effective way for undergraduates to meet other students, present their research, and interact with practicing scientists. Zone meetings in 2020–21 will take place virtually. For more information and to find out when your zone meeting will be hosted, visit [spsnational.org/meetings/zone-meetings](https://spsnational.org/meetings/zone-meetings).
- Subscribe to the SPS newsletter. Each issue includes chapter and program-related announcements and deadlines, information about upcoming meetings, REU and internship opportunities, SPS featured jobs, and more. Make sure your SPS account has “opt-in” selected to receive correspondence from SPS National.
- Follow @SPSNational on Instagram, Twitter, and Facebook! Stay informed about upcoming opportunities and resources, and take part in social media competitions, trivia, and more!
- Review SPS’s Remote Learning Resources webpage. The SPS National Council and staff have gathered resources to help both students and professors adapt to remote learning. For more information, visit [spsnational.org/remote-learning](https://spsnational.org/remote-learning). //

**ABOVE:** The SPS National team marked Halloween with this virtually composed image. Photo courtesy of SPS National.

## Cultivating a Healthy SPS Chapter through Alpacas and Social Activities

by Cameron Lamar, SPS Chapter President, University of New Mexico

**LEFT:** UNM SPS members pose with friendly alpacas during a visit to Humming Desert Alpacas. Standing, from left to right: Alan Jiang, Eric Putney, and Dilys Ruan. Crouching, from left to right: Xena Gurule, Autumn Durham, Ivey Davis, Nic Litza, Christine Bennett, Jesus Aguilar, Sanjna Mahobia, and Andy Mueller. Photo courtesy of Cameron Lamar.

**W**hile physics engagement is one of the main objectives of any SPS chapter, it is crucial that members occasionally take time to step away from physics. At the University of New Mexico (UNM), our chapter regularly gathers for activities outside of physics. As much as we all love and enjoy the subject, we admit that it can be taxing. This practice of stepping away refreshes our members and serves as a great tool for team building.

A few of our recent activities include visits to a local alpaca farm (Humming Desert Alpacas) and an experiential learning center, a science center called Explora. When visiting places like these, we do not go with the intention of sharpening our physics knowledge or developing skills to help us with our studies.

We go to simply enjoy a new or stimulating experience and build friendships along the way. As busy as most physics students are, the experiences help to keep us happy and emotionally healthy. In addition, the friendships we build are invaluable.

During the pandemic it has proven more important than ever to use SPS as a means of social interaction, but getting members involved can be difficult. The UNM chapter has found great success by continuing to host a place for students to socialize via regular game and movie nights—our Discord server. Because of this, we have seen daily engagement from many members and had more people run for officer positions than ever before. Especially in this online setting, we have found that taking time to step away from physics together is beneficial for the health of the chapter and its members. //









**1.** One of the most popular SPS chapter events at the University of Hawai'i at Manoa is stargazing at Ka'ena Point, where the island of Oahu experiences the least amount of light pollution.

**2.** Members of the University of Puerto Rico, Mayagüez SPS chapter at PhysCon 2019.

**3.** Harvard University SPS students take a study break to enjoy delicious food, meet fellow physics students, chat, and bond over a reading of satirical scientific papers.

**4.** Towson University SPS members tour the Project Liberty Ship SS *John W. Brown* in Baltimore, MD.

**5.** The Cleveland State University SPS chapter uses T-shirts featuring their unique logo as prizes for many of its special events, including a Physics Olympics and Physics Jeopardy.

**6.** The Siena College SPS officers and advisor Dr. Michele McColgan at last year's physics and computer science formal. The balloon arch was assembled by several chapter members.

All photos courtesy of the chapters via their 2019–20 SPS chapter reports.





# The Future Is Green

by Iza Lazaneo, former SPS Chapter President, and Ian Reyes, former SPS Chapter Research Coordinator, Northern Virginia Community College

**A**s a small SPS chapter at Northern Virginia Community College, we try to do the most with what we have. In recent years, we have been able to create a makeshift makerspace with tools and technology that helped us carry out types of projects never before seen at our school.

Our SPS chapter chose to focus on sustainability, green energy, and science engagement for 2019–20. Some of the projects that we designed using our makerspace include a computer-monitored, self-sufficient greenhouse and a coffee machine that operates entirely on solar energy.

After researching greenhouse methods, we decided to use hydroponics—a type of horticulture without soil that uses mineral nutrient solutions and water. To monitor and control water levels, humidity, light, and other important metrics, we programmed an Arduino board to collect measurements, turn UV lights on and off as needed, and cycle water appropriately.

After we had the basic setup, we tested different plants and different nutrient compositions under our UV lights. We modified plastic containers so that water could flow evenly through them and then we planted seeds. Unfortunately, the plants had not had enough time to grow before campus was locked down due to COVID-19. At the end of the semester, SPS chapter members had planned to present the Greenhouse Project during George Mason University's STEM Fair, but due to the pandemic, this event was cancelled along with our own STEM fair at NVCC.

In the fall semester of 2020, our advisor gave the chapter a used solar panel. The source of the panel was unknown; however, we suspect that it was an older solar panel previously used to power lights on campus.

We tested the solar panel outside, and we were happy to find out that it still worked! We had previously bought a coffee machine at a thrift store because some members wanted to see how it worked. Once we had the solar panel, they took the coffeemaker apart to investigate how it could be used with the solar panel. We hope to use this device to generate engagement within our college and to generate funds for new and exciting SPS chapter projects. //



**TOP LEFT:** Students deconstruct a coffee machine. Photo by Iza Lazaneo.

**TOP RIGHT:** Greenhouse model designed using Inventor (CAD software). Photo by Ian Reyes.

**ABOVE:** Some of the materials used for building the greenhouse. Photo by Iza Lazaneo.





# Taking SPS Chapter Research Efforts to New Heights

by Brock Mason, SPS Chapter President, Southwestern Oklahoma State University

**T**he Physics Club (SPS) at Southwestern Oklahoma State University (SWOSU) is a small but very active student group. We don't have a large physics department, but our recruitment extends beyond physics majors, especially to the technology department. This allows us to combine our skills and do some amazing things.

In the fall of 2019, through support from the Oklahoma NASA Space Grant Consortium, we started a rocketry project with the goal of competing in the 2020 Argonia Cup, a national collegiate rocketry competition held in Argonia, Kansas. To compete, each team uses a high-powered rocket to fly a golf ball up to at least 8,000 feet and then deliver the ball as close as possible to a specified landmark near the launch site.

We've learned a lot about the construction and physics of rockets, as well as altimeters, accelerometers, and GPS trackers, using microcontrollers such as Arduinos and Raspberry Pis, and much more. Furthermore, we have collaborated with the biology department to see how fruit flies behave under high acceleration in an experiment we call Astroflies. Sadly, the Argonia Cup was cancelled in 2020, but we are preparing to compete in 2021.

To deliver our Argonia Cup golf ball, we decided to use a tiny onboard drone (quadcopter) carried inside the rocket. The challenge is to build a drone small enough to fit in the rocket but strong enough to carry the golf ball even under very windy conditions. This led to some interesting side projects regarding the physics, characteristics, and operation of drones.

