

# PHYSICS DEPARTMENT NEWSLETTER

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## **GREETINGS FROM OUR DEPARTMENT CHAIR - Celebrating 2024 - 2025**

### **Welcome To the New Academic Year!**

*By CSU Professor Elliott Horsch, Physics Department Chair*

My colleagues and I in the Physics Department are proud to show you some of the highlights of last year along with some plans and aspirations for the current academic year.

Our numbers continue to increase in both our graduate and undergraduate programs, and we are focused on providing unique research opportunities for students at all levels. Read all about it here!

**FALL 2024 HIGHLIGHTS - Community Spotlight****Celebrating Women in STEM***The Connecticut Tech Council Celebrates the 19<sup>th</sup> Annual Women of Innovation Awards*

In 2025, the Women of Innovation Awards will be celebrating its 20<sup>th</sup> year of honoring Connecticut women who demonstrate excellence in STEM fields. Last year's ceremony honored two of Southern's own research fellows: 2023 BioPath fellow Paula-Marie Simpson, and 2023 Werth IAF High School research fellow Snigtha Mohanraj.

In partnership with the Innovation Hub, the BioPath program is a focused pathway for students to engage with STEM research and future employment opportunities within the CT BioTech industry.

Paula-Marie's research was entitled "The Analysis of the Inhibitory Effects of Cannabinoids on Acetylcholine Esterase via Computational Docking, Kinetic Assay and Virtual Reality". Her project, which examines the potential to treat neuro-degenerative diseases, such as Alzheimer's and Parkinson's, with THC, was nominated for the Collegiate Innovation and Leadership award. Paula-Marie was a finalist in her category, along with students from UCONN, Trinity College, and Quinnipiac. Congratulations on this accomplishment, Paula!

During the summer, Southern regularly hosts groups of Graduate, Undergraduate and High School students from across the state, who attend the Werth Family Foundation Endowed Nanotechnology IAF program. Like BioPath, the Werth IAF provides opportunities for students to connect with industry partners and gain hands-on research experience, completing an 8-week program in the SCSU Innovation Hub.

Snigtha, who was a senior at CT's Engineering and Science University Magnet School at the time of the awards, registered her first patent US 11,931,717 B2. Her patent aims to target microplastics and oil, removing them from water using natural materials. Snigtha was not only a finalist but won her category at the awards. An outstanding achievement!

SCSU i-Hub Director, Dr. Christine Broadbridge encourages women interested in STEM to apply to the BioPath and Werth IAF programs. For more information, please visit <https://southernct.edu/stem>.

**Connecticut Tech Council 19<sup>th</sup> Annual Women of Innovation Awards**

[Snigtha Mohanraj](#)

Winner: *Youth Innovation and Leadership Award*

[Paula-Marie Simpson](#)

Finalist: *Collegiate Innovation and Leadership Award*

## **Fall 2024 HIGHLIGHTS - Department Spotlight**

### **NASA CT Space Grant**

For the second year in a row, Southern was home to recipients of the annual NASA CT Space Grant.

Fall 2024 saw Department Chair and CSU Professor Elliott Horch receiving a grant for his research “Toward Imaging Stellar Surfaces with the Southern Connecticut Stellar Interferometer”. This instrument is known as SCSI,

was completed in 2016 and is just one of Professor Horch’s on-campus projects that combines the Physics department’s focus on astrophysics, quantum, and hands-on research which provides students opportunities to collaborate on meaningful research projects at both undergraduate and graduate levels.

Since its completion, the SCSI has been used on campus and transported across the country, used in tandem with larger telescopes at the Lowell Observatory in Flagstaff, Arizona. Work is currently being done to upgrade the SCSI to be able to function wirelessly, enhancing its portability, and expanding opportunities for further research and collaboration.

The Space Grant enabled Professor Horch to give Physics graduate and MS in Applied Physics candidate, Max Martone, an opportunity to collaborate on research using the SCSI.

“The project I’m on right now is working with our intensity interferometer setup,” Max told SCSU News. The instrument measures the diameters of stars, and Max says, “We’re trying to incorporate, at some point, quantum entanglement into how we collect our data...incorporating quantum phenomena into an already existing ‘classical’ device.”

