BOSTON UNIVERSITY

Boston University Photonics Center

2025 ANNUAL REPORT

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(Front cover: A photo of the BU Photonics Center. Photo Credit: Kelly Peña)

223
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(BU Photonics Center from Mountfort St. Photo Credit: Kelly Peña)

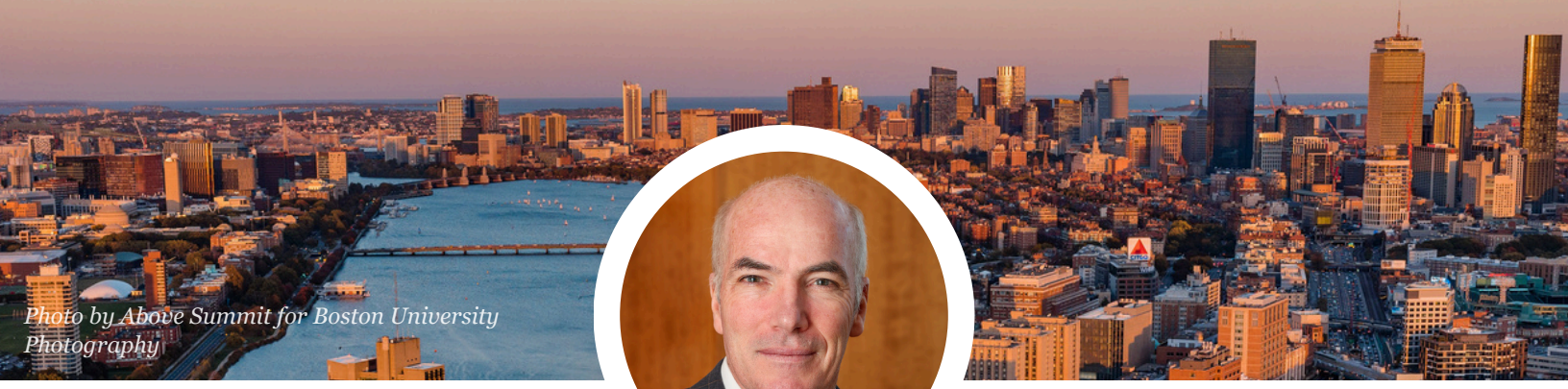


Photo by Above Summit for Boston University Photography

Director's Letter

This annual report summarizes activities of the Photonics Center for the 2024-2025 academic year. In it, you will find quantitative and descriptive information regarding our photonics programs in research, education, and business innovation.

Located at the heart of Boston University's urban campus, the Photonics Center is an interdisciplinary hub for education, research, scholarship, innovation, and technology development associated with practical uses of light. Our nine-story building houses world-class facilities and shared laboratories dedicated to the field of photonics, and sustains the work of faculty, staff, students, and affiliate companies. As a longstanding pillar of University research, our Center serves as a stalwart leader and steward to the wider research community amidst new and changing academic landscapes.

IN LIGHT OF EVOLVING STRATEGIES BOTH UNIVERSITY-WIDE AND ACROSS FEDERAL INSTITUTIONS, IT IS HEARTENING TO SHARE THAT PHOTONICS CENTER FACULTY WERE ABLE TO SECURE $36.3MM THIS YEAR IN NEW GRANT AWARDS.

Building upon a long history of success, such achievements are made possible through dedicated support from the Center's staff, faculty, and student researchers through proposal development, project management, access to fee-free core laboratories, and efforts to support research infrastructure.

Center staff engagement was particularly impactful this year through our administration and management of multiple large, multi-institution awards, our substantial renovation of faculty lab spaces and equipment, our leadership of several summer internship programs for undergraduates and K-14 Teachers, and our packed schedule of Center-hosted and -supported events, symposia, workshops, and training activities. This includes our 26th annual Photonics Center symposium, "Lighting the Brain," hosted by Professor **Chen Yang**.

This year, we welcomed Assistant Professor **Kirit Karkare** of the Physics department to our faculty; meanwhile, faculty members **Steve Ramirez**, **Lei Tian**, and **Xi Ling** were promoted to Associate Professor with tenure, while **Mary Dunlop** and **Darren Roblyer** were promoted to full professor. Collectively, our 52 active faculty have continued to author many articles in leading scientific journals, totaling **223 publications** this year, and were the recipients of multiple prestigious awards. Our graduating doctoral students defended over **37 successful** dissertations.

In addition to supporting core research, we provided critical resources to allied units across the university, aiding research and training projects that catalyzed transformative growth in areas such as biological design, precision diagnostics, and neuroscience. Recently, we received an award of a T32 training grant from the National Institutes of Health (NIH), led by NPC Director Professor **David Boas** with co-PIs Professors **Michelle Sander** and **Jerry Chen**, in close alliance with the Photonics Center.

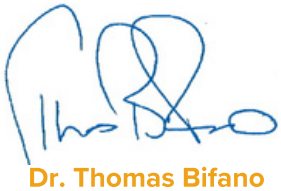
We furthermore met new and continued avenues of growth and development for our center community. Notably, the Photonics Center received $500k from SPIE as part of their SPIE Endowment Matching program, totaling a $1-million endowment with Boston University funds, which will be used to fund a photonics scholarship to support graduate students and postdoctoral scholars going forward. Associate Professor **Brian Walsh's** lab met historic success as their LEXI telescope landed on the moon earlier this year as part of Firefly Aerospace's "Blue Ghost" lunar lander project, to study the Earth's magnetosphere from space. Professor **Irving Bigio's** technology for the DermaSensor device was listed as one of TIME Magazine's best inventions of 2024. And we saw multiple prestigious awards among our faculty, including the award of an NIH S10 for a Three-Photon Microscope for Fluorescence and Phosphorescence Lifetime Imaging, led by Professor **Anna Devor**; **Mary Dunlop** was the recipient of the University's first-ever Award for Excellence in Mentoring Postdocs; and Dunlop and Boas were both recipients of this past year's internal Kilachand Fund awards.

The Business Innovation Center, which has always been a hub for industry/university engagement, houses 16 tenants, including several BU spinouts, returning innovators, and strategic optics/photonics industry partners. These affiliates support many BU student interns and engage in Center innovation and training workshops, as an important part of our community.

For the eighth year, the Photonics Center led programming, administration, budgeting, and community building for the 10-year, $40M NSF Nanoengineering Research Center on Cellular metamaterials (CELL-MET), led by Professor **Dave Bishop**.

This past summer saw another successful year of programming led by Professor **Xin Zhang** and supported by staff member **Brenda Hugot** for our Summer Research Programs. Sixteen undergraduates from around the country engaged in summer research and professional development at the Photonics Center through our NSF Research Experiences for Undergraduates (REU) program. They were joined this year by seven BU undergraduates in the CELL-MET Research Experience and Mentoring (REM) program. The NSF REU and REM programs aim to increase access to STEM research and careers. Professor Zhang's longstanding Research Experiences for Teachers (RET) proposal was renewed by NSF, promising another three years of vibrant summer experience for high school teachers and community college faculty, to inform their teaching and curriculum development. Professor **Darren Roblyer's** new REU proposal in "Translational Biophotonics" was also funded for the next three years, so our summer community continues to develop and thrive.

I am delighted to be associated with the faculty, staff, students, and industry affiliates of the Photonics Center, and appreciate your continued interest in our programs.



Dr. Thomas Bifano
Center Director

The Photonics Center Community gathers for the annual summer cookout.
Photo Credit: Kelly Peña

In August 2024, President Melissa Gilliam visited the Photonics Center to tour our shared facilities and laboratories

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At a Glance

AT A GLANCE

Mission

The Photonics Center is a university-wide center reporting to the Vice President for Research with a mission to generate fundamental knowledge and develop innovative technology in the field of photonics. We work on challenging problems that are important to society, translate enabling research discoveries into useful prototypes, and train future leaders in the field.

The Photonics Center community of faculty, staff, students and postdocs engages in interdisciplinary collaborations to advance the frontiers of optics and photonics science and engineering. This mission is executed through:

Research
Basic research and academic scholarship in photonics, including support of major proposals and awards

Education
Training programs and immersive research experiences for students and teachers

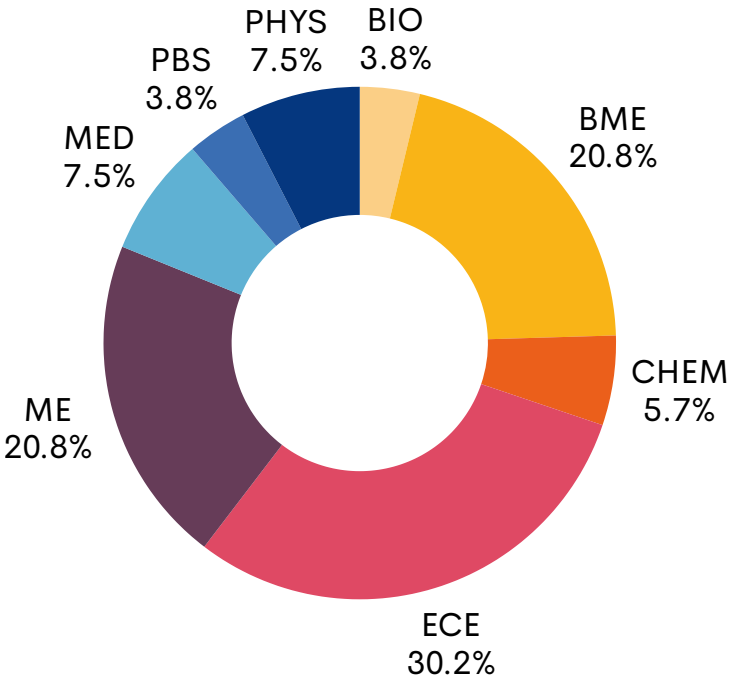
Technology Development
Technology development for defense, security, and healthcare applications

Commercial Incubation
Business incubation and commercialization of photonics technology

BUPC Membership

Over the past 10 years, faculty membership has increased from 38 members to 52 active members and 10 emeritus faculty across a wide range of departments and schools.

Affiliates include the Materials Science and Engineering Division of the College of Engineering, for which BUPC manages faculty labs and shared facility space, and the Neurophotonics Center, which BUPC supports with core funding and shared administrative aid.



AT A GLANCE

Strategic Goals

OVERVIEW

The Photonics Center operational plan is driven by five major strategic goals which steer all efforts in the Center.

1. Catalyze and support major research projects
2. Lead training and educational enrichment programs
3. Promote technology development through the Business Innovation Center
4. Foster a cohesive community through events and programming
5. Provide an enabling infrastructure of shared facilities and individual faculty labs for research

Photonics Center REUs and REMs showcased the culmination of their summer of research during our 2025 Summer Programs poster session. Photo Credit: Danny Gianciopp

MAJOR RESEARCH PROJECTS

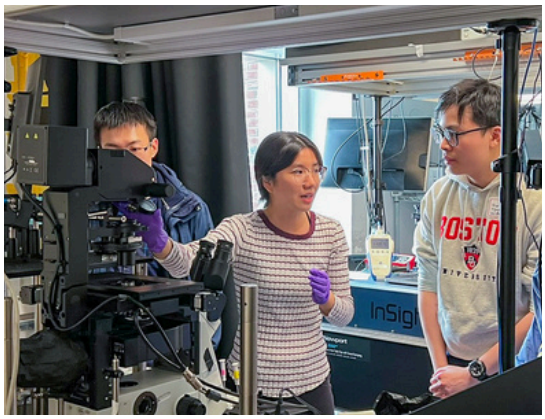
These goals are executed through the Center's continued efforts in proposing, winning, administering, and managing large research grants and projects. Currently supported major awards include the following.

NSF ERC (CELL-MET)

Now in its 8th year, the National Science Foundation Engineering Research Center on Cellular Metamaterials (NSF ERC (CELL-MET)), administered by the Photonics Center, continues to make significant advances toward our 10-year vision to build cardiac patches capable of repairing damaged hearts and cardiac tissue platforms that can serve as clinically relevant models for heart physiology and disease research. This year saw supplemental NSF funding for Research Experience and Mentoring Programs, and advancements to our EEK! outreach program. **To read more, see page #41**

NIH U19 BRAIN Initiative Award

This multi-university, five-year, $14M project to study Local Neuronal Drive and Neuromodulatory Control of Activity in the Pial Neurovascular Circuit is led by Professor Anna Devor with BU faculty Michael Economo and Lei Tian, and administered through the Photonics Center. The project involves partners from Massachusetts General Hospital, MIT, University of California San Diego, and University of Illinois Chicago. The goal is to develop a method for extracting information about neuronal circuit activity from functional Magnetic Resonance Imaging (fMRI) scans.



Kilachand Fund for Integrated Life Sciences and Engineering

This project, led by Professor Xin Zhang with BU faculty Stephan Anderson and Ioannis Paschalidis, aims to develop an ultra-low field (ULF) MRI system, thereby producing a metamaterial-enhanced hardware to physically boost the signal received by the imaging system. Now in its fourth year, the proposed ULF-MRI technology would disrupt existing limitations in MRI and lead to low-cost technology that is readily portable and mobile and could mitigate financial constraints that prevent MRI from being used prevalently throughout the world.

Center for Semiconductor Materials and Device Modeling (CSM)

Professor Enrico Belloti leads the CSM, a cooperative agreement with DOD/ARL that brings together government, academia, and industry in collaboration to fund research through subcontracts and industry contracts. With $6.25M of provided funding over 5 years, Phase II of the CSM boradly aims to advance the technology in the fields of Infrared Sensors, Photonic Devices, RF and Power, Persistent Power Sources, and Neuromorphic Devices.

NIH T32 Graduate Training at the Interface of Neuroscience, Optical Engineering and Data Science

Launched in August 2024, the NIH T32 Graduate Training continues to produce the next-generation of investigators capable of rigorously and creatively developing and applying photonics methods across a wide array of neuroscience subfields to advance our understanding of the brain in health and disease. Through a field-defining neurophotonics curriculum, combining technical training, computational/data analysis, and critical thinking skills, this program has added three new trainees this year.

Summer Research Programs

The Photonics Center's summer research experience programs continue to energize our research community. Our 2025 cohort consisted of 23 undergraduate participants with a diversity of funding. The Photonics Center's primary aim for our summer programs is to provide immersive interdisciplinary research experiences that promote graduate study in our field by talented students from diverse backgrounds, filling an important graduate recruitment pipeline. This summer's programming culminated with a joint poster event for Photonics and Physics REU and REM programs, attended by more than 120 BU students and faculty.

The 2025 REU and REM cohort after receiving their certificates of completion. Photo Credit: Kelly Peña

TRAINING PROGRAMS & INITIATIVES

In training and education, the Photonics Center administers and manages the NSF REU and RET Sites in Integrated Nanomanufacturing and NSF REM, REU, and RET Supplements for the ERC in Cellular Metamaterials. A new REU program, awarded this past year, with a focus on translational biophotonics with a complementary focus on bioethics, will be launched in summer 2026.

Additionally, the Photonics Center leads a robust outreach program with K-12 partner schools, partnering with STEM program leaders and teachers in primarily Hispanic East Boston to engage in spirited multi-grade level student interactions.

To learn more about each program, see page #38

AT A GLANCE

Highlights

This year, the Photonics Center appointed a new faculty member in addition to renovating faculty office and lab spaces. Below is a look at some of the many achievements and accolades our faculty produced.

FACULTY APPOINTMENTS

This year, the Photonics Center welcomed **Kirit Karkare** (PHYS) as a new faculty member. Assistant Professor Karkare is an experimental cosmologist, building telescopes to observe faint radiation in the millimeter-wave region, including the cosmic microwave background and distant galaxies, to learn about the Big Bang and fundamental physics in the early universe. Related photonics interest lies in utilizing OPF to fabricate sensitive superconducting photon detectors, as his cameras require detector arrays that must be custom-made.