Another ongoing project is the building of Dobsonian telescopes with parts collected from old, nonworking telescopes that had accumulated at the SWOSU Observatory. We are using these parts to make simpler, more efficient telescopes that are more easily transported. We started with small telescopes but are making increasingly larger ones. Our latest and largest project is a 16-inch Dobsonian telescope that uses a mirror donated to us 15 years ago. When finished, we will have a large portable "Dob" that we can take to remote public viewing sessions. Eventually we hope to donate some of our student-built telescopes to area high schools.

The Dobsonian telescope project led us to some opportunities for outreach. Monthly through 2019 we brought our telescopes to Roman Nose State Park. Park rangers guided visitors to a hilltop, and we held viewing sessions under the extremely dark western Oklahoma skies. We have also held observing sessions for the Boy Scouts and public viewing sessions at the SWOSU Observatory.

Other recent research projects include using microcontroller-operated seismometers to monitor the recent increase in earthquakes in Oklahoma and engaging in astrophotography and photometry, using our observatory to explore the universe from galaxies to supernovae.

These projects have enabled us to present posters at SPS zone meetings, SWOSU Research Day, and Oklahoma Research Day for the past few years. In the spring of 2020 (pre-COVID), we were asked to do a physics "magic" show in front of the crowd at the Oklahoma Research Day luncheon.

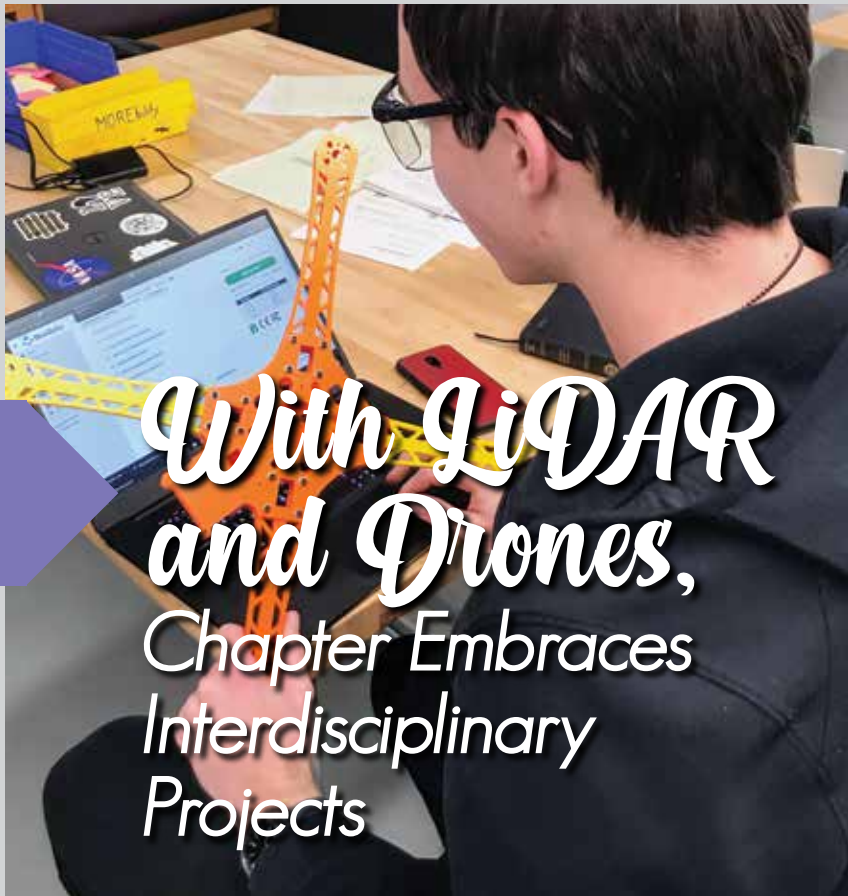
**TOP LEFT:** The SWOSU Physics Club's competition rocket blasts off.

**TOP RIGHT:** The SWOSU Physics Club. Top, L-R: Tayler Valdez, Riley Smith, Jeffrey Lewis, Raistiin Hiner, Brock Mason, and Dr. Wayne Trail. Bottom, L-R: Dr. Terry Goforth, Tabitha Taylor, Kaitlyn Schrick, Ryan Horn, and Emma Bollinger. Photos courtesy of the SWOSU Physics Club.

These research projects mean a lot to us as students. While they are great ways to make memories and be a part of something bigger than ourselves, they also enable us to expand our knowledge and skill sets beyond the classroom. The club benefits from its exposure to other schools, alumni, and the university community. This visibility brings in passionate new students who, in turn, create exciting new projects, and the cycle continues. Our project focus really benefits the whole department.

In addition to these projects, the Physics Club helps out each year with Physics Day, when we invite high schools to bring their physics students to campus to see demonstrations, admire our projects, and check out what we have to offer here at SWOSU. Each year we have talks, hands-on activities, and (sometimes wild) demonstrations for over a hundred western Oklahoma STEM students. We have even taken Physics Day to a few high schools.

Our club also hosts several social events each year, including movie nights, a Christmas party, and a Shish-Kebab Night every spring. We work hard, but we also like to play hard! //



# With LiDAR and Drones, Chapter Embraces Interdisciplinary Projects

by Rachel Barron, Ingenium LiDAR Project Manager and former SPS Chapter President, and Kyle Duke, Ingenium Coordinator and Drone Project Technology Manager, Wheaton College

**“How can we bring the physics and engineering departments together?” This was the question our SPS cabinet members had in mind as we pondered ways to build community, provide opportunities to gain hands-on skills in specialized areas, and further our chapter’s networking and career preparation objectives.**

One opportunity rose to the forefront immediately. A project-based engineering club, Ingenium, had gone dormant due to the overhead needed to run it. SPS decided to revive the club, so we combined our two cabinets and made it a goal to take on projects that connect physics and engineering students. These projects come as requests from other departments, so our members learn how to break down communication barriers between colleagues with different skill sets.

Each project has two faculty advisors: an engineering advisor and a faculty member from the department requesting the project. This way the project groups can learn the language of the requesting department but still be supported on the technical side. Additional departments may also be represented on a project as needed. Having such interdisciplinary teams has expanded our ideas and shaped our successes.

For a project requested by the archaeology department, for instance, Ingenium students are developing a ground-based LiDAR (light detection and ranging) system to provide continuity in archaeological data collection. A drone

project, requested by the math department, focuses on frame design, electronics, and integrating flight-pattern algorithms into our drone-control system (QGroundControl). Members are currently working on minimizing errors as the drone flies in a calculated path. Says Caleb Maue, an engineering student on the drone project, “Ingenium helps prepare students for future work, giving them an insight into how engineering projects operate.”

When our school transitioned to remote learning in the spring of 2020, we had to consider the impact this would have on Ingenium. The drone project required hands-on mechanical work, and although the LiDAR project had the potential to be completed remotely, other factors prevented us from being able to continue work during the spring semester. Thankfully, the fall semester brought us back to campus in person, allowing us to continue both projects. We implemented precautionary measures in accordance with Wheaton College’s COVID-19 policies, conducting socially distanced meetings, recording attendance for contact tracing, following reduced room capacities, and sanitizing equipment.