Building on the Physics Department’s history of promoting opportunities for students to get involved in research at an early level, Max is one of a number of SCSU physics students who have excelled in the early stages of their academic career, receiving a Werth IAF fellowship and working with QuantumCT alongside Professor Christine Broadbridge.

Speaking to SCSU News, Professor Horch commended the work of the faculty in the Physics Department, who always keep students at the forefront of their work. “These research opportunities are on a par with what you would get at Yale or UConn,” Professor Horch said. The SCSI is just one of the high-resolution imaging systems developed over the

years at Southern by Professor Horch in collaboration with students and faculty within the department, and other groups including NASA's Ames Research Center, University of Virginia, Apache Point and Lowell Observatories, to name a few.

Southern's astronomical instrumentation has been utilized at several of the world's largest telescopes to take images of the universe, including in 2012 when the Differential Speckle Survey Instrument took the sharpest ground-based image on record of Pluto, and in 2022 when optics instrumentation designed by Professor Horch was used in conjunction with the Gemini telescope to capture an image of the biggest stars recorded, estimated to be 200 times the mass of our sun.

Blending quantum and optics together, Professor Horch hopes to continue to expand Southern's research opportunities, by incorporating quantum optics into future programs and research, including the forthcoming Quantum Path initiative.

## **SPRING 2025 HIGHLIGHTS - Research Spotlight**

### **The Future is QuantumCT**

*Exploring new opportunities for Quantum programs and research right here at Southern*

This Summer, Southern hosted a record number of Werth Industry Academic Fellowship (IAF) students from across the state. The IAF program gives students access to research opportunities while working hands-on with equipment in the physics labs and Connecticut State Colleges and Universities Center for Nanotechnology (CNT) at SCSU and provides while engaging in use-inspired research in partnerships with companies. The recent program notably focused on applying quantum principles to address sustainability-related global challenges while working with industry partners.

This is just one aspect of the Physics Department's involvement in QuantumCT – an academic and industry research-led partnership that brings together Connecticut colleges, businesses, nonprofits, municipal and state government, trade organizations and community groups with a goal to promote quantum innovation across Connecticut. Speaking about QuantumCT, Professor Christine Broadbridge emphasized the importance of empowering students to get involved in quantum early, and Southern's unique position to provide students with these opportunities, without the cost of a private institution.

Professor Broadbridge, herself a first-generation college graduate, commended Southern's ability to provide such programs, while speaking with SCSU Physics News about the Quantum Path initiative and a recent partnership with SCSU's Office of Workforce and

Lifelong Learning (OWLL) to generate formal credentials. Bridging the gap between industry and research, Quantum Path will give students greater access to industry stakeholders and potential future employment opportunities.

“As far as we know, we are the only institution doing this,” Professor Broadbridge said.

“Students complete this experimental learning, that involves industry related research, to earn a credential that shows they’ve completed it.”

Southern is also home to a high-performance computer that Physics professor Matthew Enjalran says will soon be upgraded, enabling our students, and in the near future, research collaborators, to utilize it to perform complex simulations and computational quantum physics remotely.

“By upgrading the system, users from practically anywhere can access the high-performance computer at Southern to run codes and programs or access data,” he said.

“We’re building on the research infrastructure of the Physics Department and the Center for Nanotechnology to make this happen.”

The high-performance computer at Southern is an 8-node system, with each node housing approximately 48 CPUs and even has a small capacity to run as a GPU.

“We’re looking to build up standard high-performance computing capabilities as we progress forward with the QuantumCT initiative.” Professor Enjalran said.

“This all ties together with the work that’s already being done at Southern in quantum,” Professor Broadbridge agreed, highlighting Summer’s IAF cohort who gained experience on-campus learning to code and do quantum computing.

The emphasis the Physics Department, the Center for Nanotechnology, and the Innovation Hub places on student involvement is at the forefront of the university’s mission in partnering with QuantumCT.

“As we speak, we’re working on writing grants to support technology transfer, building this innovation infrastructure, so that when students have ideas, they can patent them, and learn all about that process too.”

Professor Broadbridge said. But the possibilities don’t end at Southern, both Professors envision expanding the Quantum Path and engagement with industry partners to make these opportunities open to students across the Connecticut State College and University system.

Partnership is at the heart of QuantumCT’s mission and values, and Southern is positioning itself to be a key partner as the state works towards becoming a global hub for quantum.