HONORS & DISTINCTIONS

Among the awards and promotions received by Photonics Center faculty for their scholarly and academic achievements, some highlights include:

Ji-Xin Cheng
Biophotonics Technology Innovator Award | SPIE, 2024

Wanzheng Hu
DOE Career Award | Dept. of Energy, 2024

Hadi Nia
DoD Idea Award Dept. of Defense | Melanoma Research Program, 2024

Roberto Paiella
Outstanding Teacher Award |Boston University ECE Dept., 2024

Sean Lubner
AFOSR Young Investigator Program Recipient | Air Force Office of Scientific Research, 2024

Tianyu Wang
Peter J. Levine Career Development Professorship | Boston University, 2024

Chen Yang
NIH Trailblazer Award | NIH, 2024

Xin Zhang
Robert Henry Thurston Lecture Award | Fast Company, 2024

PUBLICATION HIGHLIGHTS

223

Publications of prominent articles in high-impact journals by Photonics Center faculty. Highlights include:

"A Robust Near-Field Body Area Network Based on Coaxially-Shielded Textile Metamaterial" Stephan Anderson, Xin Zhang, et al. | *Nat Commun, 15*

"Widefield in vivo imaging system with two fluorescence and two reflectance channels, a single sCMOS detector, and shielded illumination" David Boas, Anna Devor, et al. | *SPIE* Digital Library

"The Parkinson's Disease Drug Entacapone Disrupts Gut Microbiome Homeostasis via Iron Sequestration" Ji-Xin Cheng *et al.* | *Nat Microbiol, 9*

"Perirhinal Cortex Learns a Predictive Map of the Task Environment" Jerry Chen *et al.* | *Nat Commun, 15*

"Millimetre-deep Micrometre-Resolution Vibrational Imaging by Shortwave Infrared Photothermal Microscopy" Ji-Xin Cheng *et al.* | *Nat Photon, 18*

"EventLFM: Event Camera Integrated Fourier Light Field Microscopy for Ultrafast 3D Imaging" Christopher Gabel, Lei Tian, *et al.* | *Light Sci Appl, 13*

"Beta-Frequency Sensory Stimulation Enhances Gait Rhythmicity Through Strengthened Coupling Between Striatal Networks and Stepping Movement" Xue Han *et al.* | *Nat Commun, 15*

"Chiral Spin-Liquid-Like State in PyroChlore Iridate Thin Films" Wanzheng Hu *et al.* | *Nat Commun, 15*

"Unconventional Solitonic High-Temperature Superfluoresence from Perovskites" Anna Swan *et al.* | *Nature 642*

"A blueprint for precise and fault-tolerant analog neural networks" Ajay Joshi *et al.* | *Nat Commun, 15*

GRANT SUPPORT HIGHLIGHTS

The SPIE-Boston University Scholarship in Photonics, **Thomas Bifano**, SPIE $500K (Matched by Boston University)

Expanding Inclusion of all Subjects for Ultra-High Density Wearable FNIRS in the Everyday World, **David Boas**, NIH $836K

Bio-Orthogonal Mid-Infrared Photothermal Imaging of Cancer Metabolism, **Ji-Xin Cheng**, NIH $1.22M

Screening Countermeasures in vitro for Filovirus Infections (SCIFI), **John Connor**, Draper Laboratory, Inc. $1.82M

Prototype Flat-Optic-Enhanced Night Vision Systems, **Luca Dal Negro**, Physical Sciences, Inc. $630K

Three-Photon Microscope for Fluorescence and Phosphorescence Lifetime Imaging, ***Anna Devor***, *NIH $749K*

Optogenetic Control for Metabolic Engineering Using Protein-Level Regulation, **Mary Dunlop**, NSF $519K

Cellular and Network Mechanisms of Epilepsy and Neuromodulation, **Xue Han**, NIH $3.17M

Collaborative Research: Interfacial Excitation Transfer In Hybrid Metal/Chalcopyrite Plasmonic Nanostructures, ***Björn Reinhard***, *NSF $411K*

Research Experience for Undergraduates (REU) Site: Translational Biophotonics, **Darren Roblyer**, NSF $462K

Linear and Nonlinear Performance Analysis of Specialty Fibers, ***Michelle Sander***, *DOD Navy $745K*

Injectable Optoacoustic Retina Prostheses, ***Chen Yang***, *NIH $590K*

Research Experience for Undergraduates (REU) Site: Integrated Nanomanufacturing, **Xin Zhang**, NSF $464K

A photo from the Blue Ghost spacecraft, featuring the Walsh Lab's LEXI telescope, LEXI

Photo courtesy of Firefly Aerospace

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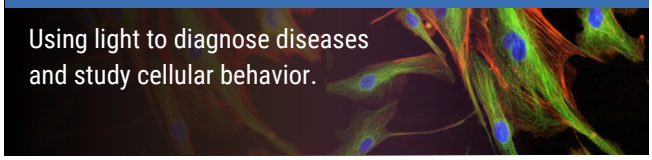
Our Research

OUR RESEARCH

Scientific & Technical Themes

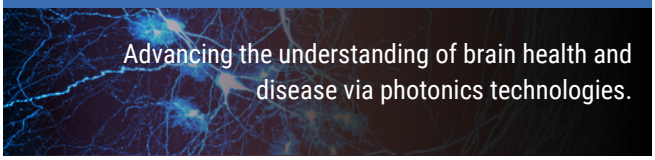
In general, research at the Photonics Center focuses on practical uses of light-based technologies. However, the Photonics Center does categorize its widespread, interdisciplinary research through six themes:

BIOPHOTONICS & BIOIMAGING



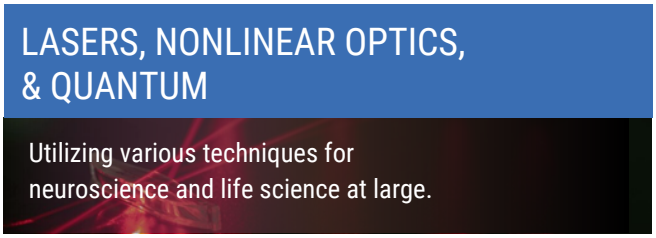
Using light to diagnose diseases and study cellular behavior.

NEUROPHOTONICS



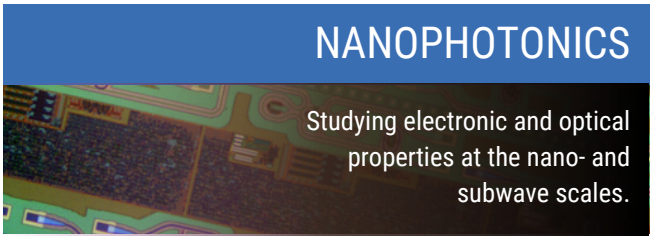
Advancing the understanding of brain health and disease via photonics technologies.

LASERS, NONLINEAR OPTICS, & QUANTUM



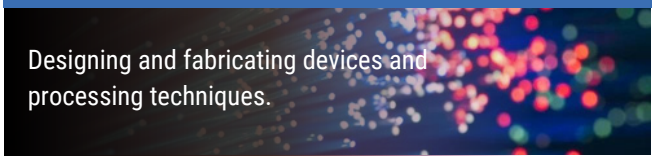
Utilizing various techniques for neuroscience and life science at large.

NANOPHOTONICS



Studying electronic and optical properties at the nano- and subwave scales.

PHOTONIC MATERIALS & DEVICES



Designing and fabricating devices and processing techniques.

PHOTONIC METAMATERIALS

Defining characteristics by shape and size using advanced technologies.

While these research themes are not all-encompassing of our members' areas of interest, they represent areas in which we have substantial activity and reputation, and in which we have made significant investments in research infrastructure through shared lab facilities and other infrastructural support.

The outcomes of research in these thematic areas have an impact on society through applications in such fields as medical imaging systems, diagnostics, laser communication, chemical and biological material synthesis, laser system development, automation, and defense.

OUR RESEARCH

Faculty

Ranging across Biology, Biomedical Engineering, Chemistry, Electrical & Computer Engineering, Materials Science & Engineering, Mechanical Engineering, Medicine, Physics, Psychological & Brain Sciences departments, our 52 active faculty and 10 emeritus faculty continue to elevate optics and photonics research in new and exciting ways.

Michael Albro
Assistant Professor
ME, BME, MSE

Stephan Anderson
Associate Professor
ME, MED

Soumendra Basu
Professor
ME, MSE

Enrico Bellotti
Professor
ECE, MSE

Thomas Bifano
Professor
ME, MSE, BME, ECE

Irving Bigio
Professor
BME, ECE, PHYS, MED

David Bishop
Professor
ECE, MSE, PHYS, ME, BME

David Boas
Professor
BME, ECE

Keith Brown
Associate Professor
ME, MSE, PHYS

Scott Bunch
Associate Professor
ME, MSE

Jerry Chen
Associate Professor
BIO, BME, PBS

Ji-Xin Cheng
Professor
ECE, BME, MSE, CHEM, PHYS

John Connor
Professor
MED

Luca Dal Negro
Professor
ECE, MSE, PHYS

Ian Davison
Associate Professor
BIO

Anna Devor
Professor
BME

Mary Dunlop
Professor
BME

Michael Economo
Assistant Professor
BME

Kamil Ekinci
Professor
ME, MSE

Shyamsunder Erramilli
Professor
PHYS, MSE, BME

Christopher Gabel
Associate Professor
MED

Lee Goldstein
Associate Professor
MED

Xue Han
Professor
BME

Wanzheng Hu
Assistant Professor
PHYS, MSE

Ajay Joshi
Professor
ECE

Masha Kamenetska
Associate Professor
PHYS, CHEM, MSE

Kirit Karkare
Assistant Professor
PHYS

Xi Ling
Associate Professor
CHEM, MSE

Sean Lubner
Assistant Professor
ME, MSE

Catherine Klapperich
Professor
BME, MSE, ME

Jerome Mertz
Professor
BME, ECE, PHYS

Hadi Nia
Assistant Professor
BME, MSE

Miloš Popović
Associate Professor
ECE

Siddharth Ramachandran
Professor
ECE, PHYS, MSE

Roberto Paiella
Professor
ECE, MSE

Steve Ramirez
Associate Professor
PBS

Björn Reinhard
Professor
CHEM, MSE

Darren Roblyer
Professor
BME, ECE

Michelle Sander
Associate Professor
ECE, BME, MSE

Benjamin Scott
Assistant Professor
PBS, BME

Joshua Semeter
Professor
ECE

Alexander Sergienko
Professor
ECE

Andre Sharon
Professor
ME, MSE

Minjung Son
Assistant Professor
CHEM, MSE, PHYS

Anna Swan
Associate Professor
ECE, PHYS, MSE

Lei Tian
Associate Professor
ECE, BME

Selim Ünlü
Professor
ECE, MSE, BME

Brian Walsh
Associate Professor
ME, ECE

Tianyu Wang
Assistant Professor
ECE

John White
Professor
BME

Chen Yang
Professor
ECE, CHEM, MSE

Xin Zhang
Professor
ME, ECE, BME, MSE

EMERITUS

Bennett Goldberg
PHYS, ECE, BME

Allyn Hubbard
BME, ECE

Theodore Morse
ECE, MSE

Theodore Moustakas
ECE, MSE

Kenneth Rothschild
PHYS

Michael Ruane
ECE

Malvin Teich
BME, ECE, PHYS

Barry Unger
MET

Alice White
ME, MSE, BME, PHYS

Lawrence Ziegler
CHEM, MSE

OUR RESEARCH

In the Media

Photonics Center community members were featured in well-over 40 articles this past year––ranging from BU's leading science news outlet, The Brink, to NSF, the New York Times, NASA, Bostonia, SPIE, Optica, MedicalXPress, and more! Be sure to check out some of our highlighted coverage here.
To see all our updates, see the News & Events section on our website!

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To see all our latest features, scan here or find it on the Photonics Center website!

COULD SEVERANCE EVER HAPPEN IN REAL LIFE?

BU Today featured Professor Steve Ramirez in their investigation into the real-life possibility of the hit television show *Severance*. Ramirez spoke about the nature of memory, the fragmentation of ourselves, and how something like *Severance* might not even break the laws of physics.

SIXTEEN CAS FACULTY PROMOTED TO ASSOCIATE PROFESSOR

Professors Xi Ling and Steve Ramirez were featured by the College of Arts and Sciences for their recent promotions to Associate Professor. Ling's successes in securing major grants for her work and Ramirez's groundbreaking work in the neuroscience of memory were highlighted in the article.

THE MOON LANDING THAT MADE BOSTON UNIVERSITY HISTORY

A telescope built by BU researchers hitches a ride on a private spacecraft and touches down on the moon. The goal: to record the dynamics between the Earth and sun.

COMBINING CUTTING-EDGE TECHNIQUES TO STUDY HOW BRAIN CELLS FUNCTION TOGETHER

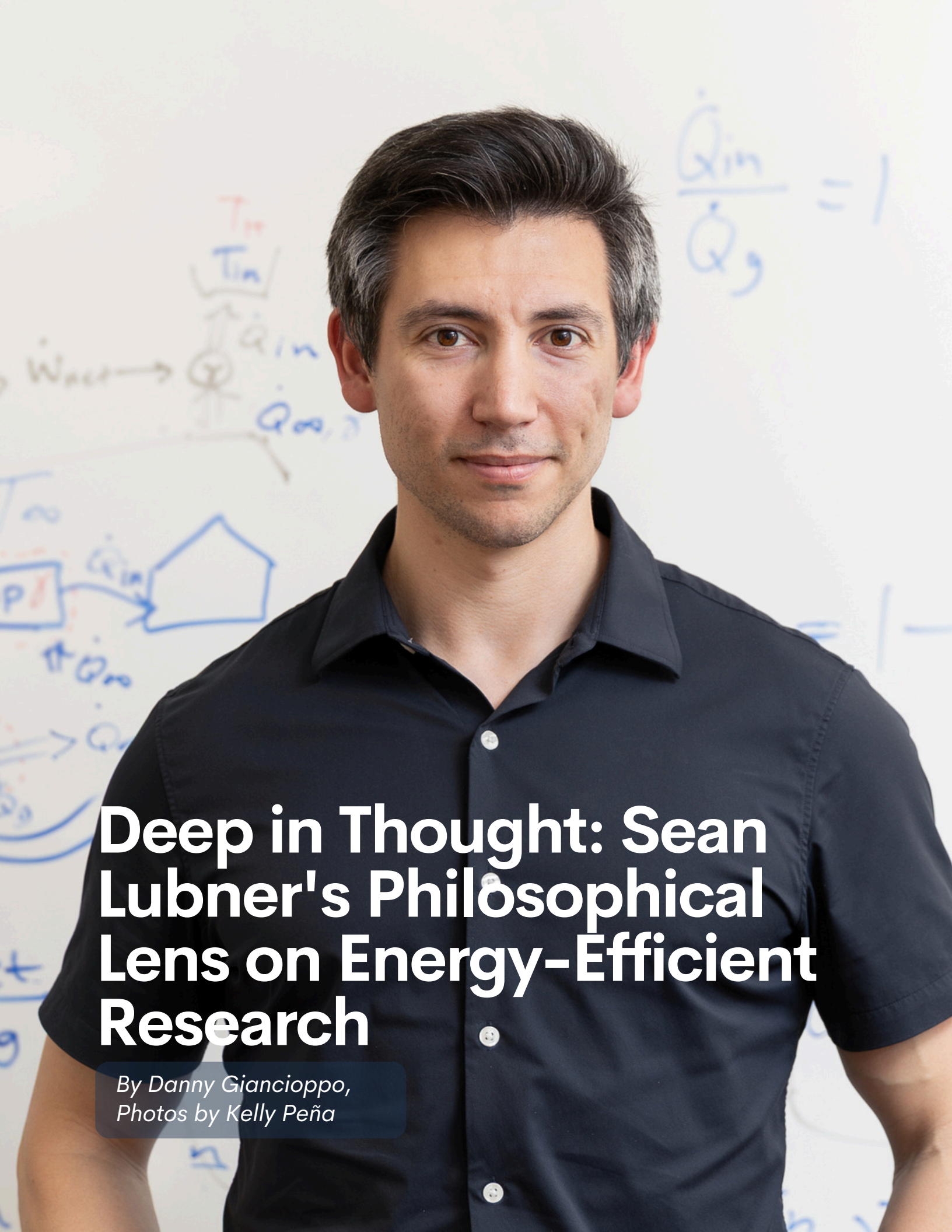
Professors Xi Ling and Steve Ramirez were featured by the College of Arts and Sciences for their recent promotions to Associate Professor. Ling's successes in securing major grants for her work and Ramirez's groundbreaking work in the neuroscience of memory were highlighted in the article.

