LSU

Department of
Physics & Astronomy

SPRING 2025

ANNUAL NEWSLETTER

Assistant Professor Eric Burns led the analysis of 7,000 gamma-ray bursts to establish how frequently this brightest of all time, or BOAT, event may occur. The answer: once every 10,000 years

Graphic by NASA's Goddard Space Flight Center

NASA MISSIONS STUDY WHAT MAY BE A 1-IN-10,000-YEAR GAMMA RAY BURST

On Oct. 9, 2022, a pulse of intense radiation swept through the solar system so exceptional that astronomers quickly dubbed it the BOAT – the brightest of all time. The source was a gamma-ray burst (GRB) the most powerful class of explosions in the universe.

The burst triggered detectors on numerous spacecraft, and observatories around the globe followed up. After combing through all of this data, astronomers can now characterize just how bright it was and better understand its scientific impact.

"GRB 221009A was likely the brightest burst at X-ray and gamma-ray energies to occur since human civilization began," said LSU Assistant Professor Eric Burns.

Burns led an analysis of some 7,000 GRBs–mostly detected by NASA's Fermi Gamma-ray Space Telescope and the Russian Konus instrument on NASA's Wind spacecraft–to establish how frequently events this bright may occur – once in every 10,000 years.

The burst was so bright it effectively blinded most gamma-ray instruments in space, which means they could not directly record the real intensity of the emission. U.S. scientists were able to reconstruct this from the Fermi data. They then compared the results with those from the Russian team working on Konus data and Chinese teams analyzing observations from the GECAM-C detector on their SATech-01 satellite and instruments on their Insight-HXMT observatory. Together, they prove the burst was 70 times brighter than any yet seen.

Burns and other scientists presented new findings about the BOAT of the burst span the spectrum, from radio waves to gamma rays, and include data from many NASA and partner missions, including the NICER X-ray telescope on the International Space Station, NASA's NuSTAR observatory, and even Voyager 1 in interstellar space. Papers describing the results presented will appear in a focus issue of The Astrophysical Journal Letters.

The signal from GRB 221009A had been traveling for about 1.9 billion years before it reached Earth, making it among the closest-known "long" GRBs, whose initial, or prompt, emission lasts more than two seconds. Astronomers think these bursts represent the birth cry of a black hole that formed when the core of a massive star collapsed under its own weight. As it quickly ingests the surrounding matter, the black hole blasts out jets in opposite directions containing particles accelerated to near the speed of light. These jets pierce through the star, emitting X-rays and gamma rays as they stream into space.

To read more visit https://bit.ly/burnsBOAT

CHAIR'S CORNER

Jeffery Blackmon, Chairman – LSU Department of Physics & Astronomy

We are pleased to bring you the latest edition of the LSU Department of Physics & Astronomy Newsletter. As usual, I want to begin by thanking our communications team for their hard work in putting this together. It's been a while since we provided an update, so there is much news to share. We are fortunate to now have Olivia Crowell as a full-time Communications Specialist working with Mimi Lavalle on our communications team. Ms. Crowell was a student worker in our department, and we were very happy that she joined our full-time staff after completing her undergraduate degree from LSU last spring. She is also our special events coordinator, and as you will see inside the Newsletter, the number of events happening keep her busy. We recently hosted two large meetings in astrophysics, as well as many workshops and special guests.

Inside you will also see some of the accomplishments of members of our department. Our faculty are leaders in their fields and continue to push the forefront of discovery. A selection of research highlights is provided on pages 16-19, as well as on the cover page. Academic year 2023-2024 was record breaking in many ways. Federal research funding expenditures topped $8M for the first time, increasing by 24% over 2 years prior. Recognition our faculty received included a Boyd Professorship, Distinguished Research Master, Rainmakers, and many more.

The accomplishments of our students, staff, and alumni are also impressive. They have received many prestigious scholarships, fellowships, and other awards, including the 2024 Distinguished Dissertation Award. Our Coordinator for Graduate Students, Ms. Stephanie Jones, received the College of Science Staff Excellence Award. We had 16 B.S. degrees awarded in each of the last 2 years. We conferred 18 Ph.D. degrees in academic year 2022-2023 and 15 in academic year 2023-2024, in addition to 9 M.S. degrees over the last 2 years.

Our department also continues to grow and strive to further improve. We welcomed our largest incoming class of graduate students this year with 24 new Ph.D. students, bringing the total number of Ph.D. students currently to 107. Last year we completed a departmental strategic planning exercise that was led by a steering committee of consisting of faculty, staff, and students. The strategic plan charts our goals in research excellence, instruction, mentoring and engagement. You can check out the strategic plan on our website www.phys.lsu.edu

Finally, I want to introduce you to our new tenure-track assistant professors that span many research areas. Dr. Michela Negro observes x-rays and gamma rays using orbiting observatories to study transient phenomena and some of most energetic events in the Universe. Dr. Natalie Hinkel focuses on optical and infrared observations to study stellar abundances and the likely properties of planets outside our solar system. Dr. Constantin Schrade and Dr. Ahana Chakraborty are theorists that study the unique quantum properties of condensed matter systems, with important implications for quantum information applications and superconducting electronics. Dr. Alexis Mercenne joined our faculty to boost our research program in theoretical nuclear physics. The future of our research program in ultrafast atomic and molecular dynamics was bolstered with the hiring of Dr. Francois Mauger as a tenure-track assistant professor. You can find out more about each of the new faculty members on page 25.

While potential cuts to future science funding that are being discussed at the federal level are a cause for concern, our department is in an excellent position due to its strategic planning and exceptional people. We are glad to have you as a partner, and we look forward to our future achievements together.

INSIDE THIS ISSUE

For more info visit: **www.phys.lsu.edu**

Or contact Mimi LaValle, Editor

External Relations Manager

NASA SPACE MISSION NAMED FOR THE LATE LSU PROFESSOR ARLO LANDOLT

LANDOLT MISSION WILL LAUNCH ARTIFICIAL STAR INTO EARTH'S ORBIT

The recently approved Landolt NASA Space Mission, housed at George Mason University, will put an artificial "star" in orbit around the Earth. This artificial star will allow scientists to calibrate telescopes and more accurately measure the brightness of stars ranging from those nearby to the distant explosions of supernova in far-off galaxies. By establishing absolute flux calibration, the mission will begin to address several open challenges in astrophysics including the speed and acceleration of the universe expansion.

Named for late astronomer Arlo Landolt, who put together widely used catalogs of stellar brightness throughout the 1970s through the 1990s, this mission will launch a light into the sky in 2029 with a known emission rate of photons, and the team will observe it next to real stars to make new stellar brightness catalogs. The satellite (artificial star) will have eight lasers shining at ground optical telescopes in order to calibrate them for observations. The effort will not make the artificial stars so brightly to see with the naked eye, but one can see it with a personal telescope at home.

Arlo Landolt

"The NASA Landolt Mission, named after renowned Louisiana State University astronomer Arlo Landolt, aims to significantly enhance the accuracy of photometric measurements of absolute stellar fluxes. Utilizing state-of-the-art technology, the Mission builds upon Landolt's pioneering work in photometry and standard stars, which will in turn ensure precise calibration for millions of stars and support critical astronomical research for decades to come," said Associate Professor Tabetha Boyajian, LSU Department of Physics & Astronomy and member of the Landolt NASA Space Mission research team.

Notorious throughout the astronomical community for his discoveries, astronomers and physicists worldwide continue to use Landolt's series of papers which established the "Landolt Photometric Standard Star Catalog" and his standard stars are among the most heavily used photometric standards throughout the globe. Landolt was the first discoverer of a pulsating white dwarf, when he observed in 1965 and 1966 that the luminosity of HL Tau 76 varied with a period of approximately 12.5 minutes.

Scientists know the universe is expanding, which is measured by calculating the brightness of numerous stars and by the number of photons-per-second they emit. According to Peter Plavchan, a George Mason associate professor of physics and astronomy and the Landolt Mission Primary Investigator, more accurate measurements are needed for the next breakthroughs.

"This mission is focused on measuring fundamental properties that are used daily in astronomical observations," said Eliad Peretz, NASA Goddard mission and instrument scientist and Landolt's deputy principal investigator. "It might impact and change the way we measure or understand the properties of stars, surface temperatures, and the habitability of exoplanets." The artificial star will orbit earth 22,236 miles up, far enough away to look like a star to telescopes back on Earth. This orbit also allows it to move at the same speed of the Earth's rotation, keeping it in place over the United States during its first year in space. "This is what is considered an infrastructure mission for

NASA, supporting the science in a way that we've known we needed to do, but with a transformative change in how we do it," Plavchan explained.

The payload, which is the size of the proverbial bread box, will be built in partnership with the National Institute of Standards and Technology (NIST), a world leader in measuring photon emissions.