“Connecticut has a chance to become the quantum hub, just the way the Bay Area in California became Silicon Valley,” said CSU Professor and Physics department chair, Professor Elliott Horch in a recent interview with Southern News.

Research and development in quantum has been over 20 years strong right here in Connecticut, with Yale, UCONN, and the CSUs all partnering with QuantumCT to ensure this continues to be at the forefront of the mission of STEM departments, enabling Connecticut students to be part of this groundbreaking new era.

“At Southern, students can engage in quantum in a range of ways,” Professor Horch said. “We have quantum research in the Nanocenter, working with quantum materials. In astrophysics, we’re exploring quantum through optics and photonics.”

Students have already utilized Southern’s quantum capabilities to conduct meaningful research on campus. Physics alum, Cristian Sayers, along with Professor Broadbridge and Tom Sadowski, presented a research project on quantum-based direct air capture entitled “Gas Adsorption on Nanoporous Materials for Carbon Capture Applications” at the Spring 2024 Seattle Materials Research Society conference. This research aims to address the significant environmental concern of carbon emissions.

Cristian used Southern’s high-performance computer cluster to develop a workflow for performing quantum simulations, analyzing the potential efficacy of different materials in removing carbon dioxide from the atmosphere. The project addresses the shortfalls of expensive and time-consuming practical experiments and has the added benefit of enabling researchers to design and test hypothetical materials.

“This was a project that emerged from work with one of our industry partners, PCI (Precision Combustion, Inc.),” said Tom Sadowski. “We felt it was an exciting avenue to investigate a host of computational techniques and look at the efficacy of using them to identify possible materials for carbon capture.”

And this is just the beginning. This kind of research will continue to expand as the department looks to make a meaningful mark on the future of quantum in Connecticut. In the meantime, students like Cristian will continue to reap the rewards of being able to participate in such projects on-ground, enhancing their skillset and employability.

“At Southern, I delved into computational quantum mechanical techniques and explored quantum chemistry software,” Cristian says, reflecting on his research. “These invaluable experiences set me on the path to graduate school, where I now apply the knowledge and skills I gained during my time there in my daily research and studies.”

Since graduating from Southern, Cristian is continuing his research at Lewis University, where he has recently assisted their chemistry department with implementing a new high-performance computer initiative, and is teaching other students about quantum computing.

Students interested in quantum are highly encouraged to apply for the Werth IAF program, reach out to their advisor, or talk to the faculty about their interests.

***With thanks to SCSU News, Cristian Sayers, Tom Sadowski, Professors Christine Broadbridge, Matthew Enjalran, and Elliott Horch for their contributions to this story.***

## **SPRING HIGHLIGHTS - Community Spotlight**

### **Nuclear Energy Summit**

*On Earth Day, Southern brought together our community to discuss sustainable energy futures*

On Earth Day, April 22<sup>nd</sup> 2025, members of the SCSU faculty across campus, along with industry stakeholders, came together to attend the university's first ever Nuclear Energy Summit. A passion project of one of Southern's largest donors and esteemed alumnus, Neil Proto (Class of 1967), the summit was conducted in the new School of Business and sponsored by Connecticut marketing agency, Pinpoint, in collaboration with supporters of Southern's Energy and Utility Leadership program, Regional Water Authority and Avangrid.

Mr. Proto, the event's keynote speaker, is renowned for his commitment to environmental advocacy and nuclear research. Commenting on his experience as a Southern graduate, Mr. Proto spoke to the SCSU School of Business about what college life at Southern taught him: "I learned how to think big here," he said. "I worry sometimes that gets lost, but that's what I wanted to do today, start big".

Mr. Proto went on to stress the important role that students play in discussions about sustainable energy.

Mr. Proto's keynote speech inspired students who attended the summit to participate in breakout sessions, co-hosted by Keith Grant, Energy Project Manager at Honeywell; Laney Brown, Vice President of Sustainability at Avangrid, and SCSU Physics Department's own Professor Evan Finch. "How do we bridge the gap to get to pure solar and pure wind? Maybe fusion is on the horizon." Professor Finch said during the closing Panel discussion, moderated by Garrett Sheehan, President and CEO of the Greater New Haven Chamber of Commerce.

Students who attended the summit walked away with a sense of confidence and empowerment to be able to discuss such an important topic.