SPIE AND BOSTON UNIVERSITY ANNOUNCE $1-MILLION ENDOWMENT FOR GRADUATE AND POSTGRADUATE SCHOLARSHIPS

The international society for optics and photonics, SPIE, awarded Boston University with a $500,000 endowment, matched by BU, to support graduate researchers at the Photonics Center.

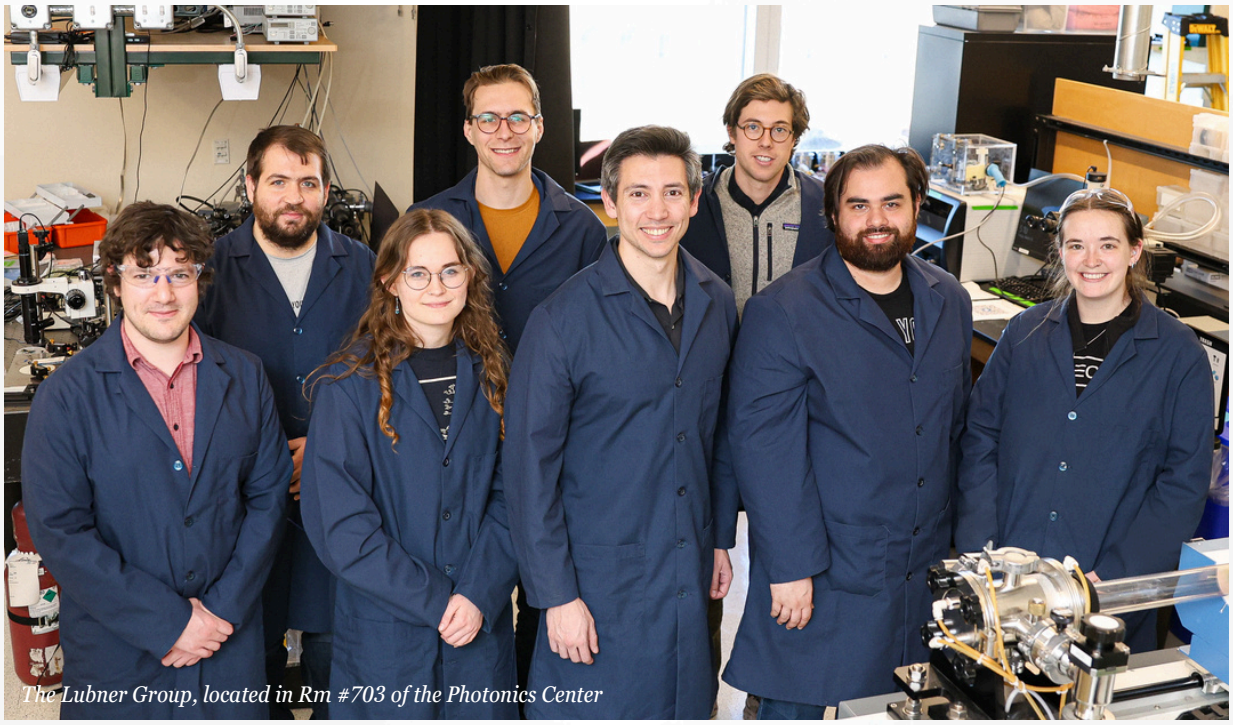
THOMAS A. EDISON PATENT AWARD FOR XIN ZHANG

The College of Engineering recognized Professor Xin Zhang for receiving the premier Thomas A. Edison Patent Award from the American Society of Mechanical Engineers. The article praised Zhang's work for its variety of applications, including healthcare and infrastructure.



Deep in Thought: Sean Lubner's Philosophical Lens on Energy-Efficient Research

By Danny Giancioppo,
Photos by Kelly Peña



The Lubner Group, located in Rm #703 of the Photonics Center

DO YOU EVER WONDER WHY WE'RE HERE?

It's one of life's great mysteries. How did the modern world come to be, how did its many societies evolve, and where are they going? In the wake of so many systemic issues, what avenues exist for change? Questions like these might not sound intrinsically related to physics and engineering––they might sound a bit more like a philosophy course––but a philosophical angle is precisely what has driven **Assistant Professor Sean Lubner (ME, MSE) and his research group to pursue projects dedicated to nano-to-macro energy storage and conversion.**

Carrying both a philosophical and academic intrigue came to Lubner during his time in undergrad, where he obtained dual degrees in mechanical engineering (ME) and applied physics, with a minor in philosophy.

"I may be in that bucket of people who have always had a very strong curiosity about how the universe works," Lubner says. "Coupled with a belief that it is interesting to understand––and it is possible to understand––how things work." This lent itself to a joint interest in physics and philosophy, serving the same overall goal: to learn more about ourselves and the world we live in, and try to improve them.

As he continued his education, pursuing a PhD and research assistant position at UC Berkeley, this mentality alerted Lubner toward larger, more systemic problems our society faces. Included were questions on sustainability and renewable energy. Opting to continue as a postdoc at Berkeley after graduation, he dedicated his work to nanoscale heat transfer and energy conversion as part of a larger academic framework. Since joining Boston University as an Assistant Professor, that framework has broken into three branches: Direct Air Capture (DAC), grid-scale thermal energy storage, and thermal wave sensors (TWS)...

DAC is a way to directly reduce atmospheric CO2, whereas grid scale energy storage is a means to enable replacing fossil fuels with renewable energy (that does not emit greenhouse gases). It is also true, however, that DAC requires enormous amounts of energy, which requires renewable energy power sources, rather than high carbon-intensity fossil fuels, to avoid worst-case climate change scenarios...

To read the full article, scan here or find it on the Photonics Center website!

Student Spotlight:

Ariane Garrett Paves the Way for More Accurate Blood Pressure Monitoring

by Gwyneth Moe

Ariane Garrett is no stranger to innovation. As a Biomedical Engineering PhD student in **Professor Darren Robyler's lab**, she's changing the game for medical professionals with her work on a new device that measures blood pressure with more frequency and precision than currently available technology.

Garrett has always had a love for science. Her mother is a professor of biochemistry at Vassar College, so you could say it runs in the family.

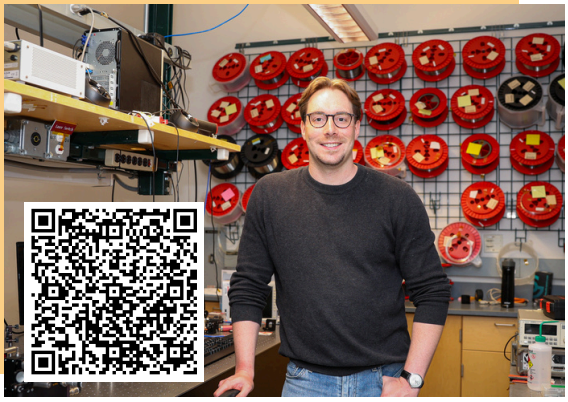
After graduating high school, she studied biomedical engineering (BME) at the University of Connecticut. She chose BME because the field combined her love of math and science with her desire to do something good for the world. It turns out she chose correctly, coming to love the field more than she could have ever imagined, and went on to pursue her doctorate in the same subject at Boston University.

"I started my PhD in 2020. So, I moved here very much in the thick of Covid, and a lot of things were remote. Moving to a new city and then also having Covid happening at the same time was definitely a difficult transition," says Garrett. But, after the rocky start, everything clicked into place once she began her research. "It's been a great experience," says Garrett. "I sometimes talk to people considering PhDs and they're like, 'oh my God, I hear it's terrible,' And I'm like, 'no, it can be a really good and satisfying.'"

During her first year at BU, Garrett circled through three lab rotations before ultimately deciding to join Darren Roblyer's lab, which works to develop a suite of optical technologies to study tissue structure and function. They specialize in the development of optical technologies to study cancer and cardiovascular disease.

"I was pretty conflicted about which lab to choose," Garrett explains. "I also rotated in Xin Zhang's and Michelle Sander's labs. But they did more microscopy work, microscopy and spectroscopy. While Darren's lab is more diffuse optics, a little bit more translational. I just really liked the vibe of his lab, and so I ended up choosing that program in [the] spring of 2021."

To read the full article, scan here or find it on the Photonics Center website!



THIERRY LAPOINTE-LECLERC STRIVES TO CONNECT PHOTONICS GRAD STUDENTS IN RESEARCH AND BEYOND

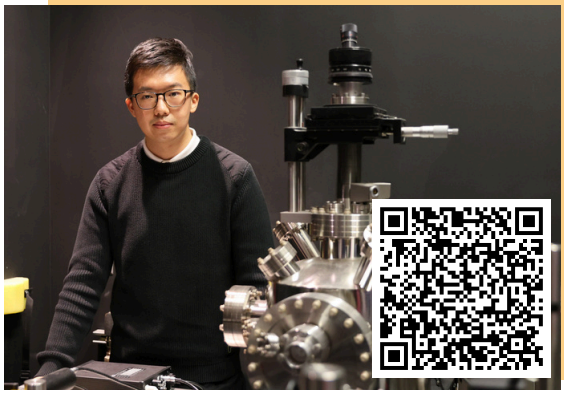
by Gwyneth Moe

Thierry Lapointe-Leclerc knows that science would be nowhere without the dedication and passion of the researchers behind it.

MONAN MA: MAKING BIG WAVES WITH NANOTECHNOLOGY IN THE EKINCI LAB

by Jack Osmond

Monan Ma researches phenomena on the nanometer scale, but he's no small figure at the Boston University Photonics Center.



WILL CUNNINGHAM MAKES MOVES ON NPC GRADUATE STUDENT ORGANIZATION AND NEURONAL CIRCUITRY RESEARCH

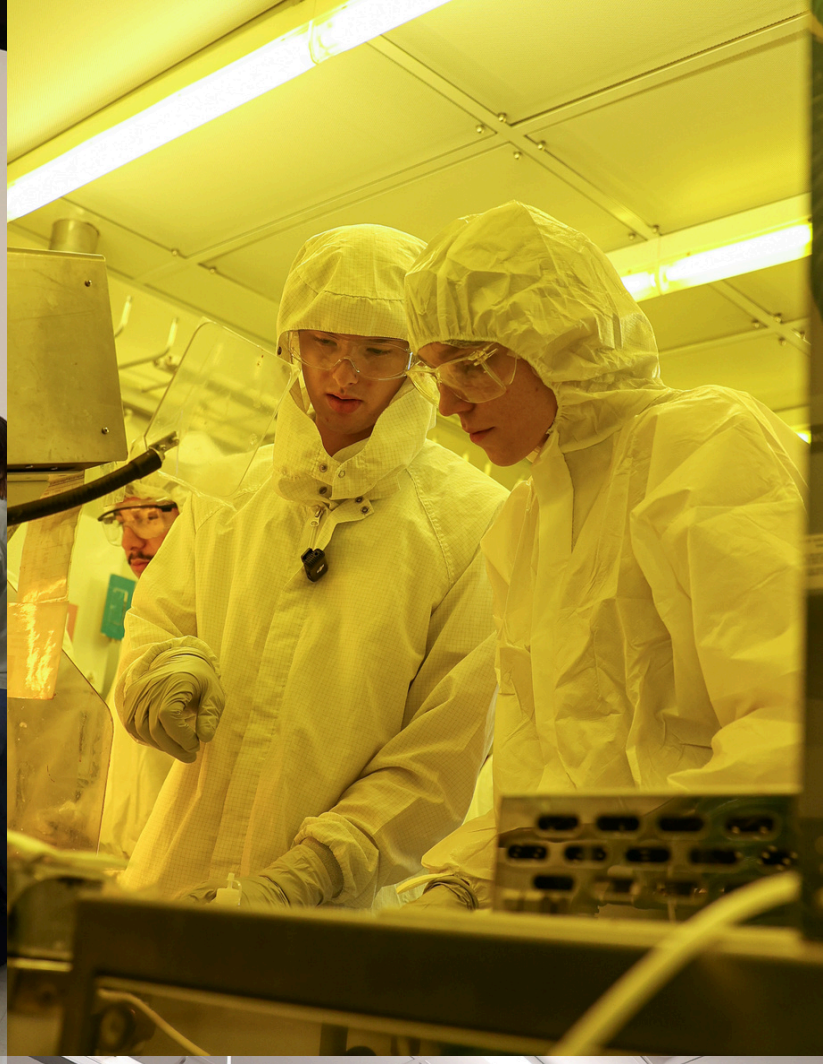
by Danny Giancioppo

Will Cunningham is helping to found the Neurophotonics Training Organization (NPTO), a student chapter that will house individual student groups under one umbrella.

PHD STUDENT DANIEL SHAHAR IS BENDING LIGHT AND BREAKING BOUNDARIES IN THE RAMACHANDRAN LAB

by Jack Osmond

Reading about the latest cutting-edge scientific discoveries, it's easy to forget about some of the people behind the experiments, crunched numbers, and written reports: the graduate students.



The Photonics Center's four shared laboratories are available for all community members to utilize, at no cost

QUANTA 3D FEG

3

Enabling Research Infrastructure

Shared Facilities
Shared Laboratories
Equipment Updates & Acquisitions

ENABLING RESEARCH INFRASTRUCTURE

Shared Facilties

Ranging across Biology, Biomedical Engineering, Chemistry, Electrical & Computer Engineering, Materials Science & Engineering, Mechanical Engineering, Medicine, Physics, Psychological & Brain Sciences departments, our 52 active faculty and 10 emeritus faculty continue to elevate optics and photonics research in new and exciting ways.

SHARED LABORATORIES

The **Optoelectronic Processing Facility (OPF)** spans over 2,500 square feet and focuses on fabricating optoelectronic and photonic devices. The facility houses equipment for thin film deposition, photolithography, wet and dry chemical processing, plasma etching and cleaning, metallization, thermal oxidation and annealing, wire bonding, and electrical characterization. Recent equipment acquisitions have substantially improved the facility's etching and optical lithography capabilities. Paul Mak manages the OPF.

The **Precision Measurement Lab (PML)** specializes in micro/nano structure measurement and analysis, as well as e-beam lithography of nanostructures. The lab features field-emission scanning electron microscopy, atomic force microscopy, surface mapping interferometry, Fourier-transform infrared spectroscopy, and scanning electron beam lithography capabilities. Alexey Nikiforov and Arthur Shih both have management responsibilities in PML.

The **Focused Ion Beam/Transmission Electron Microscope Facility (FTF)** provides nanometric and sub-nanometric machining and characterization capabilities. The facility includes a focused ion beam tool and transmission electron microscope, along with comprehensive sample preparation and characterization resources. Alexey Nikiforov manages the FTF.

The **Materials Science Core Facility (MSCF)** focuses on materials characterization, featuring processing hoods for materials preparation and equipment for X-ray crystallography, atomic force microscopy, and Raman spectroscopy. The facility operates under collective management by BUPC staff with support from the Materials Science and Engineering Division of the College of Engineering.