With more accurate measurements, experts will use the improved data from the project to enhance understanding of stellar evolution, habitable zones or exoplanets in proximity to Earth, and refine dark energy parameters, setting a foundation for the next great leaps in scientific discovery. "When we look at a star with a telescope, no one can tell you today the rate of photons or brightness coming from it with the desired level of accuracy," Plavchan, who is also the director of Mason's Observatories in Fairfax, said. "We will now know exactly how many photons-per-second come out of this source to .25 percent accuracy."

"Flux calibration is essential for astronomical research." explained NIST's Susana Deustua, a Physical Scientist in the NIST Remote Sensing Group. "We constantly ask: 'How big? How bright? How far?' and then ponder: 'What is the universe made of? Are we alone?' Accurate answers require precise measurements and excellent instrument characterization," Deustua said. Learn more at landolt.gmu.edu

About Arlo U. Landolt: Landolt's research was concerned with the measurement of stellar brightness and colors, i.e., stellar photometry. In the last 30 years, much of his time was spent in the improvement and the definition of photometric standard stars. These standard stars are used as calibration yardsticks when studying celestial objects, or indeed any objects projected against the celestial sphere, whose characteristics are unknown. For the case of physical celestial objects, one eventually can relate brightness and color measures to a variety of physical characteristics. These quantities in turn help determine stellar distance, and define a star's place in stellar evolution. Research projects also are under way in the areas of star clusters, variable stars, novae, supernovae, and eclipsing binaries.

RECENT GRADUATES

Fall 2022, Spring 2023, and Summer 2023

Fall 2022 Graduates

BS: Rachel Brown
Blayne Conway
Caleb Derrickson
Joshua Fabre
Savannah Payne

PhD: Zeeshan Ali

Anthony Grant

Spring 2023 Graduates

BS: Brandon Brumfield
Micah Couvillion
Anthony Grant
Megan Lawrence
Blu LeBlanc
Jake Normand
Ashley Patron
Tzuriel Pedigo
Elizabeth Vienne
Raenessa Walker
Duncan Wilkie

MS: Sachin Mohandas

PhD: Sudarsan Balakrishnan
Anshuman Bhardwaj
Joanna Blawat
Kai-Cheng Chuang
Margarite LaBorde
Bradley Munson
Payton H. Stone

Elizabeth Vienne

Summer 2023 Graduates

MS: Sydney Carr
James Crist
Kayla Nowak
Bryce Smith

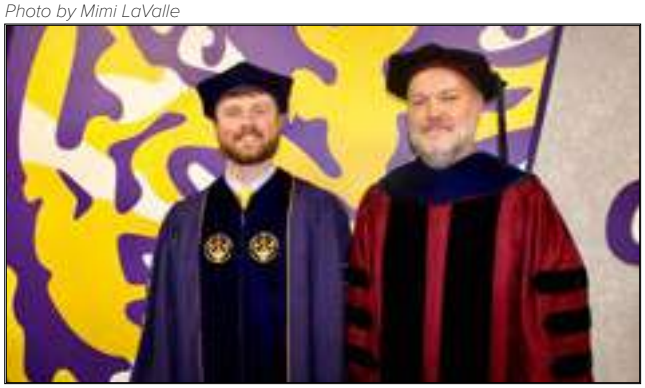
PhD: Tej B Poudel Chhetri
Chia-Lung Chien
Arshag Danageozian
Mojgan Dehghani
Andre Guimaraes
Alexander Igl
Dimitrios Kranas
Andrew McGuffey
Thomas Ruland
Jared Taylor

Mojgan Dehghani

Fall 2022 Commencement *Photo by Mimi LaValle*

Prof. Catherine Deibel & Sudarsan Balakrishnan Photo by Mimi LaValle

Spring 2023 BS grads with LSU Boyd Prof. Gabriela Gonzalez
Photo by Mimi LaValle



Dr. Andrew McGuffey and Dr. Kip Matthews *Photo by Mimi LaValle*

RECENT GRADUATES

Fall 2023, Spring 2024, Summer 2024 & Fall 2024

Fall 2023 Graduates

BS: Keslie Babin
Michael Gravois
PhD: Eklavya Thareja

Spring 2024 Graduates

BS: Stephanie Armond
Marium Asif
Daniel Carpenter
Robert Davis
Miscia Fortna
Haiden Guillory
Charles Hearne
Joshua Kasprzak
Angela Liemkeo
Nils Sommerfeld
Khristian Tallent
MS: Grant Debevec
Hunter Meyer
PhD: Reagan Dugan
Jane Glanzer
Kyle Hamer
Frank McKay
Maryam Masero

Summer 2024 Graduates

BS: William Denooyer
Ryan Macdonald
Joseph Stelly
MS: Rachael Blair
Richard Lesieur
PhD: Pratik Barge
Ashumitra Baul
Megan Chesal
Alison Crisp
Stav Haldar
Sergio Lopez-Caceres
Graeme Morgan
Fatemeh Mostafavikhatam
Shania Nichols

Fall 2024 Graduates

Jack Garick
Didrik Larsen
Dakota Peltzer

Keslie Babin

Nils Sommerfeld

Stav Haldar

(l-to-r) Hunter Meyer, Maryam Masero, Reagan Dugan, & Grant Debevec
Photo by Mimi LaValle

Jane Glanzer *Photo by Mimi LaValle*

(l-to-r) Matthew Penny, Ali Crisp, Shania Nichols, and Gabriela Gonzalez

Dakota Peltzer, Didrick Larsen, and Jack Garick *Photo by Olivia Crowell*

2022-2023 GRADUATE STUDENT AWARDS

Dimitrios Kranas – Joseph Callaway Memorial Fellowship Award, in memory of LSU Boyd Professor Joseph Callaway to assist graduate students who have shown excellence in research.

David He, Ashley Elliott & Riley Dawkins were recognized for outstanding research proposals

Maxwell Cole – Roussel Family Graduate Student Award in Communication

Riley Dawkins – Outstanding Physics & Astronomy Grader Award for Graduate Quantum

Chloe DiTusa – Outstanding Physics & Astronomy Grader Award for Undergraduate Quantum

Dept. Chair Jeff Blackmon & Riley Dawkins

Ashley Elliott – Outstanding Physics & Astronomy Grader Award for for Intro astronomy

Zachary Yarbrough – Outstanding Physics & Astronomy Teaching Assistant Award for astronomy labs

Alexander Igl – Outstanding Outreach and Service Award, recognized for the dedication and incredible amount of work he has contributed to assist with the LSU Saturday Science Program.

Alexander Igl

Pratik Barge – Coates Research Scholar award, for his dedication and significant contributions to research and other activities.

Kai-Cheng Chuang – Coates Travel Research awardresearch involves effective connectivity, based on functional magnetic resonance imaging (fMRI) time series signals, is the quantification of how strongly brain activity in a certain source brain region contributes to brain activity in a target brain region, independent of the contributions of other source regions.

Dr. Owen Carmichael and Dr. Kai-Cheng Chuang *Photo by Mimi LaValle*

2022-2023 UNDERGRADUATE AWARDS

Michael Gravois – 2023 Keen-Morris Award, presented to an outstanding graduating senior for demonstrating excellence in all areas of academics, service, leadership, and research.

Trang Huynh – Physics & Astronomy Undergraduate Research Award, presented to a student who has shown outstanding academic excellence and class performance, coupled with strong research experience.

Trang Huynh

Emily Desoto – Byrd Ball Undergraduate Award for continuing excellence and outstanding class performance.

Nils Sommerfeld – Byrd Ball Undergraduate Award for continuing excellence and outstanding class performance

Emily DeSoto

Nathaniel Wrobel – Barbara and Barry Coon Annual Physics and Astronomy Scholarship, awarded to support physics students who look to pursue a career in industry.

Miscia Fortna – Byrd Ball Outstanding Undergraduate Research Award, named for Mr. Ball, 1961 BS physics alumnus. who passed away in 2019

Dept. Chair Jeff Blackmon & Nathaniel Wrobel

Ashley Patron and Anthony Grant – Department Service and Outreach Award for undergraduates who have shown dedication to volunteer work in the tutoring center and community STEM events.

Rebekah Slocum and Felix Schafer – Tiger Athletic Foundation Student Scholarship Award, provided through the support of the Tiger Athletic Foundation for students with a 3.25 or higher GPA.

Douglas Granger, LaSPACE Analyst 3 – Data Processing / Computer Services staff member received the LSU Foundation Outstanding Staff Service Award. Doug's technical support of the LaSPACE program is the backbone of our success.