As we look forward to growing the club, we are encouraged by one member’s enthusiastic feedback. “Ingenium has been a great experience for me,” says physics student Curtis McLennan. “I have loved working with the people [involved] and having hands-on experiences. It is [an] opportunity that I think everybody should take advantage of.” //



**TOP LEFT:** Curtis McLennan, a member of the drone team, holds an assembled 3D-printed drone frame while looking at pricing for sonics sensors. Photo by Sarah Rutt.

**ABOVE:** The goal of the LiDAR project is to improve the accuracy and continuity of archeological data. This system includes three main components: a Velodyne rotating LiDAR sensor, an inertial measurement unit (IMU), and a Raspberry Pi. In this image, students are working from multiple computers to set up the internet for the Raspberry Pi and learning how to use a SLAM (simultaneous localization and mapping) algorithm in a COVID-safe environment. Photo by Trevor Gilkerson.



by Abbigail Fahrenkamp  
and Owen Johnson, SPS  
Members, and Dr. Erin Flater,  
SPS Advisor, Luther College

**W**e waited with bated breath, the work of the past 50 minutes laid out in front of us. Individual sections of the Rube Goldberg machine had been independently tested by their builders, but now was the moment of truth. Would the parts work together to form one glorious chain reaction?

A domino was felled, putting things in motion. The first section went off without a hitch and flawlessly triggered the second section, sending a Hot Wheels car racing down its track through the loop-de-loop before . . . totally missing the trigger for the third section, grinding the Rube Goldberg machine to a halt!

No one said a word as we looked at the setup with dismay. A moment later someone reached over and triggered the third stage, a precariously balanced PVC pipe and tripwire, starting the machine up again. Eventually, after two or three more snags, the final domino fell and we all let out a collective cheer. The Rube Goldberg machine wasn't perfect, but man was it fun.

While the Hot Wheels cars, meticulously stacked dominos, and unpredictable ping-pong ball trajectories didn't live up to our vision of a flawless Rube Goldberg machine, everyone agreed that the SPS meeting was a nice way to connect with other physics-enthusiast students while pretending we didn't have homework for an hour.

Our goals for SPS meetings here at Luther College are pretty simple. We strive to provide students with the opportunity to engage in fun, interactive activities and challenges and to create an environment for personal, social, and academic growth. We design our activities so that they're accessible to everyone—first-year physics students, experienced physics majors, and physics enthusiasts pursuing other fields. We've learned that a good "hook" is crucial to increasing attendance, in addition to snack-related bribery, of course. Ultimately, we hope to represent Luther College's core value of community within the physics department.

Past meeting activities have included an egg-drop competition on the roof of Valders



**LEFT:** SPS chapter leaders (L-R) Dalton Ludington, Owen Johnson, and Abbigail Fahrenkamp build contraptions for an egg-drop contest. Photo by Erin Flater.

**RIGHT:** SPS students (L-R) Owen Johnson, Bryan Crow, and Kale Altman admire their work before setting off the Rube Goldberg machine. Photo by Abbigail Fahrenkamp.

Hall of Science, construction of an almost-functioning cloud chamber, and building and racing balloon-propelled cars. We can't meet in person this year due to COVID-19, but that hasn't stopped us from hosting fun challenges during hands-on Zoom meetings, including a butane Coke rocket launch and a spaghetti bridge-building competition. We just distribute the supplies to everyone prior to the meeting.

In addition to new activities, we have a few popular meeting themes that we revisit every year. For example, when delving into the world of 3D printing at the Luther College Makerspace, we learn from its student workers and staff about designing and printing small objects such as miniature bridges, boats, and gliders. Then we compete with each other to test how much weight each bridge can hold, how many pennies will sink a boat, or how far the gliders will fly (not very far, as it turns out). Regardless of the outcome, our students leave these meetings more connected to their classmates and to Luther College physics.

Inspiration for our meetings comes from a variety of places, including a running list of ideas shared among all of the past and current Luther College SPS presidents and vice presidents, which serves to inspire future leadership teams. We also get great ideas for meeting themes from popular science videos, intriguing events on campus, and conversations with our members about their interests.

We've found that the process of planning meetings of this sort can be quite complicated, especially while juggling busy college workloads. Due to the pandemic the fall 2020 meetings required additional flexibility and preplanning, so the current leadership team of Owen Johnson and Dalton Ludington started planning in early summer. However, we in the Luther College SPS chapter would have it no other way. Our best advice for an SPS chapter looking to follow our hands-on approach is to welcome all students, explore your campus and the awesome people that learn there, and remember to double-check your Hot Wheels car trajectories before the final run of your Rube Goldberg machine. //





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1. Members of the Dillard University SPS chapter work on a research project funded by the Air Force Office of Scientific Research.

2. During the annual SPS chapter event Solar Cider on the Quad, William Jewell College physics students heat apple cider using mirrors and invite the campus community to enjoy hot cider.

3. The Washington State University SPS chapter tailgates at a football game to raise money for the Conferences for Undergraduate Women in Physics (CUWiP).

All photos courtesy of the chapters via their 2019–20 SPS chapter reports.



by Nolan Tenpas, with Co-Authors Roel Olvera, Paris Foster, Nwankwo Nwankwo, and Matthew Macasadia, SPS Members, Texas Lutheran University

**P**hysics students learn some of the most fundamental laws that govern our very existence, uncovered by great scientists like Newton, Curie, and Einstein. But we're less often exposed to the philosophical ideas put forward by these scientists. One of the most well-known physicists, Isaac Newton, once said, "We build too many walls and not enough bridges."

We as a society need bridges now more than ever. This is the philosophy that the Texas Lutheran University (TLU) SPS chapter leaders followed in 2019, and to that end we decided to put together an inclusive leadership training session for the early fall of 2019. Our SPS advisor, Dr. Toni Saucy, created an agenda for the one-day event and enlisted students to lead the session.

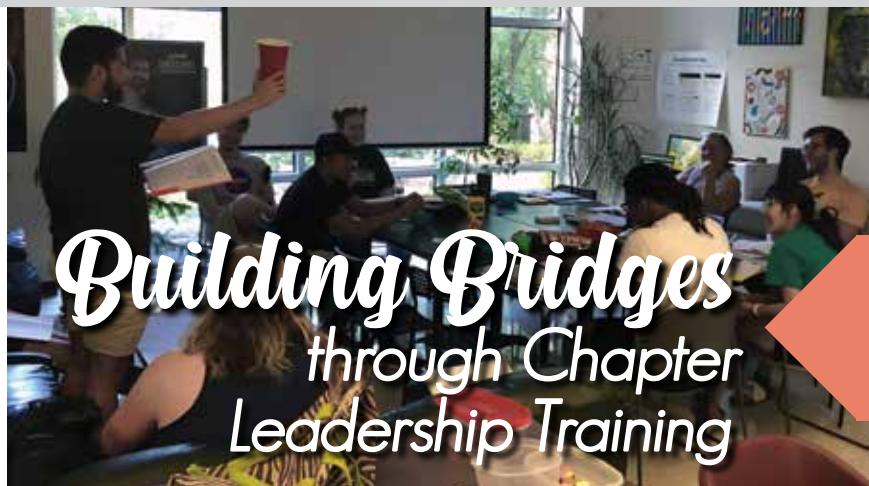
An important aspect of our leadership training came from thinking about what leadership in STEM should embody. TLU has a number of groups in the natural sciences similar to SPS. We decided to invite them to join the leadership training so that we could all learn from and guide one another. The more diverse the group, the more valuable input there is to share and the better we can build bridges between the disciplines and learn from one another.