**Quotes and Story credit to [SCSU School of Business](#)**

### **SPRING HIGHLIGHTS - Student Spotlight**

#### **A WISE Woman Once Said...**

*Mariaceleste Florian-Rodriguez reflects on her experiences as a woman in STEM.*

From a young age, Mariaceleste Florian-Rodriguez knew that her future was in STEM. In her early years, she attended after-school programs and summer camps that exposed her to a wide range of STEM specialties: building Rube Goldberg machines, exploring math concepts, and even dissecting animals. After participating in advanced physics projects and healthcare courses, Mariaceleste's STEM passions soon collided when it was time to think about college.

As a Physics major at Southern, Mariaceleste's degree "combines my favorite subjects, including physics, math, and patient-centered healthcare, while addressing diseases close to my heart, such as

cancer," she says. Mariaceleste's specialization is unique, and not without its challenges, as local opportunities for students to gain experience in medical physics are hard to find.

"Thankfully, Southern does an excellent job of sharing opportunities for undergraduates," she says. "Through the Physics Department, I learned about the American Association of Physicists in Medicine fellowship and was able to conduct research at Indiana University Health over the summer. That experience not only solidified my choice to pursue medical physics but also gave me a greater appreciation for the support and community around me."

Community is also an important aspect of Mariaceleste's experience at Southern. So much so, she has been pivotal in ensuring Southern continues to support women in STEM, as co-founder of the WISE (Women in Stem Excellence) club. "Through WISE, I have been able to connect with incredible female students and professors, learn from their diverse experiences, and build a strong support network," she says.

Although pursuing her career goals is a large part of her life, Mariaceleste also takes time to pursue other hobbies and interests. "I love cooking and dining out with friends and family. I also grew up ice skating and now enjoy teaching lessons at rinks near my home, as well as skating recreationally," she says.

Mariaceleste also has a love of pageants, recently competing in the National American Miss pageant in Massachusetts. “Pageants bring together inspiring women who are dedicated to their platforms, forming friendships that last a lifetime,” she says. “It is an incredibly uplifting environment, all while enjoying the fun of dressing up!”

With such a devotion to her college life, and dedication to her hobbies, Mariaceleste offers the following words of encouragement for our freshman class: “STEM is challenging for everyone!” She says. “Do not be discouraged by setbacks, whether on an exam or in a research project, because they are an inevitable and important part of the process. Each challenge you overcome builds your skills, confidence, and resilience!”

When asked what her favorite thing about Southern was, Mariaceleste further emphasized the importance of community on campus.

“My favorite thing about Southern is its diversity. On campus, you can look one way and see people who share your background, then look another way and see people with completely different life experiences,” she says. “This diversity fosters collaboration and success in ways that would not be possible without varied perspectives. As a woman of color, I feel deeply valued being part of a campus that not only embraces diversity but actively celebrates it.”

Mariaceleste has also worked as a tutor for both the Physics and Chemistry Departments.

“Being on campus has also given me opportunities to connect with professors who share my interests and to observe research projects off campus,” she says.

As for the future, Mariaceleste has decided to continue her academic journey: “After graduating this year, my goal is to pursue both my master’s and Ph.D. in medical physics.”

With such a wealth of experience under her belt already, Mariaceleste’s achievements have not gone unnoticed. She was recently announced as a nominee and finalist for the Collegiate Innovation and Leadership category in the 2025 round of the 20<sup>th</sup> annual Connecticut Tech Council Women in STEM awards, which will take place on October 28th this year. The Physics Department wishes Mariaceleste the best of luck for the awards!

**If you would like to join the WISE club, please visit [www.instagram.com/scsuwise/](https://www.instagram.com/scsuwise/) to find out more!**

### **Mariaceleste’s Southern Journey**

#### **2022 - 2024**

- Dean’s List

- President's List
- Physics Tutor
- General Chemistry Tutor
- Co-Founder WISE Club

**2025**

- Distinguished Alumnus Endowed Scholarship Recipient
- Spring President's List

**Mariaceleste's Achievements**

- The Italian Center of Stamford Scholarship for Excellence in the Italian Language Recipient
- Omicron Delta Kappa National Leadership Honor Society Inductee
- AAPM Research Fellowship Recipient
- CT Tech Council Women in STEM award finalist

**Congratulations Class Of 2025!**

Eight students graduated with the BS in Physics, and three students received the MS in Applied Physics this past year.