2023-2024 GRADUATE STUDENT AWARDS

'8Joseph Callaway Memorial Fellowship Award, in memory of LSU Boyd Professor Joseph Callaway to assist graduate students who have shown excellence in research.
Meysam Motaharfar

Roussel Family Graduate Student Award in Communication. 1974 PhD alumnus, Keith Roussel and his family established an award for graduate students who excel in communicating their research and recognizes exemplary research coupled with the ability to succinctly present the research findings
Mingyuan Hong
Nageeb Zaman

Dept. Chair Jeff Blackmon & Nageeb Zaman

Graduate Student Teaching Excellence Award
Kristina Callaghan

Outstanding Physics & Astronomy Teaching Assistant Award for astronomy labs
Rachel Brown
David He

Andrea Munroe

Outstanding Outreach and Service Award, recognized for the dedication and incredible amount of work he has contributed to assist with the LSU Saturday Science Program.
Andrea Monroe

Coates Research Scholar award, for his dedication and significant contributions to research and other activities
Thareja Eklavya

Stephanie Jones, Graduate Student Coordinator, received the College of Science Staff Excellence Award, which recognizes the outstanding service of a staff member. An LSU alumna, Stephanie joined the Department in 2012 as an academic coordinator. In 2023 she was promoted to graduate student coordinator. In this position, her creative approach to communication and service have been extremely important. She has volunteered to take on extra tasks when the department has been short staffed, and everything still is accomplished in outstanding fashion. Her dedication to the success of department events, and to getting graduate students much needed information on every imaginable topic, are great examples of her exemplary service.

2023-2024 UNDERGRADUATE AWARDS

2024 Keen-Morris Award, presented to an outstanding graduating senior for demonstrating excellence in all areas of academics, service, leadership, and research.
Miscia Fortna
Haiden Guillory
Khristian Tallent

Byrd Ball Outstanding Undergraduate Research Award, named for Mr. Ball, 1961 BS physics alumnus. who passed away in 2019
Stephanie Armond
Nathaniel Wrobel

Byrd Ball Undergraduate Award for continuing excellence and outstanding class performance.
Gianna Hammill
Isaac Ponder

Gianna Hammil

Barbara and Barry Coon Annual Physics & Astronomy Scholarship, awarded to support physics students who look to pursue a career in industry.
Daniel Carpenter
Henry Vo

Caleb Robinson

Department Service & Outreach Award for undergraduates who have shown dedication to volunteer work in community STEM events.
Caleb Robinson

2022 REU PROGRAM FOCUS

LSU Physics & Astronomy hosts a 10-week summer Research Experiences for Undergraduates (REU) program that introduces students to the nature of research-oriented careers in physics & astronomy, and fosters development of research-related skills and knowledge. Participants are matched with faculty mentors based on student interests. Virtual weekly seminars and workshops provided students with skills development, professional development topics (such as ethics and patents/ intellectual property), and introduction to common research resources.

(l-to-r) Kyle Hamer, Stephanie Armond & Mette Gaarde

Stephanie N. Armond, LSU, "CHigh Harmonic Generation in Benzene and Benzene Derivatives," working with Kyle A. Hamer and Mette B. Gaarde.

Caleb Derrickson, LSU, "Preliminary Software Studies in T2K's Near Detector Upgrade," mentored by Shih-Kai Lin and Thomas Kutter.

Ethan Fahimi, The Ohio State University, "EA Search For Transiting Hot Jupiter Planets in the Omega Cen Globular Cluster Using DECam," advised by Ali Crisp, Jonas Klüter, Matthew Penny, and the MISHAPS Collaboration.

Anthony Grant, LSU, "The effects of Ni vacancy on the structural properties of MnNiGe," mentored by Jing-Han Chen, Tej Poudel Chhetri, David Young, and Shane Stadler.

William Hennig, Angelo State University, "Equilibration Times of 3D Edwards-Anderson Spin Glass Ising Models," research with Ka Ming Tam, andJuana Moreno.

2022 REU group

Alexander E. Jimenez, University of Puerto Rico -Bayamon, "The Study of Anderson Localization Using Machine Learning," mentored by Ka Ming Tam and Juana Moreno.

Nicholas Kurth, Rowan University, Analysis of Loud Glitches in the LIGO Livingston Observatory during the O3 Observing Run," for research with Shania Nichols, Hong Qi, and Gabriela González.

Lauren Leese, Mount Holyoke College, "What Are the True Sizes of Retired A Stars?," working with Tabetha Boyajian and Tyler Ellis.

Ángel M. Ortega López, University of Puerto Rico Rio Piedras, "High Field Superconductivity in Thin Re/Al Bilayer Films," research with Philip W. Adams.

A. Meenakshi McNamara, Purdue University, " Ekpyrosis in a Quantum Gravitational Anisotropic Bounce," mentored by Sahil Saini and Parampreet Singh.

Alexander Nichols on the swamp tour

Alexander Nichols, Middlebury College, "A Mouse BAT Interferometry Imaging" advised by Kip Matthews

Levi Ryan, LSU, "Modeling Quantum Dynamics with Percolation," advised by Justin Wilson.

Varalee Sakorikar, Michigan State University, "First steps in analysis of 2GeV pions produced in ProtoDUNE," mentored by Thomas Kutter and Siva Kasetti.

Jaidyn Spoon, University of Nebraska at Omaha, "Investigating Scattering Noise in the Livingston Detector During O3 Trains," advised by Jane Glanzer and Gabriela Gonzalez.

Nicholas Valente, Embry-Riddle Aeronautical University "X-ray-emitting Red Giant Systems in the Galactic Bulge," mentored by Robert Hynes.

Samantha Waller, University of North Carolina at Charlotte "Testing Mirror Symmetry" advised by Catherine Deibel, Gemma Wilson, Jeffery Blackmon, Keilah Davis, Molly McLain and Khang Pham.

Sami Waller with nuclear detector

2023 REU PROGRAM FOCUS

We celebrate the 2023 REU participants and their mentors.

Daniel Carpenter, LSU, "Testing Cryogenically Cooled Components of the Signal Readout Chain for Implementation in the Deep Neutrino Experiment Vertical Drift Liquid Argon Detector," working with LSU mentors.

Ella Chevalier, University of Wisconsin, "Detailed Vetting of Transiting Planet Candidates Toward the Galactic Bulge," mentored by Matthew Penny. Alison Crisp, Jonas Klüter

Caroline Davis, LSU, "Modeling and Analysis of Absorption Spectroscopy Using Self-Amplified Spontaneous Emission Light Pulses," working with Francois Mauger.

David Duong, Nebraska Wesleyan University, "Image Quality Assessment of SPECT/CT," mentored by Kip Matthews.

Watching LSU baseball in College World Series while creating pottery at Dr. Tabetha Boyajian's house.

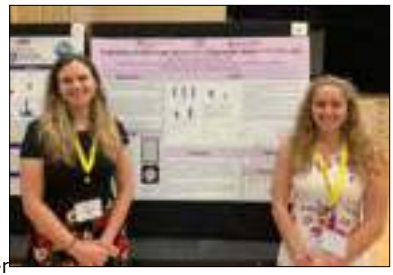
Zoe Hardnett, Mercer University, "Studying 32S,t(6Li)35Ar Reactions: Mimicking Nuclear Reactions in Classical Novae," research with Catherine Deibel and Khang Pham.

Ashley Harrington, University of Northern Iowa, "Enhanced Head Immobilization for GammaKnife Radiosurgery" mentored by Kip Matthews, Daniel Neck & Connel Chu.

Elliot Hiegel, Denison University, "Fundamental Properties of Three Metal-Poor Stars with Optical/NIR Interferometry," for research with Tabetha Boyajian and Ashley Elliott.

Aidan Kelly, Penn State, "Bayesian Uncertainty Quantification in Nuclear Reaction Theory for Astrophysical Applications," working with Kevin Becker, Alexis Mercenne & Kristina Launey.

Bernadette Lesieur, St. Michaels College, "Evaluation of MR Image Quality on a Diagnostic Versus RTP Tabletop," research with PhD alumna Krystal Kirby at Mary Bird Perkins Cancer Center.



(l-to-r) PhD alumna Krystal Kirby mentored medical physics REU student Bernadette Lesieur.

Jed McPike, Austin College, "Formation and Photodegradation of Environmentally Persistent Free Radicals (EPFRs) on ZnO Nanoparticles," mentored by Fox Foley and Phil Sprunger.

Jed McPike conducts Tesla Coil demonstration.

Sadman Rabbith, LSU, "Understanding the Causes of Mysterious Loud Instrumental Glitches in LIGO," advised by Gabriela González and Shania Nichols

Watching LSU baseball in College World Series while creating pottery at Dr. Tabetha Boyajian's house.

Anish Suresh, Rutgers University, "Towards a Modified Generalized Friedmann's Equation of an Anisotropic Universe," mentored by Parampreet Singh

(l-to-r) Meysam Motaharfar Anish Suresh, Dr. Param Singh, and Rachel Brown

Andrew Valentini, Carthage College, "Analyzing Causes of Gravitational Wave False Alarms," advised by Zach Yarbrough & Andre Guimaraes.