We've learned that a successful training session includes some necessities: safety, diversity, meaningful activities, scheduling—and, of course, snacks! Here we share how we organized our event.

Arguably the single most important part of our training happened within the first 10 to 20 minutes. We opened with a universal agreement from all attendees to appreciate every person in the room and their ideas. We wanted to ensure that every participant would be respected and protected. It was paramount that attendees felt safe; otherwise, they may have held back input or experiences.

An interactive training wouldn't be complete without meaningful activities and conversations. Topics included effective leadership, creative problem solving, having difficult conversations, and serving our members, among others. One of our favorite activities was breaking into small groups and appreciating the value and individuality of random objects, such as a cup or a knife, and then applying that thinking to our clubs. The exercise demonstrates that each person has a unique set of skills they can bring to the table. Understanding this is vital for engaging members and helping them grow.

We also set aside time for leaders to plan their club activities for the coming semester. Creating a schedule like this can sometimes feel like a burden, especially after a long day of work and activities, but doing so in advance helps to keep



**TOP:** SPS chapter president Roel Olvera presents his small group's thoughts on the value of a red Solo cup to 2019 workshop attendees.

**ABOVE:** TLU SPS chapter members pose at PhysCon 2019 with their advisor, Dr. Toni Saucy (second from right). Photos courtesy of the TLU SPS chapter.

the group on track throughout the semester. With everyone on the same page, a chapter is more likely to thrive.

Leadership training can be long, so we had snacks to keep participants sharp and focused. Who doesn't love Oreos while they're working through a 20-week schedule?

From the SPS chapter perspective, the 2019 training helped our officers set goals for the year and align their focus. The training produced an especially motivated group of student leaders who were passionate about moving our SPS chapter forward. As a result of participating in leadership training with other STEM group leaders, we also saw new friendships form between the leaders of various clubs.

We saw firsthand that experiences like this do not end when the meeting is finished. The metaphors and analogies brought into such a critical-thinking environment not only got everyone involved and engaged, but established a strong bond among attendees. Being able to learn from one another created an understanding that all parties are equal and all ideas are worth bringing to the table. This kind of leadership has helped us be successful both inside and outside of the school environment.

We have discovered that leadership training is crucial for creating a unified and effective leadership team. We held a virtual second training in 2020 and look forward to continuing the leadership training tradition, hopefully in person, for many years to come. Building bridges has to start with the leaders. We have a vision of a unified network of STEM student organizations in the future, and as George Washington Carver said, "Where there is no vision, there is no hope." //

# An SPS Symposium for Sharing Summer Research Adventures

by Lilah Mercadante, SPS Chapter Co-President, Amanda Malnati, SPS Chapter Treasurer, and Dr. Nalini Easwar, SPS Chapter Advisor, Smith College

**W**hile the stereotypical image of a scientist is someone who works in a lab, stares at a computer screen, or crunches numbers all day, we know that communicating your work clearly and coherently can be equally as important as the research. This is why we, the Smith College SPS chapter (also known as the Physics and Astronomy Club), wanted to host a research symposium giving students the opportunity to tell their peers and professors about their summer adventures in physics and astronomy and polish their presentation skills.

The Summer Research Symposium premiered in fall 2019. Many first-year students considering a major or minor in physics and/or astronomy attended the symposium, along with curious professors. The presenters, mainly juniors and seniors, gave presentations that included photos—and sometimes even props—from their summer research experience. The topics ranged from dark matter to CubeSat creation. After each presentation, the student in the spotlight eagerly answered questions from intrigued students and professors. Following the presentations, we held a potluck-style dinner where presenters, professors, and prospective majors could discuss the topics further.

This event served as a time for presenters to share their research, attendees to hear about ongoing research in physics and astronomy, and new physics students to learn about summer research opportunities. It was such a success that we hope to make it an annual event.

We initially thought the remote nature of life in 2020 would present a challenge for holding events such as the symposium. However, we have come to realize it's an opportunity to expand our audience. Given our new virtual location, we plan to extend symposium invitations to alumni. This adds another valuable dimension to the event: we hope this will allow interested alumni to see how current students are getting involved with research, and in turn, allow students to start networking with our experienced and knowledgeable alumni. This could facilitate a follow-up event in which alumni participate in a panel discussion for students.

The Smith chapter of SPS is committed to recruiting and retaining women in physics, a field where the representation of women has stayed at around 20% for the last two decades. As a historically women's college, we believe in the importance of representation, building relationships among women



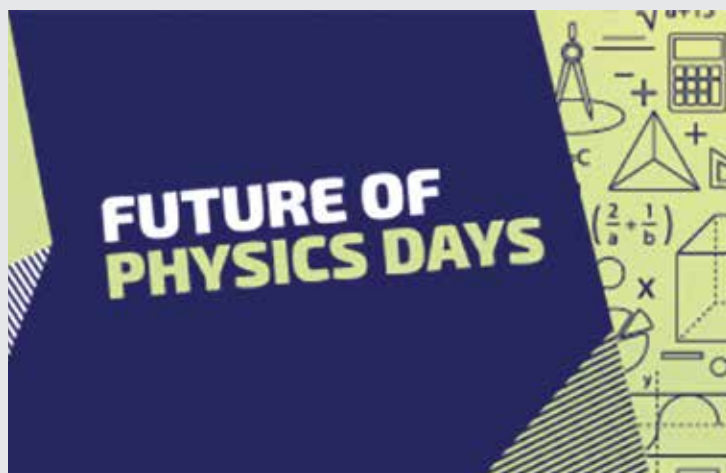
**ABOVE:** Event flyer courtesy of the Smith College SPS chapter.

within the scientific community, and preparing our members for the challenges that come with a career in professional physics and astronomy. The symposium is one way in which we can support students in developing the key skill of effectively communicating their research. //



**LEFT:** Physics students from Howard University and Morehouse College at the 2019 National Society of Black Physicists (NSBP) meeting in Providence, RI, which was also the site of PhysCon 2019. Photo courtesy of the Howard University 2019-20 SPS chapter report.





Visit [march.aps.org](http://march.aps.org) and [april.aps.org](http://april.aps.org) for more information.

Join us at the upcoming APS March and April Meetings. SPS partners with APS Careers to provide Future of Physics Days (FPD) events just for undergraduates! At FPD you can advance your career by

- Presenting your research at undergraduate-only sessions
- Gaining valuable feedback on your presentation from experienced physicists
- Receiving recognition for your work that you can add to your CV or resume

You'll also be able to

- Network with physicists from academia and industry
- Explore different areas of physics to see what you are interested in
- Learn about a diverse range of career options

There are lots of engaging activities planned for students, such as a career workshop, a graduate school fair, and more!

- APS March Meeting: March 15–19, 2021
- APS April Meeting: April 17–20, 2021

SPS National is now also offering Reporter Awards of \$75 to cover registration for virtual meetings! Apply today at [spsnational.org/awards/reporter](http://spsnational.org/awards/reporter).