EQUIPMENT ACQUISITIONS AND UPGRADES

The Photonics Center maintains its commitment to providing researchers with advanced research infrastructure through continuous improvements and strategic investments.

OPERATIONAL IMPROVEMENTS

We addressed the longstanding chilled water system issues that affected equipment performance by engaging external consultants and implementing their recommendations with satisfactory results. Additionally, we enhanced accessibility to our shared laboratories through improved asynchronous online educational resources, including comprehensive standard operating procedures and instructional videos for equipment operation.

INFRASTRUCTURE DEVELOPMENT

We supported new faculty startups with essential equipment and lab renovations while maintaining ongoing enhancements and repairs to existing research spaces. Our technical staff ensure smooth daily operations of major shared lab facilities and provide comprehensive training for students and researchers.

INSTRUMENT ACQUISITIONS

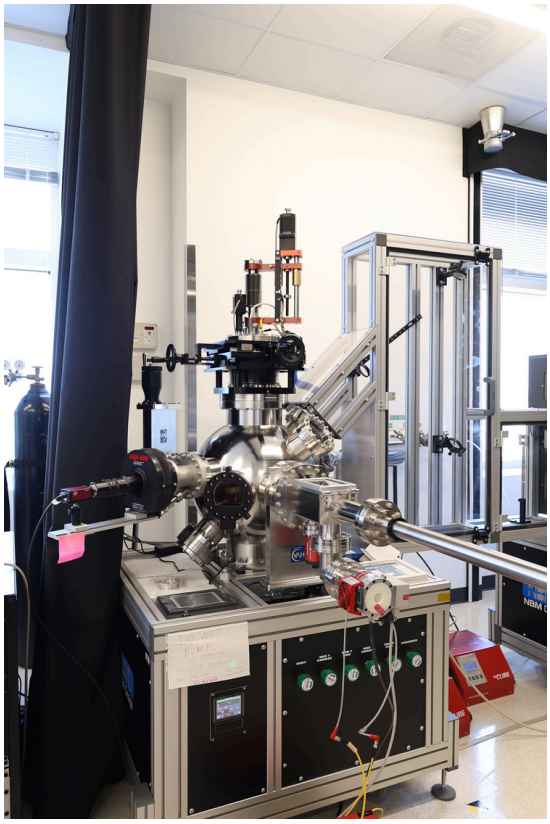
To read more about E&As, scan here or find it on the Photonics Center website!

2 Reactive Ion Etching (RIE) Instruments

Featuring advanced endpoint detection, temperature-controlled electrode plates, and multi-gas delivery capabilities supporting fluorine, chlorine, and oxygen-based chemistries. Additional capabilities include precise anisotropic etching of silicon, III-V semiconductors, dielectrics, and metals with etch rates ranging from nanometers to micrometers per minute.

Nanoscribe GT2 System

This two-photon polymerization system utilizes a 780 nm femtosecond laser for direct laser writing, achieving feature sizes down to 200 nm, and supporting both dip-in laser lithography (DiLL) and oil immersion lithography configurations, enabling fabrication of 3D microstructures up to several millimeters in size.

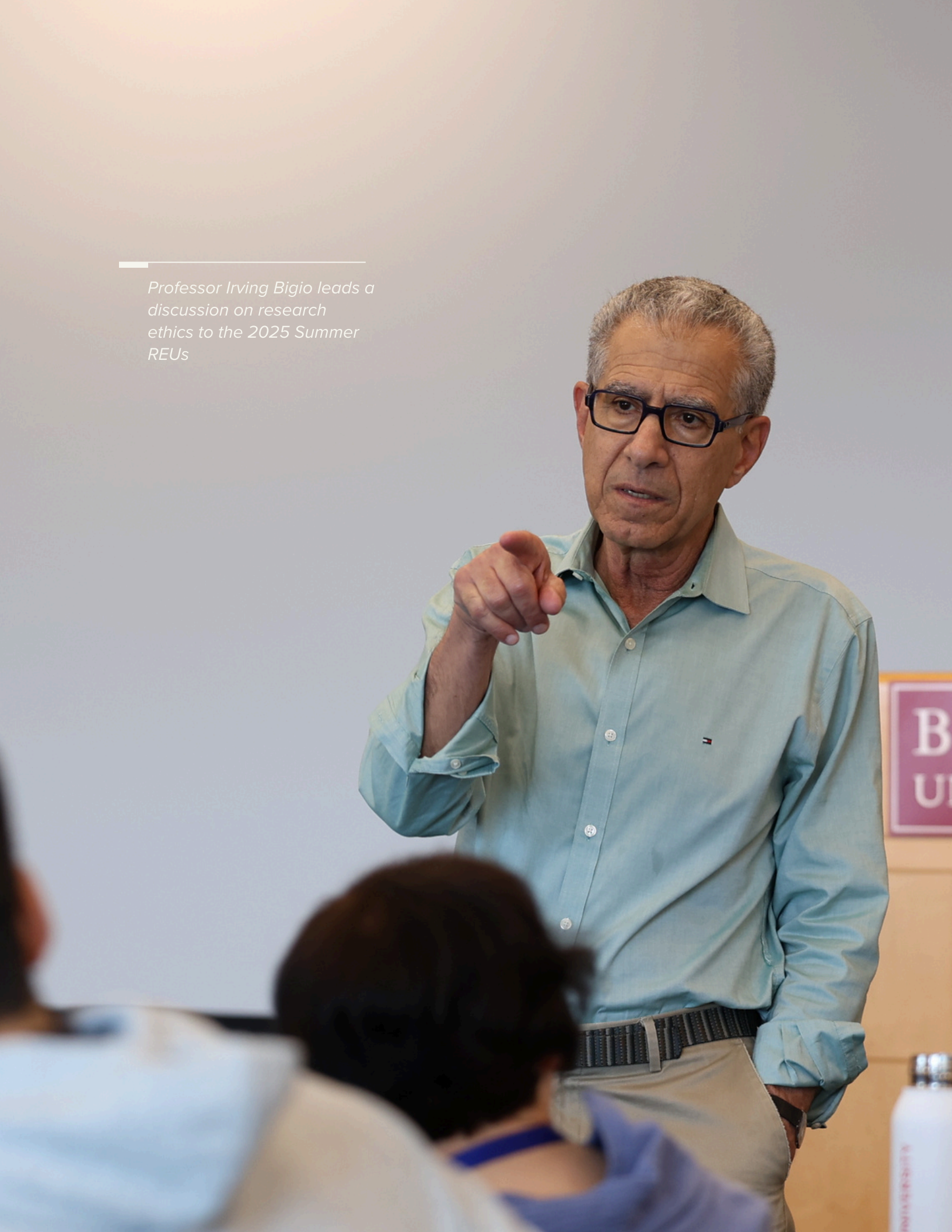


Angstrom Engineering Thermal Evaporator CoVap System

This multi-source system features six evaporation sources with individual shutters, quartz crystal monitors for real-time thickness control, and substrate rotation. The system achieves base pressures below 10^{-7} Torr and supports co-evaporation of multiple materials, enabling precise fabrication of multilayer structures, gradient films, and alloys.

NSF-Funded Pulsed Laser Deposition (PLD) System

Employs a KrF excimer laser (248 nm, 25 ns pulse width) with energy densities up to 5 J/cm² for ablating target materials. It furthermore enables epitaxial growth of complex oxide thin films, including superconductors, ferroelectrics, and multiferroics, as well as nitrides and other advanced materials with precise stoichiometric control.



Professor Irving Bigio leads a discussion on research ethics to the 2025 Summer REUs

4

Developing & Promoting Innovative Tech

Business Innovation Center

CELL-MET Innovation Ecosystem

DEVELOPING AND PROMOTING INNOVATIVE TECHNOLOGY

Business Innovation Center

The Business Innovation Center (BIC), located in the Photonics Center, is a hub of industry, housing outside entities and faculty startups looking to take their products to the next level.

The BIC main lobby, located on the 6th floor of the Photonics Center. Photo Credit: Kelly Peña

The BIC is a facility located at the Photonics Center that houses industry tenants engaged in commercial activities that are complementary to the Center's mission. Currently, the BIC is comprised of about 6000 sf of space that includes large and small office suites, multi-company shared office spaces, common areas, and dedicated shared laboratory spaces including a biosafety level 2 (BSL2) space built with funding from the Massachusetts Life Sciences Center. In FY25, the BIC hosted 16 tenants at its peak.

The goal of the BIC is to accelerate innovation by encouraging industry collaboration with faculty and to provide educational opportunities for graduate and undergraduate students. Innovation occurs at large companies as well as at start-ups, and the BIC is therefore comprised of start-up and mid- to large-size business enterprises in life sciences, biotechnology, photonics, and materials technologies.

Coalesenz
virex
AEMtec
everest biolabs
IRIS KINETICS
emeraldai
LEUKO
PlenOptika
Vision Driven Innovation
Qunett
THORLABS
STATA DX
Keylicon
Diametryx
Nuceptive
PrMetaz
BioRaster, LLC

AEMtec GmbH | Joined December 2019 | Focusing on high-accuracy die placement of components like chips, optics, and lenses. Upon joining the BIC, they made a $150,000 investment in their space to upgrade and customize it for their needs.

Bioraster | Joined November 2024 | Developing a novel antibacterial susceptibility testing instrument based on surface-enhanced Raman spectroscopy (SERS-AST) for use in clinical settings and hospitals around the world. A BU faculty spinout led by Professor Emeritus Larry Zeigler.

Coalesenz | Joined July 2021 | Creating low-cost solutions to detect clotting disorders and prevent life threatening hemorrhage and thrombosis in patients.

Diametryx | Joined March 2024 | Developing new color-changing particles in response to a magnetic field and mechanical actuation based on IP-protected technologies, including creating an erasable tattoo, energy-saving windows, and smart cosmetics.

Emerald AI | Joined May 2025 | Building a software solution to enable AI data centers to flexibly adjust their power consumption from the electricity grid on-demand. A BU faculty spinout led by Professor Ayse Coskun.

Everest Biolabs | Departed October 31, 2024 | A startup spun out of David Walt's Lab at the Harvard Wyss Institute developing sample preparation workflows and analytical techniques to power the next generation of exosome-based diagnostics and therapeutics. Two former BU PhD graduates, George Daaboul and David Freedman, ran the company.

iRiS Kinetics | Joined November 2020 | Developing and marketing imaging biosensor platforms for applications ranging from molecular binding affinity measurements to single biological particle detection. A BU faculty spinout led by Professor Selim Ünlü.

Keylicon Biosciences | Joined November 2024 | Developing a novel self-amplifying RNA (saRNA) platform. A BU faculty spinout led by Professors Mark Grinstaff and Wilson Wong.

Leuko Labs | Departed December 31, 2024 | An MIT spinout developing their PointCheck™ device for non-invasive white cell monitoring.

Nuceptive Labs | Joined April 2023 | Transforming sexual health through next-generation contraception, with novel condoms and associated accessories that enhance user experience and provide preferable alternatives to traditional birth control. A BU faculty spinout consulted by Professor Mark Grinstaff.

PlenOptika | Departed December 31, 2024 | Making technology that frees vision exams from the clinic, unlocking the regulated eyeglass prescription market.

Primetaz | Departed March 31, 2025 | Making materials that increase the signal of MRI machines. A BU faculty spinout led by Professors Xin Zhang and Stephan Anderson.

Quantum Network Technologies (Qunett) | Joined May 2023 | Developing hardware and software solutions for quantum internet, currently installing cryogenic infrastructure to build out a quantum networking test bed with a high-capacity quantum memory.

Stata Dx | Joined February 2022 | Building a next-generation blood diagnostic platform. Premiering with a portable "liquid MRI" device for the brain, enabling at-home monitoring of neurodegenerative conditions such as Multiple Sclerosis and Alzheimer's as well as rapid triage for acute neurological conditions like Traumatic Brain Injury.

Thorlabs | Joined February 2020 | Seeking partnerships with Boston area universities and researchers for: (1) accelerating research through offering early access to Thorlabs prototype technologies; (2) licensing startup or university owned patents; (3) increasing federal funding through letters of support and collaborative research; and (4) providing research opportunities for current students and career paths to graduating students while facilitating recruitment to Thorlabs.

Virex Health LLC | Departed February 28, 2025 | A subsidiary of Sorrento Therapeutics Inc., developing a rapid diagnostic that leverages the expertise of Sorrento Therapeutics in the production of highly specific antibodies targeting viral antigens, and the existing infrastructure of the glucometer industry. A BU Faculty spinout led by BU professors Scott Schaus and Mark Grinstaff.

CELL-MET Innovation Ecosystem

Capitalizing on support from NSF and additional donors, CELL-MET not only forwards cardiovascular research, but industry and innovation across relevant fields.

One of the main broader impacts goals of an NSF Engineering Research Center is to create a thriving innovation ecosystem with corporate members who bring industry perspective and facilitate and accelerate technology development and transfer to clinical use. These members form an Industry and Practitioner Advisory Board (IPAB) who regularly interact with the ERC, including engagement with trainees for workshops, "Perfect Pitch" competitions, professional development, and mentorship. John Hartnett, Director of Industry Engagement in the BU IE Office, leads this effort as the CELL-MET Industry Liaison Officer.

The NSF prescribes levels of membership and corresponding fees which can include both cash and in-kind contributions. Over the course of the 10-year ERC, one of the key elements to sustainability of the center's work beyond the NSF funding is through industry participation and support. John Hartnett developed a sustainability plan with the Senior Leadership Team as part of the ongoing strategic plan of CELL-MET.

*Mike Pratt, Managing Director, Technology Development, presenting at CELL-MET Industry Day 2024. Photo Credit: Danny Gianciopp*o

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Over the course of the 10-year ERC, one of the key elements to sustainability of the center's work beyond the NSF funding is through industry participation and support. John Hartnett developed a sustainability plan with the Senior Leadership Team as part of the ongoing strategic plan of CELL-MET.

Highlights over the first eight years of the CELL-MET ERC include the establishment of an Industry Practitioner Advisory Board whose members have contributed funds, equipment, mentoring, and internship/research opportunities. In the first eight years members have contributed $1,457,246 to the center consisting of $788,834 in cash membership dues and $668,412 of in-kind contributions. These cash contributions have been used to support nine seed projects for commercialization totaling $650K. CELL-MET has submitted 24 patent filings to date with two licenses granted. In addition, CELL-MET industrial affiliates have supported four sponsored research projects directly with CELL-MET participants, including projects with Boston Micromachines Corporation, Imagion, Analog Devices, and IBM. As part of its Innovation Ecosystem activity, CELL-MET hosted an "Industry Engagement" workshop in November 2024 with its Industry Affiliates.

A summary of support received by CELL-MET from its industrial affiliates is shown in the table below:

TOTAL OCT 2017–SEPT 2025

Company	Cash	In-Kind	Total
Bayer	$0	$25,000	$25,000
BioMetrix	$2,667	$0	$2,667
Bioventus	$39,583	$0	$39,583
Boston Micromachines Corp	$7,667	$0	$7,667
Boston Scientific	$68,750	$19,750	$88,500
Corning	$60,417	$0	$60,417
Hamamatsu	$200,000	$850	$200,850
Imagion	$50,000	$0	$50,000
K&L Gates	$0	$69,675	$69,675
Lightwave Advisors	$0	$214,000	$214,000
Nanoscribe/BICO	$6,667	$0	$6,667
Poly6	$2,583	$0	$2,583
Stembiosys	$2,000	$0	$2,000
Sublime	$5,000	$0	$5,000
Valo/Tara	$6,000	$0	$6,000
Thorlabs	$337,500	$339,137	$676,637
Total	**$788,834**	**$668,412**	**$1,457,246**

2025 REU Ayomide Olagundoye studies with her mentor in the Mark Grinstaff Lab

5

Training & Educational Enrichment

Programs & Outreach

Photonics Center K-12 Outreach Initiative
NSF Research Experiences for Undergraudates (REU)
NSF Research Experiences and Mentoring (REM)
NSF ERC (CELL-MET)

TRAINING & EDUCATIONAL ENRICHMENT

Programs & Outreach

With support from NIH, NSF, and other funding sources, the Photonics Center hosts a number of outreach programs each year, incorporating the BU community, Boston community, and undergraduates from around the country through premier STEM enrichment and industry engagement initiatives.