Non-NSF participants

Abby Tejera, Oberlin College, "From O3 to O4: The Evidence of Reduced Noise Transients in the LIGO Livingston Gravitational Waves Detector Interferometer," under the guidance of Jane Glanzer & Gabriela González.

M.J. Jones, University of Cardiff, "Solving the Mystery of Loud Glitch Sources in LIGO, mentored by Shania Nichols & Gabriela González"

LSU PHYSICS & ASTRONOMY STUDENT ORGANIZATIONS

GRADUATE STUDENT ORGANIZATION

The purpose of LSU's Physics and Astronomy Graduate Student Organization is to support physics, astronomy, and medical physics graduate students. We accomplish this goal through social events, intellectual and professional development, recruiting, and advocacy. In addition to monthly general body meetings, the GSO hold monthly Faculty/GSO meetings with the department chair, graduate student advisor, medical physics chair, and GSOs advisor to receive department updates and advocate student concerns.

GSO did make some major changes to their officer team, with two new positions being created at the end of the term: the International Student Liaison and the Events Chair (taking the Academic events and Social events chair and merging into one). We are super excited to have these new positions!

We continue to advocate to better the lives of our graduate students here in the department.

You can learn more about us by visiting our website at https://physgradorg.wixsite.com/mysite. We also have a Facebook page and a dedicated discord server that we encourage all of our graduate students to join in the department.

(l-to-r) Camilla Neill, Skye Strain, and Abigail Jesmer

SPS

The purpose of LSU's Society of Physics Students Chapter is focused on students interested in the fields of Physics and Astronomy. Our purpose is the promotion of appreciation and advancement of Physics and Astronomy in the community, as well as the further education of our members. We often aid other organizations seeking to educate, including scouts and local elementary and high schools.

(l-to-r) Phong Dang, Valerie Milton, and Joseph Henning

NEW APS STUDENT CHAPTER AT LSU

The APS Student Chapter aims to support graduate students and postdocs at LSU by harnessing the resources of the American Physical Society. Our members gain access to:

Exclusive networking events at LSU with US industry and policy leaders, Professional Development resources sponsored by the APS, Access to special support for travel to APS meetings, Channels of advocating to the department regarding graduate student and postdocs needs.

(l-to-r) Trang Huynh, Andrea Munroe, Caroline Davis and Rebekah Slocum

NEW WOMEN IN PHYSICS

The new Women in Physics group at LSU looks to support and retain women and gender minority students in their physics education, and participate in outreach events.

Membership in this chapter of Women in Physics is open to all graduate or undergraduate students involved in physics.

Caroline Davis (President)
Mette Gaarde (Campus Advisor)
Trang Huynh (Officer)
Rebekah Slocum (Vice President)

LaSPACE AT LSU: A YEAR OF GROWTH & RECOGNITION

by Colleen H. Fava, assistant director

LaSPACE, housed in the LSU Physics & Astronomy Department with major support from the Louisiana Board of Regents and LSU Administration, manages a portfolio of multiple grants worth several million dollars annually from NASA's Office of STEM Engagement's Space Grant and EPSCoR programs. We also manage the subsequent dozens of subawards issued by LaSPACE to institutions throughout Louisiana. The 2022-2023 academic year was the third year of our current multi-year Space Grant Award and the first program year of our latest NASA EPSCoR Research Infrastructure Development (RID) award. During this year, we successfully obtained a fourth augmentation to our NASA Space Grant award bringing our annual funding to $910,000 from NASA, plus $250K from LA BoR & $100K+ from LSU. We have submitted a proposal for a funded fifth year of our Space Grant agreement and are preparing to submit the next multi-year award proposal next year.

LaSPACE Programming funded under the NASA Space Grant umbrella includes support for undergraduate and graduate student research projects, authentic student flight programs, senior design projects, seed funding for faculty research projects, K-12 teacher professional development support, and public outreach events.

This summer LaSPACE participated in its first ever NASA site review. The program team produced a comprehensive collection of materials documenting our performance responsive to 11 sections required by NASA spanning content areas related to this past year such as Consortium Operations, DEI Plans & Accomplishments, Budget & Reporting Compliance, and more. Our final submission was a 100+ page document with about 75 supplemental documents totaling more than a thousand pages. We also participated in a day-long site-visit with representatives from NASA, LaSPACE, LSU, and several affiliate institutions. The result is a highly comprehensive overview of LaSPACE program goals, objectives, practices, and accomplishments. The images below show our program office team and a couple of highlights from our site visit presentation.

For more information about our programs visit:

Louisiana Space Grant: https://laspace.lsu.edu/

LaSPACE Undergraduate Balloon Program: https://laspace.lsu.edu/laaces/

High Altitude Balloon Program (HASP): https://laspace.lsu.edu/hasp/

LA NASA EPSCoR: https://lanasaepscor.lsu.edu/

The LaSPACE Program Management Team
Greg Guzik, Director
Colleen H. Fava, Assistant Director
Doug Granger, Student Flight Programs Manager/IT Lead
Aaron Ryan, Student Flight Programs Instructor/Outreach Coordinator

Following more than 41 years of dedicated service to LSU and NASA Epscor, Professor Greg Guzik retired in December 2024.

A celebration was hosted by Hosted by the LSU Office of Research and Economic Development, LSU Department of Physics & Astronomy, and LaSPACE in his honor.

OUTREACH

The Department of Physics & Astronomy offers numerous outreach programs throughout the year.

SATURDAY SCIENCE

Open to the public, the LSU Saturday Science series, organized by Param Singh and Ravi Rau, has run continuously for over 25 years with the help of Board of Regents Fellows.

All talks are available on the LSU Saturday Science FACEBOOK page to view.

Invitations are sent to over 100 area science teachers and principals, and was boosted on social media and community event calendars, with great results. The approximate average attendance was about 80 at each talk, though a few talks exceeded 150 attendees. A large segment of the attendees were students ranging from third grade to high school, with a large fraction from under-represented groups in STEM. Presentations were led this year by faculty from LSU.

"Back to the Moon and on to Mars: Challenges in America's Space Program" by **Dr. Serena Auñón-Chancellor**, Clinical Associate Professor of Medicine, LSU Health

"Unveiling Cosmic Wonders: The Total Solar Eclipse" by **Tabetha Boyajian**, Associate Professor, LSU Physics & Astronomy

"One Model to Bind Them All: Understanding Disease Outbreaks" by **Bret Elderd**, Professor, LSU Department of Biological Sciences

"Designing the Rice Plant to Mitigate the Impact of Climate Change" by **Prasanta Subudhi**, Professor, LSU School of Plant, Environmental and Soil Sciences

Going out with a Bang: Supernova Explosions & The Aftermath of Stellar Death" by **Manos Chatopoulos**, Associate Professor, LSU Physics & Astronomy

"A Song of Ice and Fire: Sea Floor Spreading Beneath the North Pole" by **Jon Snow**, Professor, LSU Geology & Geophysics

"Journey Through the Invisible Universe: Wonder Beyond the Limits of Vision" by **Michela Negro**, Assistant Professor, LSU Physics & Astronomy

"Exploring the Depths: The Science and Engineering of Marine Robotics" by **Corina Barbalata**, Assistant Professor, LSU Department of Mechanical and Industrial Engineering

Visit @ **LSUSaturdayScience** on Faceboot to view videos of previous presentations.

ASTRONOMY ON TAP

Hosted once a month at the Varsity Theater, the AoT BR satellite organization was created in 2018 by astronomy PhD alumni Tyler Ellis and Emily Saffron. AoT BR features two talks per event, along with fun astronomy and science themed trivia and raffles that end in some awesome prizes. Current volunteers who run AoT BR are all LSU graduate students/staff within the Department of Physics & Astronomy. Most talks are given by local experts from Baton Rouge, mainly stemming from the wide range of scientists and experts at LSU. **All talks are available on the Astronomy on Tap YouTube @AoTBR.**

"Stargazers and Trailblazers," **Ashley Elliott**, LSU PhD Candidate

"The Moon in a Pebble," **Matthew Loocke**, Assistant Professor & Director Chevron Geomaterials Characterization Laboratory

"The Total Solar Eclipse," **Tabetha Boyajian**, Associate Professor

"Potatoes on Mars?," **Sofia Matylis**, LSU Biochemistry Undergraduate

"Unlocking the Future of Aerospace Engineering," **Marc Aubanel**, Director of the Digital Media Arts & Engineering and **Jason Jamerson**, Director of XR Studios & Assistant Professor, Virtual Production and Immersive Media.