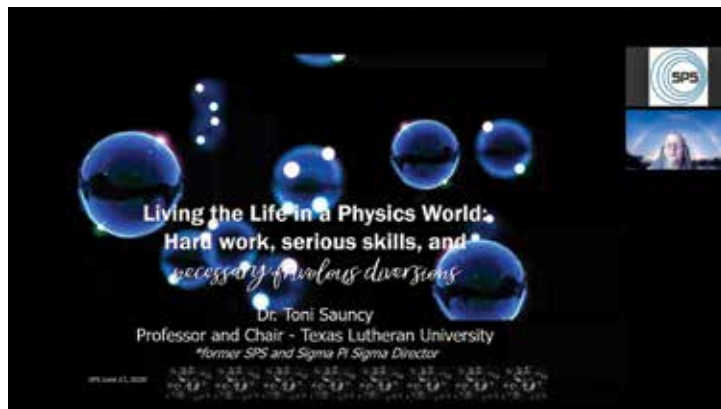
## Creating Virtual Spaces for Chapters: SPS Virtual Colloquium Series

by Mikayla Cleaver, SPS Programs Coordinator

**W**hen the pandemic hit and the United States first went into lockdown, SPS National sprang into action to create virtual opportunities for chapters across the country. With colleges and universities moving online, students missed club meetings, classes, and so much more, threatening their sense of community. SPS National is working to mitigate the effects of this with new virtual opportunities.

One of these new opportunities is the SPS Virtual Colloquium series. Starting the first week of true lockdowns in America, SPS National began welcoming speakers every other week to address our members. Participants from the American Institute of Physics (AIP) Statistical Research Center, Monash University in Australia, NASA, and other organizations covered a wide variety of topics to ensure there would be something for everyone to enjoy. After each 30- to 40-minute talk, there was time for questions, and a recording of the session was uploaded to our YouTube channel for chapters to use in the future.

As we've continued to develop the series, the average number of registrants for the virtual talks has steadily increased. We hope these talks will serve as a way for chapters to gather as a physics community online, either through live attendance or by watching the



**ABOVE:** Dr. Toni Sauncy, Texas Lutheran University SPS chapter advisor and former SPS and Sigma Pi Sigma director, gives her virtual talk titled, "Living the Life in a Physics World: Hard Work, Serious Skills, and Necessary Frivolous Diversions." Photo courtesy of SPS National.

recordings together. All of the past and upcoming talks can be found on our website ([spsnational.org/about/SPScolloquium](http://spsnational.org/about/SPScolloquium)). We look forward to seeing you as we continue this series as a monthly event in the spring semester! //

# Creating Opportunities for Growth

by Rebecca Sipen, SPS Chapter Outreach Coordinator, California State University, Northridge

**C**oming in as a freshman at California State University, Northridge (CSUN), I was scared of the road ahead. Finding fellow physics majors proved difficult, and I was unsure of what I needed to do for classes and my future. I longed for a sense of community with people who were also interested in physics.

After a few weeks in college, I heard about a club for those interested in physics. It was no surprise, then, that I gravitated to the Society of Physics Students (SPS). During my first semester in SPS, it all seemed intimidating. I hid in the back and kept to myself. However, everyone was so friendly and passionate about physics that I was compelled to be more active in the community. The next semester I took a board position, and I haven't looked back since.

One of the first things I helped create was our peer mentoring program. The program focused on inspiring underclassmen, like me, to grow as physics majors through personal and professional development. Mentors were there to encourage mentees to apply to research and scholarship programs, attend workshops and lectures, and navigate their way around the department and school. The program was also meant to strengthen connections between underclassmen and junior and senior physics students.

I joined in the first round of pairings, even though I was nervous to meet my mentor. I was afraid I wouldn't get anywhere, that my knowledge would be lacking, and that I might have picked the wrong major. My mentor helped me overcome those fears, guided me through research and scholarship applications, encouraged me after failed tests, and reminded me to take care of myself when things were stressful. Even now, after she has graduated, we stay in contact, and she continues to help me on my journey. Without this pairing, I would never have been accepted into Cal-Bridge, a scholarship program, or been able to get past bad test scores; maybe I would've even ended up changing my major. Now I am also a mentor, and I hope to make as much of a positive impact as my mentor had on me.

In addition to the mentoring program, our chapter helps students learn about current research by setting up lectures from professors and graduate students, as well as working with the colloquia held by the department. During the early days of spring 2020, we set up informal meetings with the department's colloquium speakers.

After everything went online, we continued these meetings on Zoom. Whereas colloquia allow questions only about the speaker's research, these informal meetings give students the chance to ask more personal questions about the speaker's field of study, graduate school applications, work-life balance, and much more.

During the Fall 2020 semester, we collaborated with professors and our department chair to host a department-wide meeting. Students were given the opportunity to ask about research, classes, and how to get involved. The meeting helped students connect with professors outside of the classroom setting, which can be intimidating. This was also an opportunity to welcome the new class and give them valuable guidance. As someone who came into the school knowing absolutely nothing about the physics department, I would have appreciated this when I was in their seat two years ago.

Since the fall of 2019, our chapter has also introduced a number of workshops on topics including the physics graduate record exam (PGRE), our state's Cal-Bridge program, and applying to research experiences for undergraduates (REUs). Luckily, we have been able to continue hosting these workshops despite our transition to a fully online semester due to COVID-19.

In addition to our professional development workshops, the SPS board also holds events for community development, such as our Women in Physics events. Our first event, in 2019, featured two women, a CSUN alumna and a University of California, Santa Cruz (UCSC) alumna, who opened up about their experiences on both academic and personal levels. The event created a safe space for female physics majors to discuss the experiences and hardships that come with being a woman in STEM. After this successful event, we have continued to hold Women in Physics events in which our female students feel heard, understood, and empowered.

From timid freshman to SPS member to SPS outreach coordinator, I can say I've found my place within the physics community. Through experiences such as creating lasting personal connections to getting into a scholarship program, I've never felt more prepared for my future in physics. I am proud to say that while our chapter has grown, our members have grown exponentially more. Together we have laid the foundation for many amazing programs, and I'm thrilled about the impact SPS can have on future generations. //



**TOP:** The Fall 2019 SPS board introducing the Peer Mentoring Program to members.

**MIDDLE:** Speakers Diana Blanco (CSUN alumna) and Ravipa Losakul (UCSC alumna) in the lower center and lower right, along with participants in the Fall 2019 Women in Physics event at CSUN.

**BOTTOM:** Students chatting after an SPS general body meeting in the Donald E. Bianchi Planetarium. Photos courtesy of Rebecca Sipen.





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1. The Duke SPS chapter tours the Triangle Universities Nuclear Laboratory.
2. An SPS student from the University of Wisconsin–La Crosse presents research at an annual meeting of the APS Division of Nuclear Physics.
3. Poster presenters from Texas Lutheran University pose for a photo at PhysCon 2019.
4. The Stony Brook University SPS chapter hosted a seminar on LaTeX that first-year students found especially helpful.

All photos courtesy of the chapters via their 2019–20 SPS chapter reports.



# Parachuting Physics Into Homes

by Emily Matthews, A. Louise Ferris, Alyssa Gadsby, and Willem Trainor, SPS Chapter Board Members, Duquesne University

**A**s the great author Thomas Fuller once wrote, “Charity begins at home, but it should not end there.” After students were sent off campus due to the COVID-19 pandemic, the Duquesne SPS chapter struggled with how to continue outreach and charity efforts from a distance. Like Fuller, we knew we needed to start at home, both metaphorically and physically, but we quickly realized that our ideas could and should be taken much further. This led to our effort to create a kit containing a series of short, at-home physics experiments for elementary and middle school students.