PHOTONICS CENTER K–12 OUTREACH INITIATIVE

In support of its mission to promote engineering and photonics-themed educational pathways and careers, particularly for students from underserved communities, the Photonics Center leads a robust outreach program with K-12 partner schools. The Photonics Center partners with STEM program leaders and teachers in primarily Hispanic East Boston to engage in spirited multi-grade level student interactions.

With East Boston High School (EBHS), the Photonics Center continued its engineering outreach program with near-peer mentoring in which EBHS students are coached and mentored by their teachers and BU Photonics Center students to prepare them to teach and mentor third- and sixth-grade students at a nearby elementary school, inspiring their younger peers with hands-on learning activities in STEM topics.

During Spring 2025, five BU graduate students visited East Boston High School and Otis Elementary School to mentor approximately 20 AP Biology students from EBHS and assist them in leading STEM lessons and activities for 3rd and 6th grade classes at the Otis School. BU and EBHS students visited the Otis School five times this past spring, whereafter all participants (3rd grade, 6th grade, high school, and BU students) met for a final field trip to the Museum of Science. The topics covered were:

- **March 13-14**, What is an Engineer?
- **March 27-28**, Graphite Circuits
- **April 10-11**, Monomers and Polymers
- **May 1-2**, Engineering Design Process
- **May 15-16**, UV Light
- **June 30**, Museum of Science Field Trip

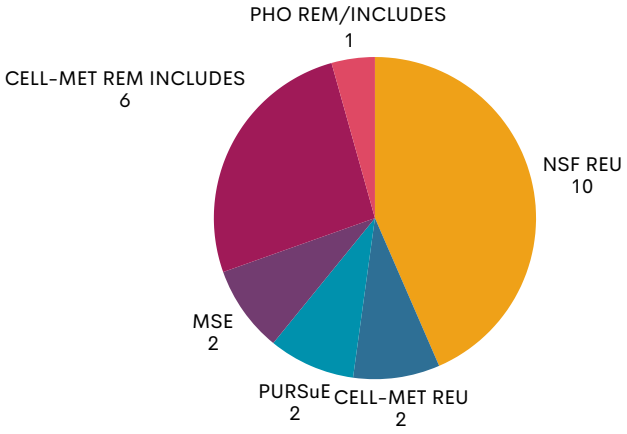
3rd graders successfully complete the design challenge. Photo Credit: Kelly Peña.

In addition, Photonics Center faculty and students engage with partner schools and organizations by helping with science fairs and after school clubs, engaging with local families at school community events such as STEAM Day, visiting RET classrooms to help with lesson activities and talk with students about career paths, and by supporting our K-12 partners in their efforts to introduce students to future career possibilities.

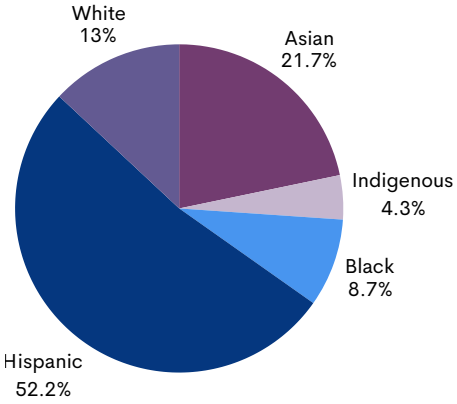
NSF RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU)

The Photonics Center's summer research experience programs, under the leadership of Photonics Center Associate Director Brenda Hugot, continue to energize our research community. Our 2025 cohort consisted of 23 undergraduate participants with a range of funding, including:

Participant Source of Funding



Participant Self-Identification



The Photonics Center's primary aim for our summer programs is to provide immersive interdisciplinary research experiences that promote graduate study in our field by talented students from diverse backgrounds, filling an important graduate recruitment pipeline. Our 2025 undergraduate participants' self-identified race/ethnicities are included on the left.

Additionally, our 2025 cohort was diverse in terms of ability and disability status, gender identity, religion, geographic diversity, and family and social status. Twelve (52%) participants self-identified as women. Fourteen participants (61%) identified as first-generation college students.

The Photonics Center's summer research experience programs engage students and teachers in meaningful and authentic research, with the shared aim of supporting individuals from historically excluded groups and broadening participation in science and engineering to build a pipeline which inspires STEM careers. This summer's programming culminated with a joint poster event for Photonics and Physics REU and REM programs, attended by more than 120 BU students and faculty.

The 2025 REU Cohort. Photo Credit: Kelly Pena

NSF RESEARCH EXPERIENCES AND MENTORING (REM)

REM Program Mentor and Skills Coordinator Christopher Alba with the 2025 REM cohort. Photo Credit: Kelly Peña

REM Alan Bonilla in the Bifano Lab. Photo Credit: Kelly Peña

Throughout the course of CELL-MET, we have been awarded six supplements for Research Experience and Mentoring (REM) Programs, which we run alongside our NSF REU and RET summer programs. In Year 7, we were awarded an NSF INCLUDES REM supplement for $250K to support a program in 2024-2025 entitled the Engineering and Science Exploration INCLUDES/REM (EASE-IN). This year-long program, designed to build research skills and provide mentoring, supported six high-performing, underrepresented, and first-generation students in their freshman year at BU's College of Engineering; the Photonics Center supported an additional student for a total of seven.

The main aim of the program is to provide learning and research opportunities designed to develop participants' skills, readiness, and confidence, affirming their STEM identities, and including them in the thriving CELL-MET community. This began with mentoring by CELL-MET doctoral students and a postdoctoral associate throughout the academic year and led to a six-week summer research experience in CELL-MET labs in summer 2025.

NSF ERC (CELL-MET)

Our National Science Foundation Engineering Research Center (ERC) on Cellular Metamaterials (CELL-MET), administered by the Photonics Center, continues to make significant advances toward our 10-year vision to build cardiac patches capable of repairing damaged hearts and cardiac tissue platforms that can serve as clinically relevant models for heart physiology and disease research; preparing the next generation of engineers; attracting young learners to engineering and other STEM disciplines through outreach; providing engineering mentoring pathways within and outside our community; and impacting society through a thriving CELL-MET innovation ecosystem.

Now in its eighth year, Photonics Center faculty and staff continue to play a prominent role in all aspects of the ERC:

- Led by PI **David Bishop**
- Professor **Thomas Bifano**, Photonics Center Director, leads Budget and Strategy in addition to imaging work
- **Cara Ellis McCarthy**, Executive Director, serves as the Administrative Director
- **Sandra Rodegher**, Associate Director for Convergence and Workforce Development, leads workforce programming and outreach
- **Brenda Hugot**, Associate Director for Programs and Outreach, directs the REX programming at BU
- **Maria Harlow**, Associate Director of Administration
- **Lisa Tanrikulu**, Administrative Coordinator
- **Nozomi Ito,** Associate Director of Grants Administration, continues to manage budgets, compliance, and supplemental programs for the ERC
- **Meghan Foley**, Assistant Director of Finance and Administration, works across the team for purchasing, expense tracking, and compiling financial data for reporting
- **John Hartnett** from the BU Industry Engagement Office leads the Innovation Ecosystem
- Partners and domestic collaborators in CELL-MET include University of Michigan (UM), Florida International University (FIU), Harvard Medical School, Harvard/Wyss Institute, Columbia University, North Carolina State University, and Brown University

Year-8 Advancements

- The 2024-25 NSF CELL-MET Research Experience and Mentoring supplement entitled Engineering and Science Exploration INCLUDES/REM (EASE-IN) supported six high performing underrepresented and first-generation freshman Engineering students.
  - Providing learning and research opportunities designed to develop participants' skills, readiness, and confidence, affirming their STEM identities, and including them in the thriving CELL-MET community.
  - Begins with mentoring by CELL-MET doctoral students and a postdoctoral associate during the academic year and led to a six-week summer research and training component in CELL-MET labs in summer 2025
- CELL-MET's flagship outreach program, EEK! (the Engineering Engagement Kit), launched the "EEK! A Million" campaign––strengthening formal and informal educator capacity for EEK! and other CELL-MET-related activities, providing a science communication skill-building opportunity for CELL-MET trainees, and adding several programs to EEK!'s suite of offerings. The overall goal of this campaign is to reach a million learners over the course of five years. Three key programs were implemented as groundwork for this strategic plan:
  - EEK! Summer Camp Development Program (Spring and Summer 2024)
  - EEK! in Schools Skill-building Retreat (Fall 2024)
  - EEK! Traveling Exhibit Ideation Session.

The Photonics Center community gathers every July for a summer cookout on the BU Beach

6

Fostering Community

Events

JULY 18, 2024

Photonics Center Community Ice Cream Social

AUGUST 1, 2024

Lunch & Learn: "Remote Photonics Medicine"
Dr. Zeev Zelevsky, Bar-Ilan University

OCTOBER 7, 2024

Photonics Center Networking Hour Featuring Scholar Award Recipients

OCTOBER 17, 2024

Visit of Delegation of Italian Universities
Hosted by Dr. Luca Dal Negro

OCTOBER 30, 2024

Photonics Students Research on Tap
Co-organized by the Photonics Student Society

NOVEMBER 21, 2024

Photonics Center Symposium: "Lighting the Brain" Organized by Dr. Chen Yang

DECEMBER 4, 2024

Photonics Center Holiday Party

DECEMBER 5, 2024

Lunch & Learn: "Label-free Nanoscopy of Cell Metabolism by Ultrasensitive Reweighted Visible Stimulated Raman Scattering"
Dr. Haonan Lin, Boston University

MARCH 27, 2025

Lunch & Learn: "A Discussion About the Transition from Academic Discovery to Societal Impact"
Mike Pratt, Boston University, Technology Development

APRIL 23, 2025

Lunch & Learn: "Optical Simulations of Gravitational Lensing"
Dr. Kiko Galvez, Colgate University

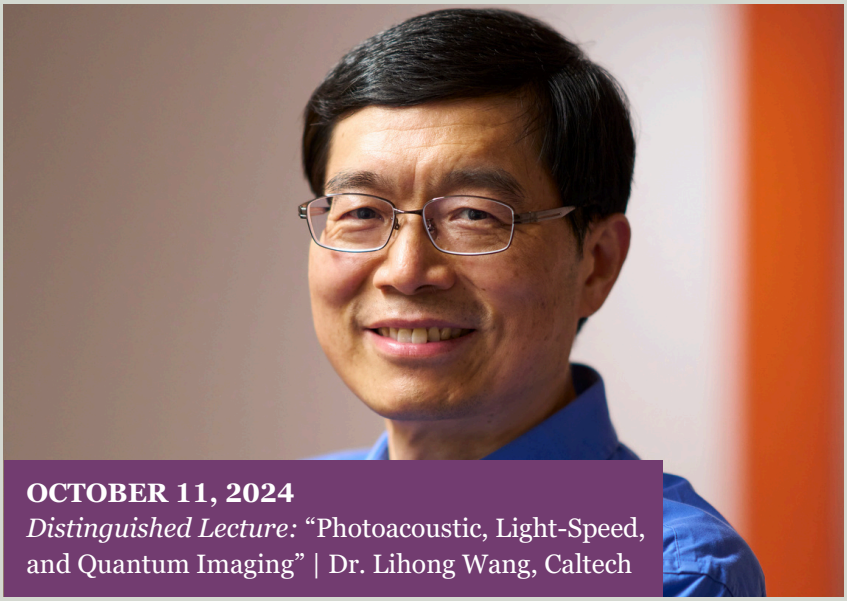
APRIL 28, 2025

Photonics Center Student Employee Recognition Lunch

AUGUST 6, 2024
Visit by BU President Dr. Melissa Gilliam

AUGUST 5, 2024
Photonics Center Cookout

OCTOBER 23-26, 2024
Recruiting Booth at BMES in Baltimore, MD



OCTOBER 11, 2024
Distinguished Lecture: "Photoacoustic, Light-Speed, and Quantum Imaging" | Dr. Lihong Wang, Caltech

FEBRUARY 5, 2025
Photonics Student Society Leadership Elections

FEBRUARY 25, 2025
Photonics Center Networking Hour

The Photonics Center offers an exciting array of events and programs throughout the year to engage the community, offering enriching opportunities to Boston University and beyond.

Several of the Photonics Center "Lunch and Learns" were organized by the Photonics Student Society at Boston University, with support from the Photonics Center.

JUNE 17-18, 2025
Summer Workshop on Chemical Imaging
Organized by Dr. Ji-Xin Cheng

2024 Photonics Center Symposium

"Lighting the Brain" Highlights Six Neurophotonics Experts as well as Student Presenters

BY DANNY GIANCIOPPO

On November 21, 2024, Professor Chen Yang gathered speakers across industry and academia for her organized symposium "Lighting the Brain," the topic of the 26th annual Photonics Center Symposium. With a blend of Boston University and external presenters, an audience of graduate students, faculty, staff, and international colleagues were invited to learn about the recent innovations involving photonics and optics research in neuroscience––or, more commonly known, neurophotonics.

"The symposium covered a broad range of talks in the area of light interfacing with the brain innovatively as tools for fundamental studies as well as emerging clinical applications," explains Professor Yang. As ever, the symposium began with opening remarks from the organizer (Yang) and Center Director and VPR ad interim Thomas Bifano.

Each of the six speakers are prominent researchers in their fields, with varying backgrounds in physics, neuroscience, biomedical engineering, material engineering and biological chemistry. Their presentations included topics on developing new molecular probes, imaging technologies, and material systems for imaging and modulating the brain, with insights into how the brain functions.