The Physics department is very proud of them and excited to see what good things await them as they start the next chapter of their careers!

A special mention to Ana Baculima and Gage Posick on receiving the Outstanding Academic Achievement in Physics Award.

**Recent Awards and News**

*Starting the 2025/2026 School Year with New Projects and New Opportunities*

**PRISTINE Partnerships to Promote Research & Innovation for Societal Impact & Novel Engagements**

Professors Christine Broadbridge and Matthew Enjalran, along with Provost Julia Irwin and Peter Dimoulas have been awarded funding to launch PRISTINE - a project dedicated to enhancing capabilities and resources to foster external research and innovation with the primary objective of encouraging wider engagement in cutting-edge technologies including

Quantum and AI. SCSU is partnering with Allegheny College and Xavier University of Louisiana. The grant, totaling \$398,176 from the National Science Foundation (NSF) is part of the EPIIC initiative which you can read about here:

<https://www.nsf.gov/funding/opportunities/epiic-enabling-partnerships-increase-innovation-capacity>

### **Hubble Space Telescope**

Professor Dana Casetti and Dr. Terrence Gerard have been awarded time on the Hubble Space Telescope - a difficult feat, as only around 15% of annual proposals are selected by NASA for approval. Data collected will be used for the project “Search for an Intermediate-Mass Black Hole in Globular Cluster 47 Tucanae”. You can read more about the project here:

[https://www.stsci.edu/files/live/sites/www/files/home/hst/proposing/approved-programs/\\_documents/HSTCycle33-Approved-Abstracts.pdf](https://www.stsci.edu/files/live/sites/www/files/home/hst/proposing/approved-programs/_documents/HSTCycle33-Approved-Abstracts.pdf)

- **Speckle Surveys of Nearby Stars**

Todd Henry (Georgia State University), Jennifer Winters (Bridgewater State University), and Professor Elliott Horch have received a collaborative research award from the NSF towards a project entitled “Speckle Surveys of Nearby Stars” utilizing the DSSI (Differential Speckle Survey Instrument) developed here at Southern, to observe a sample of almost 5000 stars, with an aim to detect stellar companions and establish benchmark measurements of various aspects. Southern’s portion of the award will bring \$237,593 in new grant money to campus. The grant enables student involvement in hands-on research across the three participating institutions. You can read more about this project here:

- [https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=2510385&HistoricalAwards=false](https://www.nsf.gov/awardsearch/showAward?AWD_ID=2510385&HistoricalAwards=false)

### **A YEAR IN PICTURES**

Highlights included the Summer Werth Industry Academic Fellowship Program, SCSU students who came home winners from the Quantum Up! Challenge, the next generation of the Physics Club, and the SCSU Alumni Magazine featuring Ana Baculima and Sebastian Lucero!

The SCSU undergraduate and graduate research conferences are always a highlight of the semester, where the department showcases the achievements of our students and research conducted right here on campus.

## LOOKING AHEAD

### **Opportunities to Get Involved**

#### **Werth Industry Academic Fellowship (IAF)**

During this eight-week summer program, IAF students will have the opportunity to conduct team-based interdisciplinary industry-motivated research in sustainability challenges using nano and quantum technologies.

**Applications open November 1<sup>st</sup> and close February 15.**

**Visit [southernct.edu/stem/career-internship-opportunities](https://southernct.edu/stem/career-internship-opportunities) to apply!**

#### **WISE Club**

Join us to explore your program of interest. Meet individually with graduate faculty, staff, and graduate students committed to helping you achieve your personal and professional aspirations, plus, interact with distinguished faculty and admissions representatives.

**Bi-Weekly Meetings on Mondays from 5pm - 6pm in JE 111**

**Visit Instagram [@scsuwise](https://www.instagram.com/scsuwise) for more information!**

#### **Physics Club - The Society of Physics Students (SPS)**

Our department is proudly home to the SCSU chapter of the Society of Physics Students, the national professional organization for physics majors. With the 2025 Physics and Astronomy Congress ahead in Denver, CO, now is the perfect time to get involved!

**Weekly Meetings on Wednesdays from 3pm - 4pm in the Lower-Level Atrium. Email Club President Andre at [correaa6@southernct.edu](mailto:correaa6@southernct.edu) for more information.**