We were fortunate to be able to continue our classes during the spring of 2020, but we knew other students had more limited access to educational resources. The idea for the kit emerged as we brainstormed ways that we might help. As finals were approaching and many of our SPS members were still adjusting to life during a pandemic, the four of us—our chapter’s board members—decided to do a test run and establish whether it was feasible to create something so unique.

After making a preliminary plan for our project, we got in touch with a professor from our department, Dr. Patrick Cooper, who founded a nonprofit called Pittsburgh Learning Commons (PLC) to help local communities in need. Dr. Cooper connected us to PLC’s executive director, Jacqueline Cameron, and our partnership began.

The kit we ultimately sent out centered on a booklet containing an introduction, engaging questions, and thoughtful conclusions for ten experiments. Each section was accompanied by a fun story aimed at motivating and invigorating students. Since we wanted to appeal to participants of varying ages and abilities, we included experiments with a range of difficulty levels. For the more challenging projects, we recommended that a parent or guardian help younger students as needed.

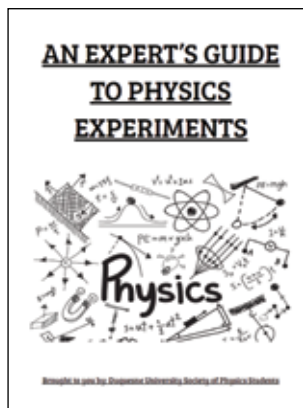
Along with the booklets, the kits included supplies for each activity. In one example, students were asked to construct a classic parachute. The instructions: Acquire different items from around the house (coffee filters, grocery bags, pieces of paper), then make a parachute using the provided yarn and cup. Students could then put different weights into the cup to see which product supported the weight best. In the process, students were introduced to some common physics vocabulary terms (such as gravity and air resistance) and answered questions about their experiments. We hoped that they would

continue with more trials until they could see the physics at work. Eventually, they might begin to recognize terms, and they would also have something fun to share with friends.

Materials were ordered, packaged, and paid for by PLC, which then delivered the kits to a local school to be picked up by students and their families at no cost. We had a wonderful time partnering with PLC and hope that the bonds we created will last for many years to come.

After a lot of hard work, it was gratifying to hear that the distribution of materials went well and that students and their families enjoyed the experiments. In light of its success, this outreach activity will now be open to our entire chapter. This will enable us to create a greater number of experiments and make them diverse enough to intrigue students with different interests. We plan to partner with PLC again and, now that we’re back on campus, hopefully meet some of the participating students. Even if the students aren’t planning to pursue STEM, our goal is to build a strong connection with them and to inspire them to chase their dreams.

We would like to thank everyone who supported us along the way, including PLC and Jacqueline Cameron, Dr. Patrick Cooper, and our chapter advisor and department chair, Dr. Simonetta Frittelli. //



**TOP:** The cover of the experiment booklets created by the Duquesne SPS chapter.

**ABOVE:** Duquesne SPS board members hold a virtual meeting. Due to the COVID-19 pandemic, full meetings were postponed to allow chapter members to move home and tackle finals without having extra commitments. Images courtesy of the Duquesne SPS chapter.



# Spooky Science



It's never a bad time to share physics with others, but SPS chapter activity suggests Halloween is an especially good time! From pumpkin chucking to haunted labs, SPS creativity is on full display each October during events across the country. The demos are spooky, the crowds are big (with the understandable exception of 2020), and the pictures are fantastic. Here's a small sample from 2019. //



1. The SPS chapter at Luther College hosts an annual haunted lab filled with demos and activities to engage curious families.

2. A black light adds a spooky feel to oobleck during the Rhodes College SPS chapter's annual Pumpkin Drop outreach event.

3. During Agnes Scott College's Halloween Pick-a-Sweet event, SPS chapter members provide candy and science-y crafts for local kids.

4. SPS teams from South Dakota School of Mines and Technology participate in a Punkin Chunkin contest during Rapid City's Great Pumpkin Festival.

5. Kids love the Spooky Science demo show put on by the University of Oregon's SPS chapter at a local science center.

All photos courtesy of the chapters via their 2019–20 SPS chapter reports.



# Successful Outreach and the SPS SOCK

by Holly Fortener, 2020 SPS SOCK Intern



**TOP:** 2020 SPS SOCK intern Holly Fortener. Photo courtesy of the author.

**ABOVE:** In one SOCK activity participants use a slinky and tuning fork to investigate two types of waveforms in our world: transverse and longitudinal. A discussion on sound waves then helps identify sound waves as longitudinal waves. Photo by Holly Fortener.

**2020 SOCKs are free and available to chapters now. For more information and to request your kit, visit [www.spsnational.org/programs/outreach](http://www.spsnational.org/programs/outreach).**

## WHAT DOES SOUND LOOK LIKE?

So begins an activity on sound, waves, and oscilloscopes in the 2020 SPS Outreach Catalyst Kit (SOCK). Through engaging lesson plans and activities, the SOCK is designed for SPS chapters that are interested in hosting science outreach events but would like some extra help planning engaging activities and creating a fun, friendly environment. The kit includes all the materials you need and a manual, and it's free to SPS chapters.

The 2020 SOCK includes a number of hands-on activities: viewing audio signals, listening to soundscapes, and tinkering with tuning forks. In my favorite activity, participants speak into a handheld microphone connected to a portable oscilloscope. They are actually able to see the sounds they make!

Like all of the other SOCK activities, the portable oscilloscope and microphone come with a handy guide that not only explains how to set up the demonstration but also the physical concepts, or key takeaways, paired with intriguing questions to drive educational conversations with different age groups.

Science outreach is not only a way for SPS members to educate others, but also to express their passion for physics and astronomy and promote growth in STEM fields.

Whether you use the SOCK or your own activities, keeping the following things in mind will go a long way to helping you host a successful outreach event.

## ACTIVITIES ARE EXECUTED IN A SAFE WAY.

Will students be around lasers? Liquid nitrogen? Will you have an open flame? (Ask me about "Fire Fridays" in my high school chemistry class for a story about this!) Are the hosts—SPS members—practicing and modeling good safety? Considering these questions is essential.

## ACTIVITIES PROMOTE A FUN AND FRIENDLY ENVIRONMENT.

Think about your own experience attending an outreach event or in science class. What is the best way to interact with people attending an outreach event? Choose hands-on activities that promote engagement, like those in the SOCK!

## ACTIVITIES CONVEY KEY LEARNING POINTS IN AN AUDIENCE-APPROPRIATE MANNER.

Are the activities age appropriate for your expected participants? Do they assume an appropriate level of subject knowledge? You can often do the same activity with different kinds of audiences if you adjust the language you use, difficulty level, and expected outcomes; the SOCK was designed to be flexible in this way. Adapting outreach activities for your specific audience may take time but is key to a successful event. //



# Reflections on Developing Outreach Resources

by Shannon Brindle, Physics Undergraduate, University of Mary Washington

**Physics has taught me two fascinating lessons: how to be comfortable with being uncomfortable and why it's not being wrong you should fear—it's not learning why you are wrong.**

Two years ago, a major shift in my educational goals—from psychology to physics/premed demanded that I quickly adjust. The lessons I learned about discomfort and fear during this period, coupled with the need for affordable, accessible STEM education in underserved communities, inspired me to lay the foundation for STEM Starter, Inc. A sustainable, affordable, grassroots nonprofit organization, STEM Starter is dedicated to promoting the use of everyday, rudimentary, and household objects as guides for STEM education. Each STEM Starter experiment reinforces use of the scientific method while encouraging critical thinking and demonstrating that there is no finish line in learning.