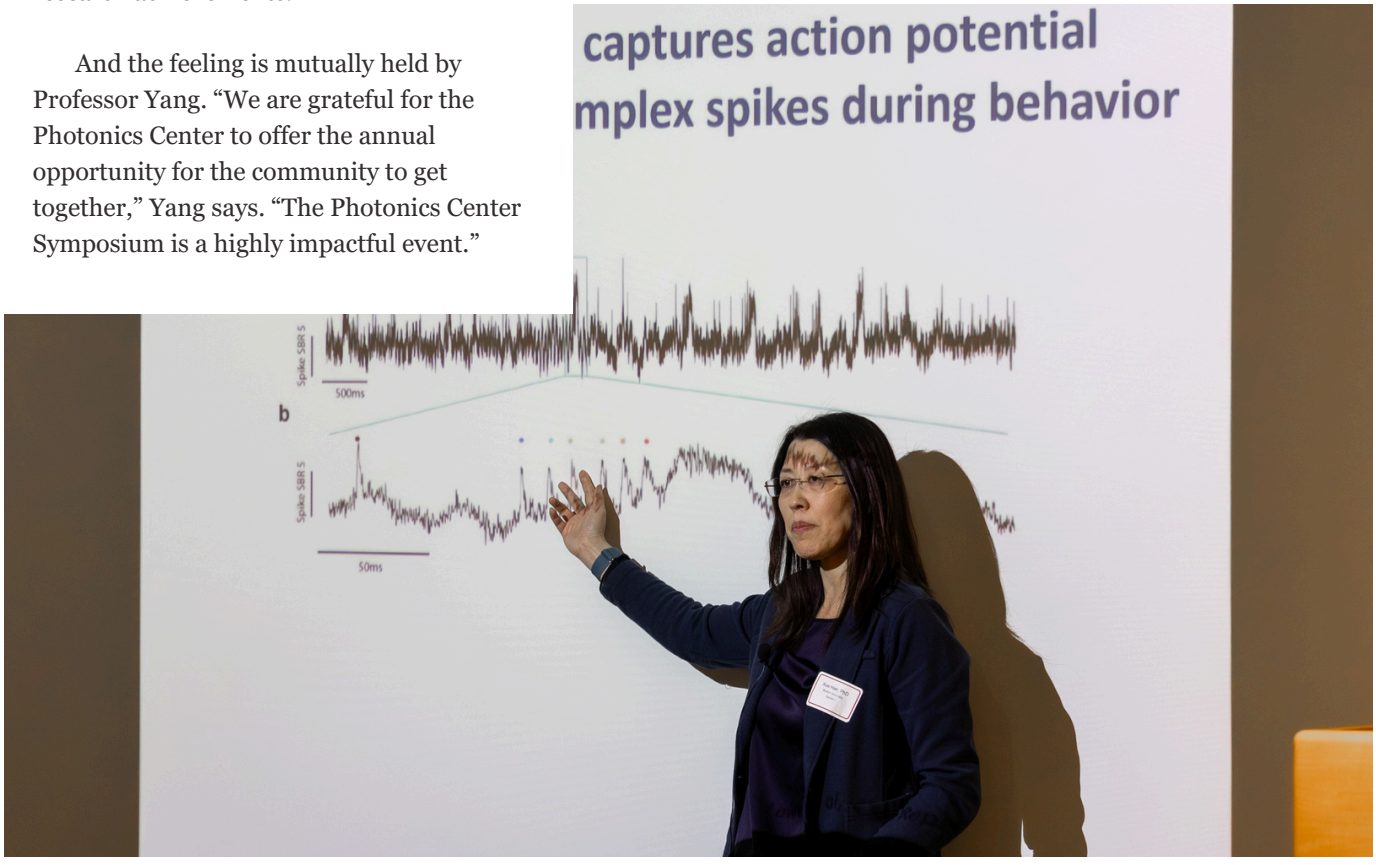
A unique addition to this year's symposium included a round of "lightening talks," in which four students were invited to present their research to a dedicated audience of scholars.

Professor Yang notes it as an important part of this year's symposium. "Trainees (postdoc and PhD students) are essentially the driving force behind all research [at Boston University]. It was just exciting to see how they discussed their research with strong passion and expertise. Our excellent student lightening talks indeed showcased the excellence in BU student research in these areas."

Every year the Photonics Center symposium brings together not only members of the BU community, but the research community at large––notably, within Boston. This year saw guests from Massachusetts General Hospital, Brigham and Women's Hospital and Harvard Medical School, to name a few.

"The Photonics Center owes a debt of gratitude to Professor Chen Yang for hosting an engaging and stimulating symposium focused on the important theme of brain imaging," Center Director and VPR ad interim, Dr. Thomas Bifano, says. "Our community was inspired by talks given by distinguished faculty speakers, and delighted by the inclusion of BU graduate students who gave "lightning talks" on their own exciting research achievements."

And the feeling is mutually held by Professor Yang. "We are grateful for the Photonics Center to offer the annual opportunity for the community to get together," Yang says. "The Photonics Center Symposium is a highly impactful event."



CELL-MET ERC Events

SEPTEMBER 16, 2024

EEK! Teacher Training

NOVEMBER 11–13, 2024

CELL-MET ERC Industry and Community Days

JANUARY 17, 2025

EEK! Ideation Workshop

MAY 15, 2025

CELL-MET Virtual Retreat

MAY 22, 2025

CELL-MET ERC Annual Virtual NSF Site Visit

Additionally, the Photonics Center CELL-MET staff supported a Perfect Pitch competition, monthly Trainee Journal Clubs, monthly Community Technical meetings, quarterly Community Training meetings, professional development workshops for students and postdocs, numerous trainee socials, community visioning workshops, and various community outreach events on campus and at collaborating institutions and schools.

Xining Gao presents at CELL-MET Industry Day 2024.
Photo Credit: Danny Gianciopo

FOSTERING COMMUNITY

Faculty Committees

The Photonics Center has five standing committees that support and serve its faculty and staff. The Photonics Center Director appoints the committee chairs.

Photonics Center Distinguished Guest Speakers: 2024-2025 Chairs – Doctoral Student Carolyn Marar and Rylie Bolarhino
The Distinguished Speaker Seminar Series and a new monthly Lunch & Learn Series are managed by student leaders of the BU student chapters of the OSA and SPIE––renamed the "Photonics Student Society at Boston University." With support from the Photonics Center for travel and seminar expenses, students host a distinguished speaker of their choice each semester.

Carolyn Marar

Rylie Bolarhino

Thomas Bifano

Academic Advisory: 2024-2025 Chair – Professor Thomas Bifano
The Academic Advisory Committee advises the Director of the Photonics Center on educational and academic issues and is composed of the chairs from the Center's cognate departments.

Space Allocation: 2024-2025 Chair – Professor Thomas Bifano
This committee chair generates policy guidelines for space management.

Education Committee: 2024-2025 Chair – Professor Ji-Xin Cheng
This committee was established to focus on the Graduate Student Initiative with three primary goals: 1) Support recruitment needs for Photonics Center faculty departments to attract highly talented and diverse doctoral students with a particular interest in photonics and optics, 2) Create a vibrant and distinctive community for Photonics Center graduate students and postdocs that highlights professional development and student led scholarly activities and events; 3) Catalyze new opportunities for external funding to support graduate students. Faculty members on the committee are Darren Roblyer, Björn Reinhard, and Minjung Son; included staff members are Cara Ellis McCarthy, Beth Mathisen, and Hossein Alizadeh.

Ji-Xin Cheng

Darren Roblyer

Björn Reinhard

Minjung Son

Cara McCarthy

Beth Mathisen

Hossein Alizadeh

Chen Yang

Symposium: 2024-2025 Chair – Professor Chen Yang
It is the role of the Symposium Chair, chosen by Photonics Center leadership, to dictate a symposium theme each year, as well as to compose a list of expert speakers across relevant fields of research.

FOSTERING COMMUNITY

Graduate Students

Among our 250+ graduate students, the Photonics Center supports a student society dedicated to uplifting the community, with community-appointed leaders.

Society Leadership

Thierry Lapointe-Leclerc
President

Carlos Acosta
Vice President

Nolan Vild
Secretary

Vineetha Ashok
Treasurer

THE **PHOTONICS STUDENT SOCIETY AT BOSTON UNIVERSITY (PSS@BU)**––formerly known as the SPIE/IEEE/Optica Student Chapter––is a largely student-directed community advised by the Graduate Education Committee. The student leaders were elected to this role and are also active in the professional organizations SPIE, IEEE, and Optica.

The Photonics Student Society organized several events throughout the fiscal year, including an external presence at the NextGen STEMFest in Waltham, MA, hosted by the Girl Scouts, wherein society leaders provided optics-based STEM exercises. Other organized events included multiple “Lunch & Learns” with expert presenters in relevant optics and photonics fields, which the society organizes alongside faculty member Ji-Xin Cheng. Additionally, PSS ran a booth for interested students to learn about the student community and enter a raffle during the annual Photonics Center Cookout. Each of which was at least partially supported by Photonics Center funding.

Lastly, the Photonics Student Society helps to maintain and coordinate the Photonics Center Journal Club, which meets regularly to discuss selected, popular topics in STEM advancements and publications.

FOSTERING COMMUNITY

Staff

The Photonics Center staff offer pillars of support for faculty, graduate students, and university-wide colleagues in administrative aid, grant assistance, building and facility operations, communications, and more.

Hossein Alizadeh

Technical Director

Thomas Bifano

Center Director, VPR ad Interim

Meghan Foley

Assistant Director of Finance & Administration

Danny Giancioppo

Communications Manager

Maria Harlow

Associate Director of Administration, ERC

Brenda Hugot

Associate Director of Summer Programs & Outreach

Nozomi Ito

Associate Director of Grants Administration

Paul Mak

Laboratory Manager

Beth Mathisen

Assistant Director of BIC, Grants, Events & Initiatives

Cara McCarthy

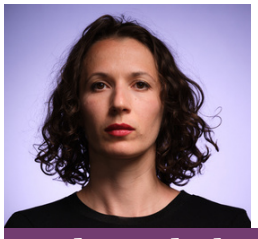
Executive Director

Alexey Nikiforov

Laboratory Manager

Kelly Peña

Multimedia Manager

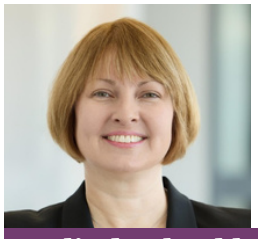


Sandra Rodegher

Associate Director of Convergence and Workforce Planning

Arthur Shih

Laboratory Manager



Melinda Shockley

Director of Faculty Entrepreneurship

Lisa Tanrikulu

Administrative Coordinator, ERC

Joseph Walker

Manager of Operations & Technical Programs

In addition to journal publications, our faculty produce numerous patents each year, as well as advising PhD dissertations and winning large grants

7

Achievements & Accolades

PhD Student Dissertation Titles

With well-over 250 Photonics Center graduate students, we see dozens of successful dissertation defenses each academic year. Below is a list of our recent graduating PhD students across affiliated faculty labs, alongside their dissertations.

Rohan Soni, MSE | Soumendra Basu
Surface Nitridation of Aluminum Alloys for Protective Nitride Coating

John Glennon, MSE | Enrico Bellotti
Advanced Quantum Structures for Infrared Detectors

Mike Zhu, ECE | Enrico Bellotti
Simulation of Advanced Semiconductor Devices with 3D Monte Carlo

Alexander Gray, BME | Irving Bigio
Quantifying Pathological Changes to Myelin with High-Resolution Birefringence Microscopy and Deep Learning

Bingxue Liu, ECE | David Boas
Speckle Decorrelation-Based Techniques for Measuring Cerebral Dynamics with Ultrasound and Optics

Nikola Otic, BME | David Boas
Multi-Wavelength Multi-Distance Approach for Evaluating the Metabolic Activity of the Brain in Diffuse Correlation Spectroscopy and Wearable Near Infrared Spectroscopy

De'Ja Rogers, BME | David Boas
Easing Utility in Multimodal Functional Near Infrared Spectroscopy (fNIRS) and Electroencephalography (Eeg) in Diverse Participants

Kelsey Snapp, ME | Keith Brown
Discovering Tough and Impact-Resistant Structures Using a Self-Driving Lab

Xiaowei Ge, ECE | Ji-Xin Cheng
High-Sensitivity Stimulated Raman Microscopy for Metabolism Mapping

Zhongyue Guo, BME | Ji-Xin Cheng
Protein Assemblies in Their Natural Environment by Mid-Infrared Photothermal Microscopy

Hongli Ni, ECE | Ji-Xin Cheng
Advanced Vibrational Microscopy for Clinical Translation

Jiaze Yin, ECE | Ji-Xin Cheng
High-Speed Mid-Infrared Photothermal Microscope for Dynamic and Spectroscopic Imaging

Caroline Blassick, BME | Mary Dunlop
Characterizing Heterogeneity in Escherichia Coli Gene Expression and Its Consequences for Antimicrobial Tolerance

Owen O'Connor, BME | Mary Dunlop
Advancing Single-Cell Analysis: Deep Learning for Cell Segmentation and Tracking with Improved Metrics

Hagen Gress, ME | Kamil Ekinci
Stochastic and Deterministic Dynamics of Polymeric and Solid-State Micro-/Nano-Mechanical Resonators

Jacob Warshauer, Physics | Wanzheng Hu
Accessing Non-Equilibrium States of Correlated Materials through Targeted Ultrafast Optical Excitation

Cansu Demirkiran, ECE | Ajay Joshi
Building Next-Generation Deep Learning Hardware Using Photonic Computing

Brian Dawes, Physics | Maria Kamenetska
Analyzing Nucleic Acid Structures Using Optical Tweezers

Daniel Jackson, Chemistry | Maria Kamenetska
Advances in Optical Trapping Beyond Biophysics: Combining Force and Optical Spectroscopies Under Diverse Chemical Conditions

Lu Ping, MSE | Xi Ling
2D Wide Bandgap Transition Metal Oxides: Synthesis and Photoelectron Spectroscopic Studies

Qishuo Tan, Chemistry | Xi Ling
Emergent Electronic and Magnetic Properties of 2D Antiferromagnetic NIPS3 via Light-Matter Interactions

Shuqi Zheng, ECE | Jerome Mertz
Speckle Applications for Volumetric Imaging of Biological Dynamics

Rohin Banerji, BME | Hadi Nia
Crystal Ribcage: Development of a Platform to Probe Real-Time Lung Function with Cellular Resolution in Health and Disease

Kathryn Regan, BME | Hadi Nia
The Role of Mechanical Cues in Biological Systems: From Tissue Micromechanics to Immune Cell Motility

Deniz Onural, ECE | Miloš Popović
Silicon CMOS Electronic and Photonic Integrated Circuit Platforms for Photonic Superconducting Circuit Interfaces and Microwave Signal Processing

Manuj Kumar Singh, ECE | Miloš Popović
Electronic-Photonic Millimeter-Wave Systems-On-Chip and Passive Devices in Silicon CMOS Photonics

Aaron Peterson-Greenberg, ECE | Siddharth Ramachandran
The Amplification of Twisted Light in Multimode Optical Fibers

Leslie Velasco, Chemistry | Björn Reinhard
The Amplification of Twisted Light in Multimode Optical Fibers

Taejun Han, Chemistry | Björn Reinhard
Deep-UV Plasmonic Resonators of Aluminum for Surface-Enhanced Circular Dichroism and Asymmetric Photocatalysis

Carlos Gomez, BME | Darren Roblyer
Non-invasive Monitoring of the Respiratory Muscles via Diffuse Optical Modalities

Gaoziang Mei, Physics | Ken Rothschild
[Dissertation Title Missing]

Shutao Xu, ECE | Michelle Sander
Thulium-Doped Ultrafast Fiber Laser System Designs and Dynamics

Joseph Greene, ECE | Lei Tian
Computational Extended Depth of Field Fluorescence Microscopy in Miniaturized and Tabletop Platforms

Chang Liu, BME | Lei Tian
Pushing the Limits of SNR and Resolution for In Vivo Neural Imaging via Self-Supervised Learning

Hao Wang, ECE | Lei Tian
Advancing Optical Metrology through Computational Imaging Techniques

Jiabei Zhu, ECE | Lei Tian
Advancing Intensity Diffraction Tomography with Multiple Scattering Models in Transmission and Reflection Systems

Connor O'Brien, Astronomy | Brian Walsh
Uncertainty Quantification for Solar Wind-Magnetosphere Coupling Predictions

Publications

Each year, Photonics Center faculty publish their research across a variety of prestige scientific outlets. This year we set a new record-high of 223 published journal articles.

JOURNAL ARTICLES

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ACHIEVEMENTS & ACCOLADES

Faculty Awards

Our Photonics Center faculty are consistently awarded for their leadership in education, research, and industry. Below is a list of their many honors, promotions, and awards from this past year.