"From Stars to Planets to Life," **Natalie Hinkel**, Assistant Professor

"Navigating Neutron Stars: A Concise Coverage of the Compact Objects," **Caleb Robinson**, LSU Physics & Astronomy Undergraduate

"Charting the Evolutionary Dance of Long-Period Algol KU Cygni", **Emelly Tiburcio**, LSU PhD Candidate

"Celebrating 25 Years of the Chandra X-ray Observatory: From Fierce Planets to Fierce Astrophysics," **Rob Hynes**, Professor

"Frozen Fierce: The Cold & Lonely Planets That Will be Found by the Nancy Grace Roman Telescope," **Matthew Penny**, Assistant Professor

"Can You Own the Moon?" **Allison Crisp**, 2024 LSU PhD Alumna

"Stargazers and Trailblazers: The Women of Astronomy Part 2," **Ashley Elliott**, LSU PhD Candidate

"Magnetars: Serving Up Giant Flare Energy," **Aaron Trigg**, LSU PhD Candidate

"How to Go Fast," **Colin Turley**, Astrophysics Instructor

"Why We Do Astronomy From Space," **Tom Maccarone**, Presidential Excellence in Research Professor, Texas Tech University

"Supernova Forensic Files," **Jennifer Andrews**, Associate Astronomer at Gemini North, 2011 LSU PhD Alumna

"The Hubble Constant," **Brendan Parenti**, LSU Undergraduate

"Universe Exploration from the Lunar Surface," **Ahmad Sohani**, LSU PostDoc

"De Stella Nova," **Adrien Picquenot**, LSU PostDoc

"Red Hot Martian Moments," **Carlos Gary-Bicas**, GANGOTRI Mars Mission Postdoctoral Researcher

OUTREACH

Sounds of Science: a Transdisciplinary Celebration of the Creation of the Universe

The East Baton Rouge Parish Library in collaboration with the LSU School of Music, the LSU Department of Physics & Astronomy, and the LSU Manship School of Mass Communication launched a special series of public events exploring NASA's James Webb Space Telescope (JWST) mission, our understanding of the universe, and how music provides an alternate method for understanding our place in the universe.

In the natural world we see trees, flowers, insects, animals, soil, rivers, rocks, and mountains around us. Above us we see birds, clouds, the Moon, the Sun, and stars. The air carries the scent of life.

Based upon measurable evidence and logic, science provides a profound understanding of the origin of things dating back in deep time to almost 13.8 billion years when the origin event governed by quantum gravity began our universe. Over the next small fraction of a second the universe expanded by 26 orders of magnitude, and within the first three minutes all of the basic forces (gravity, electromagnetism, strong, weak) and components (electrons, protons, neutrons, photons) were assembled.

During the next 300,000 years the universe cooled enough so neutral atoms could form, but it would take another 150 million years before the first stars would light up. It is these first stars that began the process of making the carbon and calcium in our bodies, the oxygen and nitrogen we breathe, and the silicon and iron that comprises the Earth. As our universe aged, galaxies formed, stars died, black holes merged to generate gravitational waves, and space expanded. Most recently, science determined that a mysterious "dark energy", acting like an "anti-gravity" force, is driving an increase in the universe expansion rate. The ultimate fate of the universe is still controversial but, in general, it is thought that as the universe expands into the far future (greater than 100 Trillion years) fewer stars will be born, the existing stars will die, and the universe will darken.

In the "Sounds of Science" David B. Walters, LSU School of Music, rendered his interpretation of the evolution of the universe and life on Earth into a musical composition that reflects the mystery and majesty of the known science.

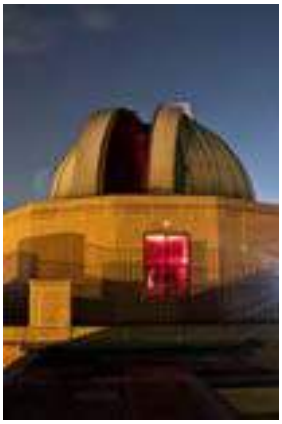
The series also included presentations from the LSU Department of Physics & Astronomy:

"How Earth Came to Be: From the Big Bang to Planet Formation," by Assistant Professor Matthew Penny;

"A journey to the Big Bang and Beyond," by Professor Parampreet Singh

"The First Exciting Discoveries with the James Webb Space Telescope," by Geoffrey Clayton, Ball Family Distinguished Professor

The finale hosted activities for children and adults, including the LaSPACE/ MARS Truck, special stories, interactive music making, and a Sounds of Science panel discussion musical performance.



LANDOLT ASTRONOMICAL OBSERVATORY

Come back to campus and explore our universe. We open for public viewing once a month during the Fall and Spring semesters, on the Saturday best for Moon visibility (home football games permitting).

If the weather is mostly cloudy, there will not be any observing, as there will not be any celestial body to see.

Admission is free and you need not bring anything. The observatory was built in the late 1930's and is not handicapped accessible.

For more information and updates on how weather may affect the public nights, please follow us @lao.lsu on Instagram

OUTREACH

ASTRONOMY ON TAP ALL-STAR KREWE IN NOLA

The worldwide phenomenon, Astronomy on Tap, made a special appearance in New Orleans at Republic NOLA in 2024. The 'Astronomy on Tap All-Stars Krewe' production featured space-themed trivia, games, prizes and astronomical presentations from LSU's planetary astrophysicist Natalie Hinkel and NASA theoretical astrophysicist Ronald S. Gamble, Jr.

This stellar event offered the opportunity to experience space like never before. More than 700 people came to learn about stars, planets, black holes, distant galaxies, and the most exciting astronomy news while thousands of scientists and educators were in town for the 'Super Bowl' of astronomy.

AoT All-Star Krewe event team in New Orleans, LA

FIERCE PLANETS: WHERE ART AND ASTRONOMY COLLIDE


(l-to-r) Roland Miller, Natalie Hinkel and Caleb Wheeler at the LSU Museum of Art Fierce Planet exhibition

A unique collaborative opportunity presented itself when the LSU Museum of Art was planning a new exhibition titled "Fierce Planets and Interior Space."

We embarked on the cosmic adventure at LSU MoA with a panel discussion featuring LSU planetary astrophysicist Natalie Hinkel and photographer Roland Miller, moderated by astrophysicist Caleb Wheeler.

The juried exhibition Fierce Planets featured fiber art inspired by the work of Dr. Sabine Stanley, the Bloomberg Distinguished Professor at Johns Hopkins University in the Department of Earth and Planetary Sciences and the Space Exploration Sector of the Applied Physics Lab, and author of the book, What's Hidden Inside Planets. Responding to a call from the Studio Art Quilt Associates, Inc. (SAQA), artists from across the globe designed forty-two intricate objects inspired by planets and space. Their interpretations vary wildly, and include traditional quilts, fabric assemblages, and soft sculptures made using a variety of materials and techniques. Objects and artifacts from LSU's Department of Physics & Astronomy and Geology & Geophysics, including a tile from a Space Shuttle and meteorites, accompanied the artwork, allowing the viewer to glean a deeper appreciation and knowledge of space and the formation of planets.

The five month exhibit offered the public to discover the beauty of space from a unique perspective. The 'Interior Space' exhibition featured captivating photographs by Roland Miller & Paolo Nespoli and an exclusive insight into Miller's project documenting the Space Shuttle program and the building of the International Space Station.

In addition, LSU Museum of Art and Astronomy on Tap - Baton Rouge hosted a cosmic evening at the museum with AoT on the Road. Professor Rob Hynes talked 25 years of Chandra, and Assistant Professor Matt Penny lead a talk about the Nancy Roman Space Telescope.

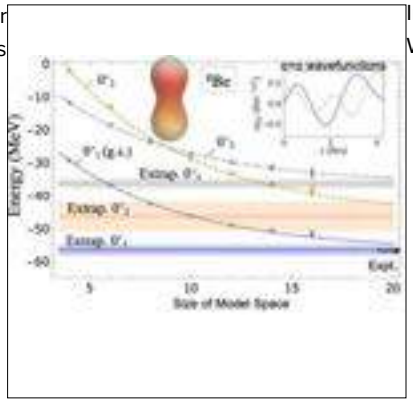
Offering cosmic wonder for the entie family, LSU MoA hosted a FREE & family-friendly event, featuring an inflatable planetarium provided by LSU Department of Physics & Astronomy and the Louisiana Space Grant & NASA EPSCoR Programs

RESEARCH NEWS

LSU Researchers Collaborate to Better Understand the Weak Nuclear Force

PHYSICS JOURNAL PRL FEATURES LSU NUCLEAR PHYSICS RESEARCH.

Physical Review Letters, PRL, the world's premier physics letter journal, has published two papers by a team of Louisiana State University nuclear physics researchers to advance the knowledge on the important implications for understanding the physics of the weak nuclear force.