What began two years ago as a small service project has evolved into an online program that offers free STEM education resources. In September 2020 we launched our first book, *STEM Starter: Charting a New Course*, and since October our outreach activities have been made available to the residents of a local juvenile detention center. I expect to continue these efforts and plan to provide STEM Starter information and supplies to rural community centers and crisis shelters.

The development process has not been without its frustrations and obstacles. What I learned is that it's important to employ the three P's: patience, persistence, and planning. Patience: Things will often take longer than you imagine, particularly if you are a full-time student. Persistence: At times you will need more faith in yourself and your vision than everyone around you. Planning: Be realistic when planning both your time and finances. Keep these in mind as you reach out to others, and with inspiration and hard work, we physics students can make a lasting impact. //

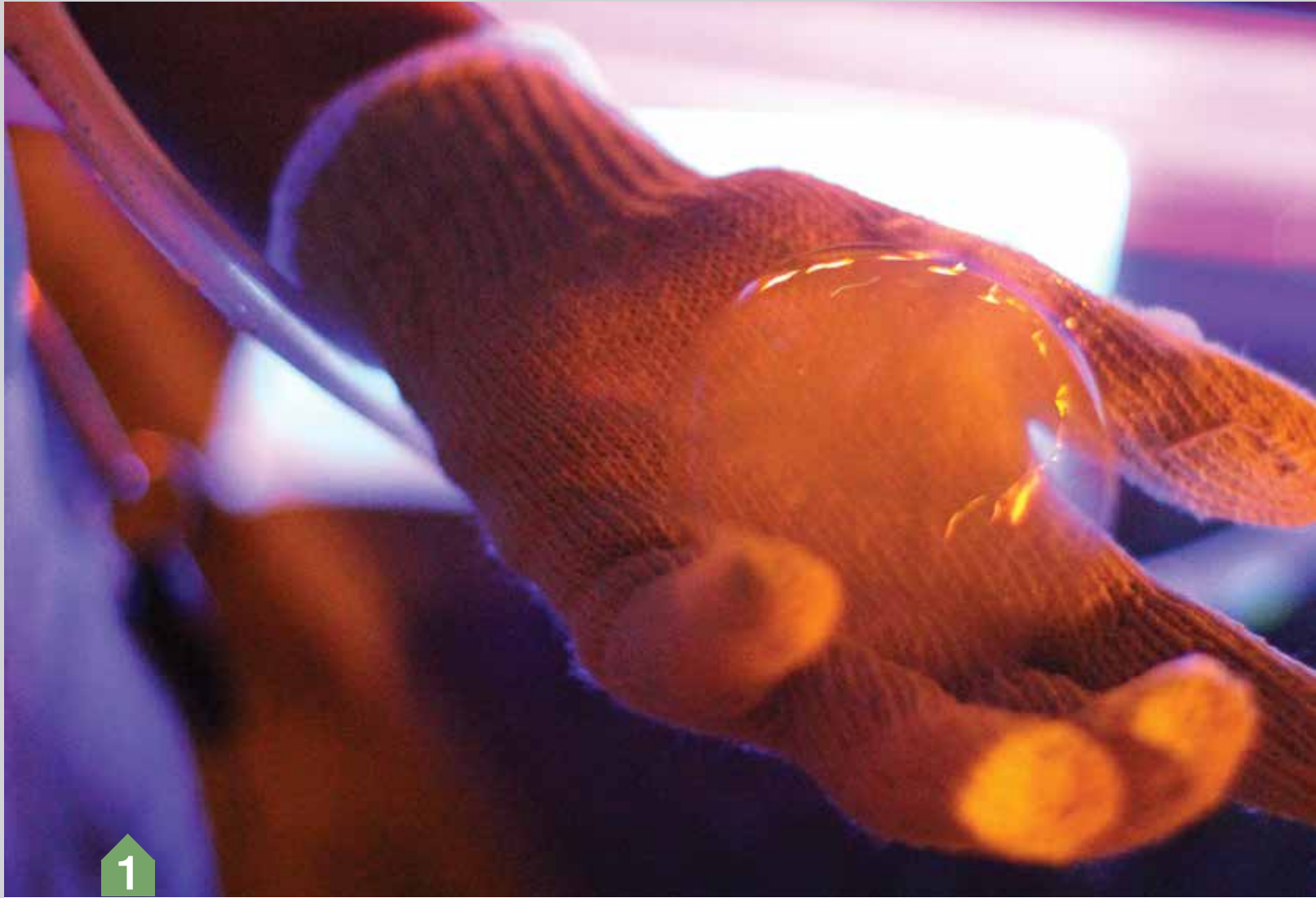


■ ABOVE: Photo courtesy of Shannon Brindle.

Learn more about STEM Starter at  
[www.startingwithstem.org](http://www.startingwithstem.org)



LEFT: The University of San Diego SPS chapter has an ongoing relationship with Hoover High School and hosts 20 students and their teacher for a day each semester. Here, Hoover High students and various SPS members pose after a great event. Photo courtesy of the University of San Diego SPS chapter.



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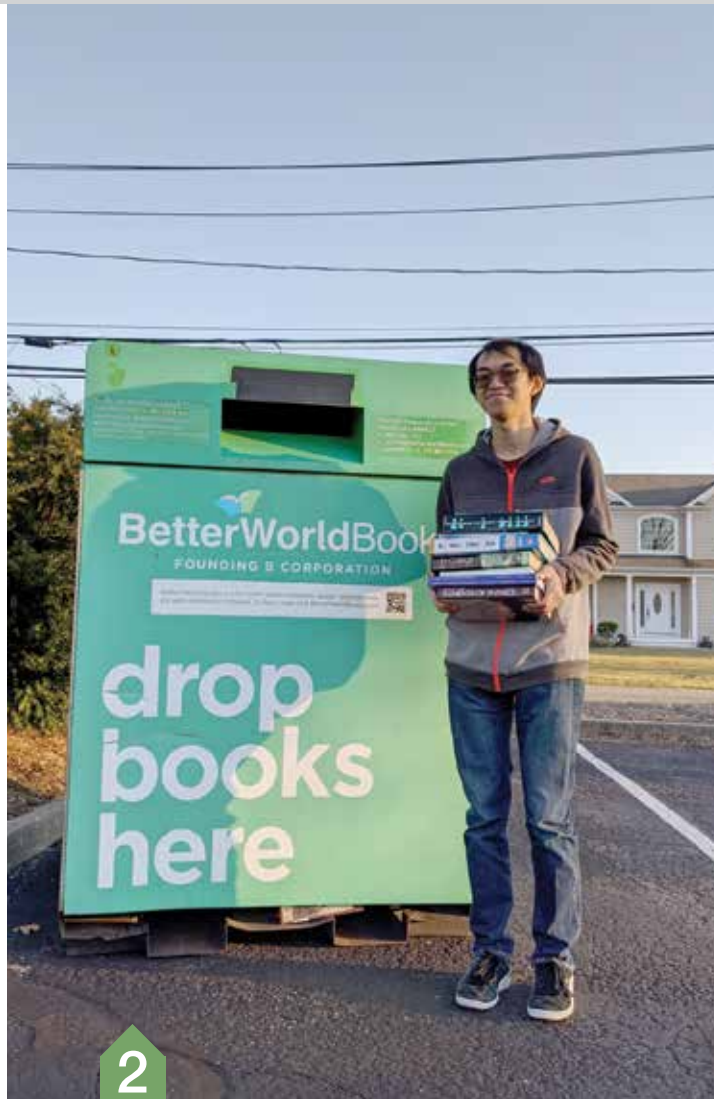


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1. “Boo bubbles” were among the new demonstrations at the annual Pumpkin Drop event hosted by the Rhodes College SPS chapter in 2019. Filled with dry ice, the bubbles could be held by children wearing cotton gloves.