Scott **Bunch**, *Dean's Faculty Leadership Fellow* | Dean of College of Engineering, 2024

Ji-Xin **Cheng**, *Raman Award, Most Innovative Technical Development* | International Conference of Raman Spectroscopy, 2024

Ji-Xin **Cheng**, *Biophotonics Technology Innovator Award* | SPIE, 2024

Ji-Xin **Cheng**, *Charles DeLisi Lecture Award* | Boston University College of Engineering, 2024

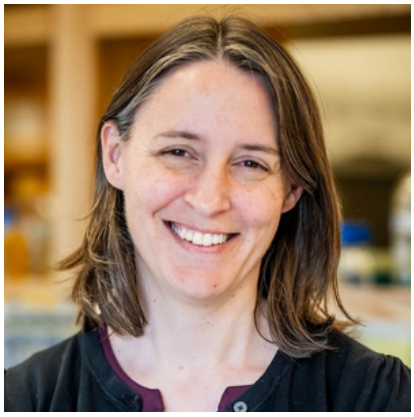
Ji-Xin **Cheng**, *Division of Analytical Chemistry Spectrochemical Analysis Award* | American Chemical Society, 2024

Mary **Dunlop**, *Award for Excellence in Mentoring Postdocs* | Boston University Provost's Office, 2024

Mary **Dunlop**, Dorf-Ebner *Distinguished Faculty Fellow* | Boston University College of Engineering, 2024

Mary **Dunlop**, College of Engineering Faculty Service Award | Boston University College of Engineering, 2024

Mary **Dunlop**, *Promotion to Full Professor* | Boston University College of Engineering, 2025



Wanzheng **Hu**, *DOE Career Award* | Department of Energy, 2024

Masha **Kamenetska**, *Promotion to Associate Professor* | Boston University College of Arts & Sciences, 2025

Sean **Lubner**, *AFOSR Young Investigator Program (YIP) Recipient* | Air Force Office of Scientific Research (AFOSR), 2024

Sean **Lubner**, *Faculty of the Year* | Boston University Department of Mechanical Engineering, 2024

Sean **Lubner**, *Rising Star of Mechanical Engineering* | American Society of Mechanical Engineers, 2024

Hadi **Nia**, *Cellular and Molecular Bioengineering Rising Star* | BMES-CMBE, 2024

Hadi **Nia**, *DoD Idea Award* | Department of Defense, Melanoma Research Program, 2024

Hadi **Nia**, *Alfred Sloan Fellowship* | Alfred Sloan Foundation, 2024

Roberto **Paiella**, *2024 Outstanding Teacher Award* | Boston University ECE Department, 2024

Siddharth **Ramachandran**, *Highlighted Conference Paper – Aaron Greenberg* | Optica, 2024

Darren **Roblyer**, *Promotion to Full Professor* | Boston University College of Engineering, 2025

Lei **Tian**, *Best Poster Award to Post-Doc Trainee – Shuying Li* | Northeast Symposium on Biomedical Optics, 2024

Lei **Tian**, *Best Poster Award to Post-Doc Trainee – Shuying Li* | Gordon Research Seminar, Optics and Photonics in Medicine & Biology, 2024

Lei **Tian**, *MS Research Award to Trainee – Phuong Tran* | Boston University ECE Department, 2024

Tianyu **Wang**, *Peter J. Levine Career Development Professorship* | Boston University, 2024

Chen **Yang**, *NIH Trailblazer Award* | NIH, 2024

Xin **Zhang**, *Honoree of Fast Company Innovation by Design Awards* | Fast Company, 2024

Xin **Zhang**, *Finalist of the Falling Walls Science Breakthroughs of the Year* | Falling Walls, 2024

Xin **Zhang**, ASME Robert Henry Thurston Lecture Award, 2024

Patents

With well-over 50 total patents from Photonics Center faculty, we are proud to present their latest achievements each year, spanning the fields of optics and photonics and enabling groundbreaking research.

Bishop, D., Javor, J., et al. (January 16, 2024). US11874343B2, *Single Point Gradiometer*.

Bishop, D., Javor, J., et al. (March 19, 2024). US11933864B2, *System and Method for Measuring Second order and Higher Gradients*.

Cheng, J-X., **Tian, L.**, et al. (February 27, 2024). US11913881B2, *Bond-Selective Intensity Diffraction Tomography and Uses Thereof*.

Cheng, J-X., et al. (May 14, 2024). US11982615B2, *Nanosecond-Scale Photothermal Dynamic Imaging*.

Cheng, J-X., Li, Z., et al. (May 28, 2024). US11994687B2, *Meta-Optics for Virtual Reality and Augmented Reality Systems*.

Cheng, J-X., et al. (August 8, 2024). US12055536B2, *Device for Detection of Cellular Stress*.

Cheng, J-X., **Ünlü, S. M.**, et al. (November 19, 2024). US12147022B2, *Dark-Field Mid-Infrared Photothermal Microscopy*.

Cheng, J-X., et al. (November 26, 2024). US12152990B2, *Fluorescence-Coded Mid-Infrared Photothermal Microscope*.

Ünlü, S. M., et al. (September 10, 2024). US12085691B2, *Method and Device for High-Quality Imaging of Embedded Tissue Sections*.

Ünlü, S. M., et al. (November 12, 2024). US12140775B2, *Efficient and Uniform Color-Light Integration Device*.

White, A. E., Michas, C., et al. (May 28, 2024). US11993763B2, *Metamaterial Scaffolds and Uses Thereof*.

Yang, C., and **Cheng, J-X.** (January 30, 2024). US11883344B2, *Neutral stimulation in vitro and in vivo by Photoacoustic Nanotransducers*.

Zhang, X., **Anderson, S.**, et al. (September 10, 2024). US12085629B2, *Nonlinear and smart Metamaterials Useful to Change Resonance Frequencies*.

Sponsored Research Awards & Funding Sources

Photonics faculty members received $36.3MM in external funding. The following table lists funds in the fiscal year (July 1, 2024 – June 30, 2025), as reported by the BU Sponsored Programs office. Grants shaded in blue represent grants which were led by the Photonics Center, and grants shaded in yellow represent grants which were catalyzed by the Photonics Center.

Award Title (Full)	PI	Sponsor	Project Dates	Add'l Funds this Budget Period (Total Obligated)
A Bio-Inspired Latent TGF-Beta Conjugated Scaffold for Patient-Specific Cartilage Regeneration	Albro Michael	NIH/National Institute of Arthritis & Musculoskeletal & Skin	06/01/2022 – 05/31/2027	$608,459
A Bio-Inspired Latent TGF-Beta Conjugated Scaffold for Patient-Specific Cartilage Regeneration	Albro Michael	NIH/National Institute of Arthritis & Musculoskeletal & Skin	06/01/2022 – 05/31/2027	$608,459
Arthroscopic Raman Monitoring of Cartilage Content for PTOA Diagnosis and Chondroregenerative Treatment Response	Albro Michael	NIH/National Institute of Arthritis & Musculoskeletal & Skin	08/02/2022 – 05/31/2027	$585,295
Graduate Student Billing Agreement for Sedat Dogru	Albro Michael	Beth Israel Deaconess Medical Center, In	01/01/2025 – 06/30/2025	$44,280
AI/MI-Made: AI/MI Augmented Materials And Device Exploration	Bellotti Enrico	Department of Defense/Army Contracting Command/Aberdeen Prov	09/30/2022 – 09/29/2026	$500,000
Simulation of Semiconductor Devices and Materials ARL/BU Initiative	Bellotti Enrico	Department of Defense/ARL	09/26/2023 – 09/25/2028	$616,040
Broadband Optical Attenuator Via Amplified Free Carrier Absorption	Bellotti Enrico	Physical Sciences, Inc.	01/01/2024 – 07/31/2025	$148,375
Fundamental Studies Of Heterostructure Avalanche Photodetectors	Bellotti Enrico	Government of Israel - Ministry of Defen	05/01/2025 – 04/30/2026	$150,000
Validation Of Light Scattering Spectroscopy For Intra-Operative Margin Guidance During Oral Cancer Resection	Bigio J Irving	Boston Medical Center Corporation	07/07/2020 – 06/30/2025	$176,716
Optimization And Validation Of Quantitative Birefringence Microscopy For Assessment Of Myelin Pathologies Associated With Cognitive Impairments And Motor Deficits In Young And Old Aging Monkey Brain	Bigio J Irving	NIH/National Institute on Aging	01/01/2022 – 11/30/2026	$503,149

Award Title (Full)	PI	Sponsor	Project Dates	Add'l Funds this Budget Period (Total Obligated)
Nanosystems Engineering Research Center For Directed Multiscale Assembly Of Cellular Metamaterials With Nanoscale Precision: Cell-Met	Bishop David	National Science Foundation	10/01/2017 – 09/30/2027	$249,997
Nanosystems Engineering Research Center For Directed Multiscale Assembly Of Cellular Metamaterials With Nanoscale Precision: Cell-Met	Bishop David	National Science Foundation	10/01/2017 – 09/30/2027	$1,787,500
Neurophotonic Advances For Mechanistic Investigation Of The Role Of Capillary Dysfunction In Stroke Recovery	Boas David	NIH/National Institute of Neurological Disorders & Stroke	09/27/2022 – 08/31/2027	$638,725
Brain Connects: Mapping Connectivity Of The Human Brainstem In A Nuclear Coordinate System	Boas David	The General Hospital Corporation d/b/a Massachusetts General	09/01/2023 – 08/31/2026	$102,155
Low-Cost High-Performance Nirs-Scos Device For Non-Invasive Monitoring Of Cerebral Blood Flow And Intracranial Pressure In Traumatic Brain Injury	Boas David	The General Hospital Corporation d/b/a M	06/01/2024 – 05/31/2029	$114,927
Graduate Training At The Interface Of Neuroscience, Optical Engineering And Data Science	Boas David	NIH/National Institute of Neurological Disorders & Stroke	07/08/2024 – 06/30/2029	$ -
Graduate Training At The Interface Of Neuroscience, Optical Engineering And Data Science	Boas David	NIH/National Institute of Neurological Disorders & Stroke	07/08/2024 – 06/30/2029	$37,202
Graduate Training At The Interface Of Neuroscience, Optical Engineering And Data Science	Boas David	NIH/National Institute of Neurological Disorders & Stroke	07/08/2024 – 06/30/2029	$130,176
Graduate Training At The Interface Of Neuroscience, Optical Engineering And Data Science	Boas David	NIH/National Institute of Neurological Disorders & Stroke	07/08/2024 – 06/30/2029	$ -
Expanding Inclusion Of All Subjects For Ultra-High Density Wearable Fnirs In The Everyday World	Boas David	NIH/National Institute of Biomedical Imaging & Bioengineerin	09/01/2024 – 07/31/2026	$422,619
Novel Volumetric Optical Microscopy To Unravel Cerebral Microvascular Architecture And The Role In Functional Neuroimaging In Human	Boas David	The General Hospital Corporation d/b/a Massachusetts General	08/01/2024 – 07/31/2025	$50,789
Edlow Scholar Award In Clinical Research (Cambareri)	Boas David	The General Hospital Corporation d/b/a M	06/01/2023 – 07/31/2024	$55,041
Emerging Consciousness Program (Cambareri)	Boas David	The General Hospital Corporation d/b/a M	09/26/2022 – 05/31/2023	$24,137
Uncovering A Fingerprint Of Metal-Organic Framework (Mof)-Polymer Interactions	Brown Keith	Department of Defense/Army Contracting Command/Aberdeen Prov	03/29/2024 – 03/28/2027	$50,000

Award Title (Full)	PI	Sponsor	Project Dates	Add'l Funds this Budget Period (Total Obligated)
An Autonomous Platform For Studying Hydrogel-Based Nanoparticle Sensors	Brown Keith	Department of Defense/Army Contracting Command/Aberdeen Prov	09/01/2024 – 08/31/2026	$60,000
An Autonomous Platform For Studying Hydrogel-Basednanoparticle Sensors	Brown Keith	Department of Defense/Army Contracting C	09/01/2024 – 08/31/2026	$33,000
Data- Driven Advancement Of Additive Manufacturing Of Functional Polymers	Brown Keith	Honeywell Federal Manufacturing & Technologies, LLC	11/11/2024 – 08/31/2025	$60,000
Bridging Function, Connectivity, And Transcriptomics Of Mouse Cortical Neurons	Chen Jerry	Allen Institute, d/b/a Allen Institute for Cell Science	09/01/2022 – 06/30/2027	$213,657
Local And Long-Range Cortical Circuits Underlying Tactile Perception	Chen Jerry	NIH/National Institute of Neurological Disorders & Stroke	12/01/2024 – 11/30/2029	$548,088
Vibrational Spectroscopic Imaging To Unveil Hidden Signatures In Living Systems	Cheng Ji-Xin	NIH/National Institute of General Medical Sciences	07/01/2020 – 06/30/2025	$577,500
High-Content High-Speed Chemical Imaging Of Metabolic Reprogramming By Integration Of Advanced Instrumentation And Data Science	Cheng Ji-Xin	NIH/National Institute of Biomedical Ima	04/01/2022 – 12/31/2025	$50,488
High-Content High-Speed Chemical Imaging Of Metabolic Reprogramming By Integration Of Advanced Instrumentation And Data Science	Cheng Ji-Xin	NIH/National Institute of Biomedical Imaging & Bioengineerin	04/01/2022 – 12/31/2025	$454,378
Sub-Millimeter Precision Wireless Neuromodulation Using A Microwave Split Ring Resonator	Cheng Ji-Xin	NIH/National Eye Institute	08/01/2022 – 07/31/2025	$206,250
Ipa For Cheng Ji-Xin	Cheng Ji-Xin	Jesse Brown VA Medical Center	01/01/2023 – 12/31/2025	$24,858
Personnel Agreement For Research Services Of Hongjian He	Cheng Ji-Xin	Jesse Brown VA Medical Center	01/01/2023 – 12/31/2025	$103,520
Incorporation Of Quantitative Srs Imaging In Seisa For Developing Anticancer Nanomedicines	Cheng Ji-Xin	Brandeis University	03/01/2022 – 02/28/2028	$123,750
Super-Sensitive Vibrational Imaging By Synergic Development Of Instruments And Probes	Cheng Ji-Xin	NIH/National Institute of Biomedical Imaging & Bioengineerin	01/01/2024 – 12/21/2027	$543,462
Super-Sensitive Vibrational Imaging By Synergic Development Of Instruments And Probes	Cheng Ji-Xin	NIH/National Institute of Biomedical Ima	01/01/2024 – 12/21/2027	$60,384
Bio-Orthogonal Mid-Infrared Photothermal Imaging Of Cancer Metabolism	Cheng Ji-Xin	NIH/National Cancer Institute	09/01/2024 – 08/31/2027	$407,113
A Transformative Method For Functional Brain Imaging With Speckle Contrast Optical Spectroscopy	Cheng Xiaojun	NIH/National Institute of Biomedical Imaging & Bioengineerin	08/15/2023 – 07/31/2026	$364,842

	Award Title (Full)	PI	Sponsor	Project Dates	Add'l Funds this Budget Period (Total Obligated)
	Development Of A Rvsv Vectored Vaccine For Lassa Virus: Nonhuman Primate Efficacy And Immunogenicity Studies	Connor H John	University of Texas Medical Branch at Galveston	09/01/2021 – 08/31/2026	$380,563
	New England Pathogen Genomics Center Of Excellence	Connor H John	Comm. of Mass./Department of Public Health	07/01/2023 – 09/30/2025	$100,000
	Rfq 7063-016 Bioinformatics Sub-2021-7063-0008	Connor H John	Mapp Biopharmaceutical, Inc.	12/14/2023 – 12/31/2024	$7,382
	Rfp 7079-024 Bioinformatics Sub-2023-7079-0010	Connor H John	Mapp Biopharmaceutical, Inc.	08/22/2024 – 02/28/2025	$44,465
	Rfp 7079-024 Bioinformatics Sub-2023-7079-0010	Connor H John	Mapp Biopharmaceutical, Inc.	08/22/2024 – 06/30/2027	$177,347
	Rfp 7079-024 Bioinformatics Sub-2023-7079-0010	Connor H John	Mapp Biopharmaceutical, Inc.	08/22/2024 – 02/28/2025	$4,926
	Rfp 7079-024 Bioinformatics	Connor H John	Mapp Biopharmaceutical, Inc.	08/22/2024 – 02/28/2025	$3,335
	Rfp 7079-024 Bioinformatics	Connor H John	Mapp Biopharmaceutical, Inc.	08/22/2024 – 06/30/2027	$13,301
	Rfp 7079-024 Bioinformatics	Connor H John	Mapp Biopharmaceutical, Inc.	08/22/2024 – 02/28/2025	$369
	Screening Countermeasures In Vitro For Filovirus Infections (Scifi)	Connor H John	Draper Laboratory, Inc.	11/18/2024 – 11/01/2026	$1,823,909
	Novel Ultrafast Nonlinear Materials And Hybrid Photonicplasmonic Nanostructures For Ir Multiband Imaging And Detection	Dal Negro Luca	Department of Defense/Army Contracting Command/Aberdeen Prov	08/01/2022 – 07/31/2025	$109,066
	Prototype Flat-Optic-Enhanced Night Vision Systems	Dal Negro Luca	Physical Sciences, Inc.	06/01/2024 – 04/01/2026	$630,001
	Local Neuronal Drive And Neuromodulatory Control Of Activity In The Pial Neurovascular Circuit	Devor Anna	NIH/National Institute of Neurological D	08/16/2021 – 05/31/2026	$2,564,400
	Metabolic And Neural Activity Normalization By Cerebral Blood Flow Increase In Ad/Adrd Models	Devor Anna	Cornell University	04/15/2023 – 01/31/2028	$472,243
	Cell Type And Circuit Mechanisms Of Non-Invasive Brain Stimulation By Sensory Entrainment	Devor Anna	Allen Institute, d/b/a Allen Institute for Cell Science	09/01/2024 – 08/31/2025	$27,845
	Three-Photon Microscope For Fluorescence And Phosphorescence Lifetime Imaging	Devor Anna	NIH/Office of the Director	05/15/2025 – 05/14/2026	$749,227