Unveiling new physics in 8Be (figure adapted from doi.org/10.1103/PhysRevLett.128.202503)

The weak nuclear force is currently not entirely understood, despite being one of the four fundamental forces of nature. In a pair of Phys. Rev. Lett. articles, a multi-institutional team, including theorists and experimentalists from LSU, Lawrence Livermore National Laboratory, Argonne National Laboratory and other institutions worked closely together to test physics beyond the "Standard Model" through high-precision measurements of nuclear beta decay.

By loading Lithium-8 ions, an exotic heavy isotope of lithium with a less than one second half-life, in an ion trap, the experimental team was able to detect the energy and directions of the particles emitted in the beta decay of Lithium-8 produced with the ATLAS accelerator at Argonne National Laboratory and held in an ion trap. Different underlying mechanisms for the weak nuclear force would give rise to distinct energy and angular distributions, which the team determined to unrivaled precision.

State-of-the-art calculations with the ab initio symmetry-adapted no-core shell model, developed at Louisiana State University, had to be performed to precisely account for typically neglected effects that are 100 times smaller than the dominant decay contributions. However, since the experiments have achieved remarkable precision, it is now required to confront the systematic uncertainties of such corrections that are difficult to be measured.

In their paper, "Impact of Clustering on the 8Li Beta Decay and Recoil Form Factors," Phys. Rev. Lett. 128, 202503, the LSU-led collaboration places unprecedented constraints on recoil corrections in the β decay of 8Li, by identifying a strong correlation between them and the 8Li ground state quadrupole moment in large-scale ab initio calculations. The results are essential for improving the sensitivity of high-precision experiments that probe the weak interaction theory and test physics beyond the Standard Model. Dr. Grigor Sargsyan led the theoretical developments while he was a PhD student at LSU, and is currently a postdoctoral researcher at Lawrence Livermore National Laboratory (LLNL).

In "Improved Limit on Tensor Currents in the Weak Interaction from 8Li β Decay," Phys. Rev. Lett. 128 202502, researchers present the most precise measurement of tensor currents in the low-energy regime by examining the $\beta-\bar{\nu}$ correlation of trapped 8Li ions with the Beta-decay Paul Trap. The results are found to be consistent with the Standard Model prediction, ruling out certain possible sources of "new" physics and setting the bar for precision measurements of this kind.

"This has important implications for understanding the physics of the tensor current contribution to the weak interaction," said LSU Assistant Professor Alexis Mercenne. "Heretofore, the data has favored only vector and axial-vector couplings in the electroweak Lagrangian, but it has been suggested that other Lorentz-invariant interactions such as tensor, scalar, and pseudoscalar, can arise in the Standard Model extensions."

"These are remarkable findings – the level of theoretical precision reached in ab initio theory beyond the lightest nuclei is unprecedented, and opens the path to novel high-precision predictions in atomic nuclei rooted in first principles," said LSU Associate Professor Kristina Launey. "In addition, no one expected that these theoretical developments would unveil a new state in 8Be nucleus that has not been measured yet. This nucleus is notoriously difficult to model due to its cluster structure and collective correlations, but become feasible for calculations in the ab initio symmetry-adapted no-core shell-model framework."

The excitement of modern nuclear physics is its interdisciplinary nature and the use of a wide range of techniques and tools. LSU has both experimental and theoretical research groups in nuclear physics, with strong connections to the high-energy physics and astrophysics/space science groups. The principal focus of the experimental and theoretical groups is in the area of low-energy nuclear structure and reactions, including the study of nuclei far from stability and applications to astrophysics.

New MicroBooNE analysis takes a closer look at the sterile neutrino

The MicroBooNE collaboration at Fermilab released a new analysis of their neutrino data. The result provides constraints on a model that assumes the existence of a sterile neutrino to explain anomalies in neutrino measurements by other experiments.

A new result from the MicroBooNE experiment at the U.S. Department of Energy's Fermi National Accelerator Laboratory probes the Standard Model—scientists' best theory of how the universe works. The model assumes there are three kinds of neutrinos. Yet for more than two decades, a proposed fourth kind of neutrino has remained a promising explanation for anomalies seen in earlier physics experiments. Finding the theorized sterile neutrino would be a major discovery and radical shift in our understanding of the universe.

The new analysis compares the experiment's data to a model with a fourth, sterile neutrino to test their compatibility. MicroBooNE scientists found no evidence of the long-sought sterile neutrino in the parameter range explored.

"Our ability to explore sterile neutrinos and rare interactions will be enhanced when we add in the data from Fermilab's Main Injector neutrino beam," said Hanyu Wei, assistant professor of physics at Louisiana State University and a co-leader of the sterile-neutrino analysis. "The interplay between the two beams' data will be interesting, not just more statistics."

The possibility that sterile neutrinos caused the yet-unexplained anomalies reported by previous experiments still remains. These include measurements by the Liquid Scintillator Neutrino Detector at Los Alamos National Laboratory, the MiniBooNE experiment at Fermilab, and several radiochemical and nuclear reactor neutrino experiments.

While the most basic version of a sterile neutrino is becoming less likely, other, more subtle types of physics might be at play. For example, there could be a sterile neutrino working in combination with something else, such as dark matter. Or there could be completely different explanations for the anomalies. Unexplained physics related to the Higgs boson or other physics beyond the Standard Model could be the reason.

"In this work, we found an important interplay between the neutrino appearance and disappearance, which was not considered in the previous experimental work. This has important consequences in the search result," said Xiangpan Ji, a postdoctoral researcher at DOE's Brookhaven National Laboratory, who is one of the co-leaders of this analysis.

Like the 2021 results, the new finding uses only half of MicroBooNE's dataset. Researchers will continue to look for potential sterile neutrino signals in future analyses. They also will expand their analyses to the full dataset.

MicroBooNE features state-of-the-art particle detection techniques and technology. The experiment studies neutrino interactions and is probing models of a theorized fourth neutrino called the sterile

Wei worked on the 2D signal processing and Wire-Cell 3D event reconstruction for liquid argon time projection chamber (LArTPC), which enables high performance physics analyses for the MicroBooNE experiment, and co-led the flagship low-energy excess search at MicroBooNE, which aims to resolve the long-standing MiniBooNE anomalous low-energy excess issue.

"After I came to LSU, Ico-led the 3+1 active-to-sterile neutrino oscillation search at MicroBooNE, which provides the first constraints on the eV-scale sterile neutrino parameter space measured in a LArTPC detector from an accelerator neutrino source," said Wei.

MicroBooNE is one of three particle detectors that make up Fermilab's Short-Baseline Neutrino Program. ICARUS and the Short-Baseline Near Detector are the other two detectors. Together, they enable the detailed exploration of neutrino properties. In particular, they examine neutrino oscillations at low energies and short distances. Scientists hope that the combined measurements of these three detectors will completely resolve the anomalies in neutrino measurements seen by LSND and MiniBooNE.

Currently Wei is working on various advancements, including addition of neutrino data from a different beamline, improved neutrino energy reconstruction, and more precise neutrino flux prediction, to further improve the sensitivity reach of a sterile neutrino oscillation search at MicroBooNE.

Seeing deeper into the cosmos with gravitational-wave detectors

With reduced noise, a new technique could expand our ability to observe distant cosmic events such as merging black holes

PhD Candidate Scott M. Aronson

Large-scale interferometers such as the Advanced Laser Interferometer Gravitational-Wave Observatory (aLIGO) detect subtle distortions in spacetime, known as gravitational waves, generated by distant cosmic events. By allowing scientists to study phenomena that do not emit light, gravitational wave measurements have opened a new window for understanding extreme astrophysical events, the nature of gravity and the origins of the universe.

“Quantum noise has become a limiting noise source when measuring gravitational waves,” said Scott M. Aronson, a member of the LSU research team. “By tuning the system to respond at a desired frequency, we show that you can reduce this noise by using an optical spring to track a signal coming from a compact binary system. In the future, this binary system could be two black holes orbiting each other – within our galaxy or beyond.”

In the Optica Publishing Group journal Optics Letters, researchers led by Thomas Corbitt in collaboration with the LIGO Laboratory at CalTech and Thorlabs Crystalline Solutions report a proof-of-concept experiment showing that dynamic tracking could help reduce noise in a gravitational-wave detector.

“This is the first measurement of an optical spring tracking a target signal over time,” said Aronson, first author of the paper. “This dynamic tracking technique is a strong candidate for quantum noise reduction in the future. Whether in current interferometers such as LIGO, or future detectors such as Cosmic Explorer, optical spring tracking is worth investigating to improve sensitivity and further our ever-growing population of gravitational wave events.”

Creating an optical spring -- When two orbiting objects such as black holes emit gravitational waves, their rotational frequency increases creating what is known as a chirp. It has been proposed that matching the frequency of this chirp with a tunable optical spring could reduce noise and improve the signal clarity of a gravitational-wave observatory.