2. Stony Brook SPS donated over a hundred physics, math, and chemistry textbooks to Better World Books, an online bookseller that donates a book to someone in need for every book sold.

3. An SPS member at Texas A&M University–Commerce (right) helps Girl Scouts light up a miniature light bulb during an event with the Girl Scouts of Northeast Texas.

4. A liquid-nitrogen-filled pumpkin falls 12 stories in celebration of the hundred-year anniversary of physics and astronomy at Washington State University. Photo by Kai Eiselein of *Moscow-Pullman Daily News*.

5. Missouri Southern State University’s SPS chapter partnered with other science clubs on campus to host a fun and colorful science show for the 4–5-year-olds attending Lion Cub Academy.

6. Make-a-Difference Day is a one-day community service event that supports over 100 service projects throughout the community of Meadville, PA. Last year the Allegheny College SPS chapter participated as a team called the Phix-it Physicists!



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# You Can't Plan for This: A March 2020 Zone Meeting

by Keegan Karbach, Instructor, University of Colorado Denver and Former Zone 14 AZC, Metropolitan State University of Denver



**It started with a conversation—SPS director Dr. Brad Conrad and I had discussed the idea of a large, regional zone meeting during his visit to the Colorado School of Mines in Denver the year before the pandemic changed the paradigm of academic fellowship.**

After our conversation, I began to plan; I envisioned participation from the entire mountain region, from the Dakotas to Arizona. As the date approached, there were solid attendance commitments from schools in Zone 14 (Colorado and Wyoming), as well as plans from schools in surrounding zones including Utah, New Mexico, and South Dakota. Thanks to the help of Dr. Gearba-Sell at the United States Air Force Academy (USAFA), who is also SPS president, and Dr. Devin Della-Rose, observatory director at USAFA, we set up a tour of their newly refurbished planetarium and observatory. Thanks to the Metropolitan State University of Denver physics department, we had access to labs for tours, research talks from professors, and a workshop from the Physics for Humans project. Everything seemed to be coming together. The zone meeting was planned for the final weekend of February to coincide with the APS March Meeting being held nearby. The intention was to enable students presenting research there to have a practice run presenting in a more informal environment during the zone meeting.



**TOP:** The John H. Martinson Planetarium and STEM Center at the United States Air Force Academy.

**MIDDLE:** Zone meeting attendees visit the USAFA's new 1-m telescope.

**BOTTOM:** Dr. Tagg speaks with students at the Physics for Humans workshop. Photos courtesy of Keegan Karbach.

Travel is hard for anybody but especially for physics majors rapidly approaching finals. I began receiving cancellations as the date approached, which is understandable and not unexpected. I thought, that's alright, we can plan around it. At the same time, we had just started to receive information regarding a virus that was spreading on the other side of the globe—not on my radar at all. The show must go on. However, as the day approached and more contributors began pulling out, I began to worry. My carefully laid itinerary was beginning to look like swiss cheese, so I got help. SPS

National is an amazing organization for many reasons, and I can't thank them enough for their help with this meeting.

SPS assistant director Dr. Althea Gaffney flew to Denver early the first morning of the conference and provided attendees with transportation from Denver to the tour site in Colorado Springs. Fifteen bleary-eyed, pre-coffee physics students piled into a large van and were off on the 90-minute drive south to the USAFA. The Academy tour was amazing; we were treated to a private show at the James P. Bruni Planetarium, followed by an exclusive look at the new 1-meter telescope at the USAFA Observatory, hosted by Dr. Della-Rose.

My planning came up short, after the tour, as I had no backup plan for food on the first day. The original plan was entrusted to one of the schools that had been unable to come, but the National Office came to the rescue again and we had pizza delivered to the Denver campus once we returned. We wrapped up the events for the day with an innovation workshop hosted by Dr. Randall Tagg, founder of the Physics for Humans project. Here we got into groups and came up with physics-based innovations that could potentially solve real-world problems.

That evening, APS made the call to cancel the March Meeting due to the risk of transmission of the novel coronavirus. In kind, we decided to cut the zone meeting short. The decision was sudden and surprising, but necessary—a cancellation that became a harbinger of things to follow in 2020. You can't plan for this.

Despite the circumstances, I look back on this experience happily. The best-laid plans can change at the drop of a hat—global pandemic notwithstanding. Being agile in planning and executing an event is huge, and I cannot express how thankful I am for the support from SPS National to take a situation from disaster and salvage it into a meaningful experience, helping to support student members in trying and unprecedented times. //



# SPS Chapter Report

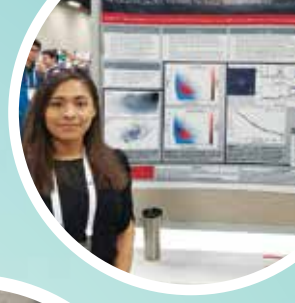
Submission Deadline: **June 15**

## Importance of Chapter Reports

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

## Qualify for National Recognition

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



For more information on chapter reports, visit [www.spsnational.org/chapter-reports](http://www.spsnational.org/chapter-reports)

Has your leadership changed since your last chapter report? Update your contact information with the National Office anytime at [www.spsnational.org/chaptercontacts](http://www.spsnational.org/chaptercontacts)

Society of Physics Students

# SPRING AWARDS

*Applications  
Deadline*

**March 15**

## Mark your calendars!

The Society of Physics Students (SPS) and Sigma Pi Sigma have consolidated deadlines for awards, scholarships, and internships.

These opportunities are available only to chapters and members, so remember to pay your dues to qualify.

## Outstanding Chapter Advisor Award

## SPS Award for Outstanding Undergraduate Research

## SPS Scholarships

### SUMMER DEADLINE:

**June 15**

Chapter Reports—  
Including the  
Blake Lilly  
Prize



### FALL DEADLINE: November 15

- Sigma Pi Sigma Chapter Project Award
- Future Faces of Physics Award
- SPS Chapter Research Award
- Marsh W. White Award



### WINTER DEADLINE: January 15

SPS Summer  
Internship  
Program



### ONGOING OPPORTUNITIES:

- SPS Travel Awards
- SPS Reporter Awards
- SOCK Kit Requests
- SPS and Sigma Pi Sigma Service Awards