	Award Title (Full)	PI	Sponsor	Project Dates	Add'l Funds this Budget Period (Total Obligated)
	Illuminating Cholinergic Modulation Of Cortical Dynamics Through Its Effect On Dendritic Excitability	Devor Anna	United States - Israel Binational Science Foundation (Israel	10/01/2024 – 09/30/2028	$11,316
	Optogenetic Control For Metabolic Engineering Using Protein-Level Regulation	Dunlop Mary	National Science Foundation	04/15/2025 – 03/31/2028	$519,071
	Linking Motor Cortex Activity And Movement In The Mouse Orofacial System.	Economo Nicholas Michael	NIH/National Institute of Neurological D	02/01/2022 – 01/31/2027	$371,251
	High- And Low-Level Computations For Coordination Of Orofacial Motor Actions	Economo Nicholas Michael	University of California, San Diego	08/15/2024 – 07/31/2029	$453,205
	Validation Of Lens Beta-Amyloid As A Novel Biomarker For Early Detection Of Alzheimer'S Disease At The Boston University Alzheimer'S Disease Research	Goldstein E Lee	NIH/National Institute on Aging	09/30/2023 – 06/30/2028	$ -
	Validation Of Lens Beta-Amyloid As A Novel Biomarker For Early Detection Of Alzheimer'S Disease At The Boston University Alzheimer'S Disease Research	Goldstein E Lee	NIH/National Institute on Aging	09/30/2023 – 06/30/2028	$811,737
	Leveraging Novel Mouse Models To Investigate Toxic Metal Exposures On Brain Aging And Alzheimer'S Disease	Goldstein E Lee	NIH/National Institute on Aging	09/30/2024 – 08/31/2029	$2,122,961
	The Role Of Chemical Exposures In Alzheimer'S Disease (Ad) And Its Trajectory	Goldstein E Lee	Duke University	08/15/2024 – 07/31/2025	$82,500
	Defining The Molecular Spectrum Of White Matter Vascular Lesions	Goldstein E Lee	University of California, Los Angeles	09/14/2024 – 08/31/2027	$123,750
	Bil - Highly Stable Engineered Oxygen And Fuel Electrodes For Solid Oxide Electrolysis Cells	Gopalan Srikanth	Department of Energy	12/01/2024 – 11/30/2027	$1,895,539
	Bil - Highly Stable Engineered Oxygen And Fuel Electrodes For Solid Oxide Electrolysis Cells	Gopalan Srikanth	Department of Energy	12/01/2024 – 11/30/2027	$98,013
	A Relaxin-Loaded Hydrogel For The Treatment Of Hypertrophic Scars	Grinstaff W Mark	NIH/National Institute of Arthritis & Mu	07/01/2024 – 06/30/2029	$486,042
	Multidimensional Optimization Of Voltage Indicators For In Vivo Neural Activity Imaging	Han Xue	NIH/National Institute of Mental Health	03/01/2020 – 01/31/2025	$66,447
	Collaborative Research: Dynamic Interactions Of Individual Neurons In Supporting Hippocampal Network Oscillations During Behavior	Han Xue	National Science Foundation	10/01/2020 – 09/30/2025	$78,124

	Award Title (Full)	PI	Sponsor	Project Dates	Add'l Funds this Budget Period (Total Obligated)
	Cellular And Network Mechanisms Of Epilepsy And Neuromodulation	Han Xue	NIH/National Institute of Neurological D	06/01/2025 – 05/31/2030	$657,958
	Bidirectional Manupulation Of Phase Transitions By Laser Excitation Of Optical Phonons	Hu Wanzheng	Department of Energy	09/01/2020 – 08/31/2025	$53,699
	Bidirectional Manupulation Of Phase Transitions By Laser Excitation Of Optical Phonons	Hu Wanzheng	Department of Energy	09/01/2020 – 08/31/2025	$282,146
	Nonlinear Phononics Control Of Electric Polarization And Magnetization	Hu Wanzheng	Eindhoven University of Technology	03/01/2025 – 12/31/2025	$52,731
	Novel Biosensors For Monitoring Fertility At The Point Of Care	Klapperich M Catherine	Massachusetts Life Sciences Center	07/01/2024 – 06/30/2027	$805,660
	Targeting Pathologic Spike-Ripples To Isolate And Disrupt Epileptic Dynamics	Kramer Mark	The General Hospital Corporation d/b/a M	01/01/2021 – 11/30/2025	$319,171
	New Cooperative Adsorbents And Regeneration Methods For The Efficient Removal Of Carbon Dioxide From Air	Lubner Sean	Lawrence Berkeley National Laboratory	04/20/2023 – 09/30/2025	$160,000
	New Cooperative Adsorbents And Regeneration Methods For The Efficient Removal Of Carbon Dioxide From Air	Lubner Sean	Lawrence Berkeley National Laboratory	04/20/2023 – 09/30/2025	$135,000
	Phonon Control For Next-Generation Superconducting Systems And Sensors	Lubner Sean	Lawrence Berkeley National Laboratory	10/12/2023 – 08/31/2025	$200,000
	Development Of Crystal Ribcage For Imaging Of Functioning Lung At High Spatiotemporal Resolution	Nia Hadi	The Arnold and Mabel Beckman Foundation	09/01/2022 – 08/31/2026	$150,000
	Inflammaging In The Lung: Dissecting The Impact Of Aging On Pulmonary Vs. Circulatory Factors	Nia Hadi	American Federation for Aging Research	12/31/2024 – 12/31/2027	$375,000
	Non-Hermitian Topological Light Sensors	Paiella Roberto	National Science Foundation	09/01/2024 – 08/31/2027	$402,134
	Collaborative Optically Disaggregated Arrays Of Extreme-Mimo Radio Units (Codaemimo)	Popovic Milos	National Science Foundation	10/01/2023 – 09/30/2026	$156,803
	The Effect Of Adolescent Drug-Induced Neuroimmune Signaling In Sex-Specific Social Development And Reward Learning	Ramirez Steve	Albany Medical College	07/01/2022 – 03/31/2027	$14,208
	Improved Nanoparticle Targeting Of Tissue Myeloid Cells For Hiv-1 Long-Acting Pre-Exposure Prophylaxis	Reinhard M Bjoern	NIH/National Institute of Allergy & Infe	03/17/2023 – 02/28/2027	$657,525

Award Title (Full)	PI	Sponsor	Project Dates	Add'l Funds this Budget Period (Total Obligated)
Uv Plasmon-Enhanced Chiroptical Spectroscopy Of Membrane-Binding Proteins	Reinhard M Bjoern	NIH/National Institute of General Medical Sciences	09/23/2023 – 07/31/2027	$115,771
Collaborative Research: Interfacial Excitation Transfer In Hybrid Metal/Chalcopyrite Plasmonic Nanostructures	Reinhard M Bjoern	National Science Foundation	07/15/2024 – 06/30/2027	$411,535
Multiplexed Imaging In The Near Infrared With Indium Phosphide Quantum Shells	Roblyer Darren	Northeastern University	08/01/2022 – 07/31/2025	$81,594
Northeast Afrl Regional Research Convergence Hub (Ne Hub)	Roblyer Darren	Cornell University	08/01/2024 – 01/31/2025	$99,942
Northeast Afrl Regional Research Convergence Hub (Ne Hub)	Roblyer Darren	Cornell University	08/01/2024 – 07/31/2025	$42,623
Reu Site: Translational Biophotonics	Roblyer Darren	National Science Foundation	04/01/2025 – 03/31/2028	$462,600
Remote Patient Monitoring Of Breast Cancer Treatment Using At-Home Optical Imaging	Roblyer Darren	American Cancer Society, Inc.	01/01/2025 – 12/31/2026	$294,000
Photothermal Label-Free Dynamic Probing And Modulation Of Astrocytes And Fibroblast Cell Models	Sander Michelle	Department of Defense/AFOSR	12/01/2022 – 11/30/2025	$145,224
Linear And Nonlinear Performance Analysis Of Specialty Fibers	Sander Michelle	Department of Defense/Navy/US Naval Rese	01/15/2025 – 01/14/2030	$25,000
The Role of the Locus Coerules-Norepinphrine System in Flexbile Decision-Making	Scott Benjamin	NIH/National Institute of Mental Health	04/13/2023 – 03/31/2025	$41,250
The Role of the LC-NE System in Perceptual Deficits in a SHANK3 Mouse Model	Scott Benjamin	Simons Foundation	02/01/2025 – 01/31/2027	$300,000
Eager: Exploiting Smartphone GNSS Signals for Ionospheric Science	Semeter L Joshua	National Science Foundation	10/01/2024 – 09/30/2025	$99,637
High-Resolution Ionospheric Imaging Using Dual-Frequency Smartphones	Semeter L Joshua	NASA	10/04/2024 – 10/03/2025	$116,469
Quantum Networking With Diamond Nanophotonics (Umut Yazlar)	Sushkov Alexander	President and Fellows of Harvard College	08/10/2024 – 08/10/2025	$50,789
Career: Fundamental Discovery with Solid Spin Ensembles	Sushkov Alexander	National Science Foundation	12/15/2021 – 11/30/2026	$160,591
A Novel Method For Volumetric Oxygen Mapping In Living Retina	Tian Lei	The Johns Hopkins University	03/01/2021 – 02/28/2025	$81,550

	Award Title (Full)	PI	Sponsor	Project Dates	Add'l Funds this Budget Period (Total Obligated)
	Computational Miniature Mesoscope For Cortex-Wide, Cellular Resolution Ca2+ Imaging In Freely Behaving Mice	Tian Lei	NIH/National Institute of Neurological D	04/01/2022 – 03/31/2027	$371,250
	Mesoscopic Microscopy For Ultra-High Speed And Large-Scale Volumetric Brain Imaging	Tian Lei	The Johns Hopkins University	04/01/2023 – 03/31/2027	$88,569
	Mesoscopic Microscopy For Ultra-High Speed And Large-Scale Volumetric Brain Imaging	Tian Lei	The Johns Hopkins University	04/01/2023 – 03/31/2027	$86,798
	A Spatially Uniform Illumination Source For Widefield Multi-Spectral Optical Imaging	Unlu Selim M	iRiS Kinetics	09/19/2024 – 08/31/2025	$95,078
	Lunar Environment Heliophysics X-Ray Imager (Lexi)	Walsh Michael Brian	NASA	03/19/2020 – 09/30/2025	$52,740
	Single-Source, Solar Wind Magnetosphere Ionosphere Link Explorer (Smile)	Walsh Michael Brian	NASA	10/01/2023 – 09/30/2026	$90,661
	Single-Source, Solar Wind Magnetosphere Ionosphere Link Explorer (Smile)	Walsh Michael Brian	NASA	10/01/2023 – 09/30/2026	$38,662
	High Dynamic Range Radiation Instrumentation	Walsh Michael Brian	NASA	08/18/2024 – 08/17/2025	$50,518
	Specifying Near-Earth Solar Wind Conditions: A Novel Model For Propagating Solar Wind Values And Uncertainties	Walsh Michael Brian	Johns Hopkins University Applied Physics Laboratory LLC, The	05/16/2024 – 05/15/2025	$89,775
	Assembly And Integration Design Of A Charged Particle Filter (Fellowship For Aadarsh Arasu)	Walsh Michael Brian	Massachusetts Institute of Technology	09/01/2024 – 12/31/2024	$2,300
	Correlation Engineering Of Deep Multiphoton Microscopy	Wang Tianyu	Yale University	03/01/2024 – 02/28/2028	$150,998
	Energy Efficient Multilayer Nonlinear Optical Neural Networks With Active Photonic Integrated Circuits	Wang Tianyu	Ayo Electronics, Inc.	01/01/2025 – 12/31/2025	$63,999
	Discovering Pfas-Free Coatings By Exploring A Modular Polymer Chemistry With A Self-Driving Lab	Werner Joerg	Department of Defense/Army Contracting C	03/19/2025 – 03/18/2028	$83,000
	Discovering Pfas-Free Coatings By Exploring A Modular Polymer Chemistry With A Self-Driving Lab	Werner Joerg	Department of Defense/Army Contracting C	03/19/2025 – 03/18/2028	$20,000
	Understanding The Mechanism Of Microwave Neuron Inhibition	Yang Chen	Department of Defense/ARO	05/09/2022 – 05/08/2026	$92,907
	Understanding The Mechanism Of Microwave Neuron Inhibition	Yang Chen	Department of Defense/ARO	05/09/2022 – 05/08/2026	$40,000
	Understanding The Mechanism Of Microwave Neuroninhibition	Yang Chen	Department of Defense/ARO	05/09/2022 – 05/08/2026	$19,877

	Award Title (Full)	PI	Sponsor	Project Dates	Add'l Funds this Budget Period (Total Obligated)
	Massively Parallel Optoacoustic Retinal Stimulation At Micrometer-Resolution	Yang Chen	NIH/National Eye Institute	09/01/2023 – 08/31/2026	$207,650
	Injectable Optoacoustic Retina Protheses	Yang Chen	NIH/National Eye Institute	09/30/2024 – 09/29/2027	$588,568
	Developing Next Generation Photoacoustic Implant For Retinal Stimulation	Yang Chen	Axorus	09/01/2023 – 09/30/2025	$27,060
	Reu Site: Integrated Nanomanufacturing	Zhang Xin	National Science Foundation	01/01/2025 – 12/31/2027	$464,871
	Acoustic Power Harvesting And Communication For Sensors In Downhole Environment	Zhang Xin	University of Texas at Austin	08/01/2021 – 06/30/2025	$128,919

Photonics Center staff and faculty enjoying the annual cookout on the BU Beach

2026 The Year Ahead

With FY26 already underway, the Photonics Center is eagerly looking toward future successes. As our tireless faculty, staff, and students continue to chart the future of optics and photonics research, here's a glimpse at some of our upcoming programs, events, and advancements in the upcoming year.

FALL 2025

Photonics Center Symposium: "Photonics in Space"

SPRING 2026

PSS@BU's 2nd "Boston Photonics Day"

9th Annual Neurophotonics Center Symposium

SUMMER 2026

REU in "Translational Biophotonics"

A NEW 3-Year RET Program

Anna Devor's Neuroscience Summer School

Boston University Photonics Center
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Suite 936
Boston, MA 02215

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