Although this idea is being investigated for future interferometer configurations, Aronson and colleagues decided to carry out a proof-of-concept experiment to demonstrate the potential of dynamic tracking in larger-scale systems, such as a gravitational-wave observatory. The work was conducted as part of the LIGO scientific collaboration and the larger LIGO/Virgo/KAGRA (LVK) collaboration.

To accomplish this, co-author Garrett D. Cole from Thorlabs Crystalline Solutions constructed a cantilever that weighs just 50 nanograms using layers of aluminum gallium arsenide and gallium arsenide. The cantilever acts as a mirror that can “feel” the radiation pressure imparted by a laser beam, creating an optical spring that allows the researchers to investigate the interplay of the radiation pressure from the laser light with the cantilever’s motion.

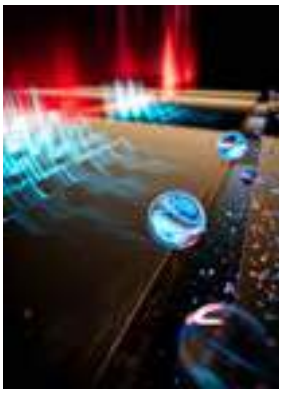
Tracking the signal -- To test the tracking system, the researchers simulated an incoming gravitational wave by embedding a target signal into the phase of a laser beam. They used an alternate signal to control the position of a larger movable mirror within an optical cavity. The optical spring frequency could be tuned by adjusting the distance between the mirror and a cantilever.

During the experiment, the researchers moved the mirror to “track” the target signal as its frequency shifted from 40 kHz to 100 kHz over 10 seconds. Comparing this approach to keeping the mirror stationary, they demonstrated that tracking the signal with the movable mirror increased the signal-to-noise ratio by up to 40 times, producing a clearer measurement.

The researchers note that implementing the dynamic tracking technique in a large-scale interferometer would require highly robust feedback control of all optical components. This can be particularly challenging because as power levels increase, radiation pressure becomes critical in maintaining the precise positioning of mirrors. The technique also requires prior information about an incoming gravitational wave, which could be obtained using proposed space-based detectors like LISA.

“This dynamic tracking technique represents a significant step toward enhancing the sensitivity of gravitational-wave detectors, bringing us closer to unlocking the mysteries of the universe’s earliest moments,” said Aronson. “With future generations of gravitational-wave detectors, we will have the possibility of learning about the merger of compact objects formed by the first generation of stars, or even more exotic objects such as primordial black holes formed shortly after the Big Bang.”

MULTIPARTICLE NANOSTRUCTURES FOR BUILDING BETTER QUANTUM TECHNOLOGIES



In a recent publication in Nature Physics, the LSU Quantum Photonics Group offers fresh insights into the fundamental traits of surface plasmons, challenging the existing understanding. Based on experimental and theoretical investigations conducted in Associate Professor Omar Magaña-Loaiza's laboratory, these novel findings mark a significant advancement in quantum plasmonics, possibly the most noteworthy in the past decade.

While prior research in the field has predominantly focused on the collective behaviors of plasmonic systems, the LSU group adopted a distinct approach. By viewing plasmonic waves as a puzzle, they were able to isolate multiparticle subsystems, or break down the puzzle into pieces. This allowed the team to see how different pieces work together and revealed a different picture, or in this case, new behaviors for surface plasmons.

Plasmons are waves that move along the surface of metals when light is coupled to charge oscillations. Much like tossing pebbles into water generates ripples, plasmons are "ripples" traveling along metal surfaces. These minute waves operate on a nanometer scale, rendering them crucial in fields such as nanotechnology and optics.

"What we found is that if we look at the quantum subsystems of plasmonic waves, we can see inverse patterns, sharper patterns, and opposite interference, which is completely opposite to the classical behavior," explained PhD candidate Riley Dawkins, co-first author of the study, who led the theoretical investigation.

Using light aimed at a gold nanostructure and observing the behavior of scattered light, the LSU quantum group observed that surface plasmons can exhibit characteristics of both bosons and fermions, which are fundamental particles in quantum physics. This means that quantum subsystems can exhibit non-classical behaviors, such as moving in different directions, depending on specific conditions.

"Imagine you are riding a bike. You would believe that most of your atoms are moving in the same direction as the bike. And that is true for most of them. But in fact, there are some atoms moving in the opposite direction," explained Magaña-Loaiza. "One of the consequences of these results is that by understanding these very fundamental properties of plasmonic waves, and most importantly, this new behavior, one can develop more sensitive and robust quantum technologies."

In 2007, the use of plasmonic waves for anthrax detection sparked research into employing quantum principles for improved sensor technology. Presently, researchers are striving to integrate these principles into plasmonic systems to create sensors with heightened sensitivity and precision. This advancement holds significant promise across diverse fields, including medical diagnostics, drug development simulations, environmental monitoring, and quantum information science.

The study is poised to make a significant impact on the field of quantum plasmonics, as researchers worldwide will leverage the findings for quantum simulations. Chenglong You, Assistant Research Professor and corresponding author, emphasized, "Our findings not only unveil this interesting new behavior in quantum systems, but it is also the quantum plasmonic system with the largest-ever number of particles, and that alone elevates quantum physics to another level."

Graduate student and co-first author Mingyuan Hong led the experimental phase of the study. Despite the complexities of quantum plasmonics systems, Hong noted that his primary challenges during the experiments were external disturbances. "The vibrations from various sources, such as road construction, posed a significant challenge due to the extreme sensitivity of the plasmic sample. Nevertheless, we eventually succeeded in extracting quantum properties from plasmonic waves, a breakthrough that enhances sensitive quantum technologies. This achievement could open up new possibilities for future quantum simulations."

Titled "Nonclassical Near-Field Dynamics of Surface Plasmons," the research was conducted entirely at LSU. "All the authors of this study are affiliated with LSU Physics & Astronomy. We even have a co-author who was a high school student at the time, which I'm very proud of," said Magaña-Loaiza.

The illustration above shows a red laser beam exciting plasmonic waves on the surface of a metallic (gold) nanostructure. These are then scattered by the slit to produce multiparticle systems with specific quantum properties. These multiparticle systems are indicated by the spheres. Our manuscript describes the quantum dynamics behind this process.

This new research is prefaced by "Observation of the Modification of Quantum Statistics of Plasmonic Systems," C. You, M. Hong, N. Bhusal, J. Chen, M. A. Quiroz-Juárez, F. Mostafavi, J. Guo, I. De Leon, R. de J. León-Montiel, and O. S. Magaña-Loaiza*, Nature Communications 12, 5161 (2021). Selected for the Editors' Highlights https://www.nature.com/collections/jiibjgacfj

Journal Reference: DOI:10.1038/s41567-024-02426-y

https://www.nature.com/articles/s41567-024-02426-y

WORKSHOP ON GRAVITY: CLASSICAL, QUANTUM, THEORETICAL AND EXPERIMENTAL

Organized by the Department of Physics & Astronomy and the Hearne Institute the workshop professed Dr. Jorge Pullin's distinctive career. Pullin is Horace Hearne Chair with the Department of Physics & Astronomy and a faculty at Center for Computation and Technology. The workshop brought together various collaborators and colleagues of Pullin from different areas of classical, quantum and numerical aspects of gravity. During his long and dynamical career, Pullin has published more than 200 research papers and 3 books on loop quantum gravity and has worked in all areas of gravitational physics including classical and quantum aspects, theoretical and experimental elements, foundational aspects of quantum theory and numerical relativity. Pullin's exemplary service to the community includes being the founding editor of Physical Review X, managing editor of International Journal of Modern Physics D, and editorial board of Living Reviews in Relativity, and starting International Loop Quantum Gravity seminars which have been run regularly by Pullin since 2006. He has been awarded various honors including the Fellow of American Physical Society and the American Association of Advancement of Science.

FEATURED SPEAKERS

- Abhay Ashtekar, Penn State
- Miguel Campiglia, Universidad de la República (Montevideo)
- Alejandro Corichi, UNAM Morelia
- Mario Diaz, University of Texas at Brownsville
- Anamaria Effler, LIGO
- Rodolfo Gambini, Universidad de la República (Montevideo)
- Pablo Laguna, The University of Texas at Austin
- Luis Lehner, Perimeter Institute
- Jerzy Lewandowski, University of Warsaw
- Ling Miao, Physical Review X, American Physical Society
- Javier Olmedo, Universidad de Granada
- Richard Price, MIT
- Carlo Rovelli, University of Western Ontario
- Thomas Thiemann, Friedrich-Alexander-Universität (Erlangen)
- Manuel Tiglio, Universidad Nacional de Cordoba

Attendees of the Workshop on Gravity, honoring the career of Jorge Pullin

Hearne Eminent Lecture Professes Juhan Frank's Distinguished Career at LSU

Peter Meszararos, Eberly Chair of Astronomy & Astrophysics and Physics at Pennsylvania State University, Director Emeritus of the Center for Multimessenger Astrophysics, and current member of the Executive Committee of the Institute for Gravity and the Cosmos, presented 'Multimessenger Astrophysics and Extreme Events.'

The lecture also highlighted the distinguished career of Juhan Frank at LSU. Born in Hungary and raised in Belgium and Argentina, Frank received his M.S. in Physics from the National University of Buenos Aires, followed by a Ph.D. at the University of California, Berkeley, in 1972. He was a postdoctoral fellow at Princeton and Cambridge Universities before joining the permanent staff of the Max Planck Institute for Astrophysics in Garching, Germany. He has held long term visiting appointments at the NASA Goddard Space Flight Center; the Harvard-Smithsonian Center for Astrophysics; Cambridge University; the Institute for Advanced Study, Princeton; the California Institute of Technology; and the Kavli Institute of Theoretical Physics, UCSB. He is a member of the U.S. National Academy of Sciences, the American Academy of Arts and Sciences, External Member of the Hungarian Academy of Sciences, Fellow of the American Physical Society, and Legacy Fellow of the American Astronomical Society; he has been a co-recipient of the Rossi Prize of the High Energy Astrophysics Division of the American Astronomical Society, and the First Prize of the Gravity Research Foundation, as well as a recipient of Guggenheim, Royal Society, Smithsonian and NAS/NRC fellowships; he was awarded an Einstein Professorship of the Chinese Academy of Science in 2013. He was a member of the Editorial Board of the Journal of Cosmology and Astroparticle Physics 2006-2022, and is currently member of the Space Studies Board of the National Academy of Sciences.

His main research interests are high energy astrophysics, cosmology and particle astrophysics. He has made significant contributions in the theory of structure formation in the early Universe; the high energy properties of magnetized neutron stars; the physics of gamma-ray bursts; ultra-high energy neutrinos and cosmic rays, and gravitational astrophysics. He is known for the "Mészáros effect" in cosmology, and for his role in the development of the fireball shock model of gamma-ray bursts and the theory of afterglows. Thomson- Reuters ranks his work on gamma-ray bursts as number one by citations and number of papers over the 1999-2009 period. He has written 410+ refereed research articles, three books, 170 invited review or conference papers, with 44,000+ citations and h-index 107 in ADS (67,000+ citations, h-index 129 in Google Scholar).

This picture circa late 1950s shows Juhan Frank and Peter Meszäros visiting the Estonian bov scout camp south of BuenosAres. Frank is 5th from left standing and Mészáros is 3rd from left standing.

WORKSHOP ON THE INTERFACE OF QUANTUM AND STATISTICAL PHYSICS AND RELATIVITY

The workshop, organized by the Department of Physics & Astronomy at LSU and the Hearne Institute professed LSU Boyd Professor Bob O'Connell's 53 year career at LSU. Dr. O'Connell has written over 350 papers and has served as an editorial board member and advisor on several journals, including Physical Review A and the Journal of Physics. He was named Distinguished Research Master at LSU in 1975 and was appointed Boyd Professor (the highest rank at LSU) in 1986. He also served as the Vice-President and the President of the Faculty Senate at LSU. In 2018, he was inducted into the LSU College of Science Hall of Distinction. He has been a Fellow of the American Physical Society since 1969.

In order to further his research, he accepted invitations to various institutions. Initially, he accepted a two year NAS-NRC award at the NASA Institute for Space Studies, New York. Next, he obtained the SRC visiting fellowship which enabled him to spend a year at the University of Oxford and Queen Mary College, London (1975-76). He later spent a summer at the Institute for Astronomy at the Cambridge University and many other summers at the Max Planck Institute for Quantum Optics, Garching and the universities of Caterina, Brazil, the Technical University of Denmark, the University of

FEATURED SPEAKERS

Denys Bondar, Tulane University, New Orleans

Ignazio Ciufolini, University of Rome and GAUSS

Leon Cohen, Hunter College New York

Friedrich W. Hehl, University of Cologne

Mark Hillery, Hunter College New York

Michael Kramer, Max-Planck-Institute for Radio Astronomy, Bonn

Wolfgang P. Schleich, Ulm University

Marlan O. Scully, Texas A&M University

M. Suhail Zubairy, Texas A&M University

Attendees of the Workshop on the Interface of Quantum and Statistical Physics and Relativity, honoring the career of LSU Boyd Professor Robert F. O'Connell

MAX GOODRICH DISTINGUISHED LECTURE - Professes Joseph Giaime's Distinguished Career at LSU

TAKING STOCK OF GRAVITATIONAL WAVE ASTRONOMY

Peter Saulson, Research Affiliate at the MIT Kavli Institute and Professor Emeritus of Physics at Syracuse University

For many decades, gravitational wave astronomy was a field whose only accomplishments lay in the future. Now, gravitational wave observatories have shown us cosmic events that had only been dreamed of. Future observations ought to show us much more, allowing us to probe the history of the universe in uniquely powerful ways. This talk will survey the history of the development of gravitational wave detectors, summarize the most important observations of gravitational wave signals, and give a glimpse into the most promising future developments.

Joseph Giaime joined LSU as an assistant professor in 1999. Upon arrival he became the leader of the development of advanced seismic isolation systems for LIGO Livingston, which at the time could only operate at night due to the seismic noise generated by human activity in the day. He was appointed head of the LIGO Livingston Observatory in 2009. Among his activities he co-led the writing of the paper describing the collision of two neutron stars and their astronomical followup, which had over 3,600 authors from several collaboration. He was named a 2020 LSU Distinguished Research Master and received many awards as part of the LIGO Scientific Collaboration.

LVK AT LSU COLLABORATING ON MULTIMESSENGER ASTRONOMY

Attendees of the LIGO-VIRGO-KAGRA Collaboration Meeting held in March 2024 on the LSU campus.

MicroBooNErs at LSU Photo by Mimi LaValle

Neutrino physicists visit the LSU campus for a collaboration meeting in Baton Rouge, LA.

Organized by Assistant Professor Hanyu Wei, the event brought more than 50 MicroBooNErs from across the United States and the United Kingdom to gather ideas for future physics measurements, etc.

Wei's principle research interest is in experimental particle physics. He primarily works on neutrino experiments, exploring the nature of neutrinos and unraveling the mysteries of neutrinos. Studying neutrinos, which are the least understood elementary particles, will play an important role in understanding how the universe works at the most fundamental level.

MULTIDISCIPLINARY SCIENCE IN THE MULTIMESSENGER ERA

Explosive transients, such as supernova, are a key focus in astronomy and astrophysics. However, new understanding of these events requires synthesis of information across several domains of science. In order to foster multidisciplinary research in this area, LSU, the Department of Energy, NASA, and the National Science Foundation recently hosted the 'Multidisciplinary Science in the Multimessenger Era' workshop on the LSU campus.

Astrophysical observations of the cosmos allow us to understand how our universe works. Modern astronomy is increasingly operating under a holistic approach, answering a question based on information gathered with observations from all forms of light, such as X-rays, and beyond, such as the gravitational waves detected by LIGO facilting in Livingston, La. This is analogous to how we make sense of our environment by combining information from all five senses. Key sources of interest are explosive transients, whose understanding requires multidisciplinary studies at the intersection of Astrophysics, Gravitational Physics, Nuclear Science, Plasma Physics, Fluid Dynamics, Computational Physics, Particle Physics, and Atomic, Molecular, and Optical Science, and their corresponding interdisciplinary fields.

Incorporating fundamental physics into higher fidelity astrophysical observables requires both high-performance computing studies and enhanced data analysis methodologies. Multidisciplinary studies must occur across the separate fields of science, between different funding agencies, and across different professional societies. The reward includes understanding the origin of the elements, whether we can peek inside a black hole, and why we appear so alone in the universe.

Kenneth J. Schafer Honored as Boyd Professor, LSU's Highest Professorial Ranking

LSU Boyd Professor Kenneth J. Schafer

The LSU Board of Supervisors unanimously voted to designate Kenneth J. Schafer, Ball Family Distinguished Professor in Physics & Astronomy, the rank of Boyd Professor—the highest and most prestigious academic rank at LSU.

"Dr. Kenneth Schafer's outstanding achievements and international recognition in both teaching and research make him most deserving of this prestigious academic ranking at LSU," said LSU President William F. Tate IV. "Dr. Schafer embodies the meaning of Scholarship First, a champion in academics and a pioneer of scientific achievement, it is an honor to recognize him as the newest Boyd Professor.

Schafer is the 79th Boyd Professor named at LSU since the honorific was established in 1953 by the LSU Board of Supervisors after brothers David and Thomas Boyd, former faculty members and presidents of LSU.

Schafer joined the LSU physics department in 1995 as a promising scientist and has long served as a leading researcher and pioneer in ultrafast laser and X-ray physics.

Schafer's research focuses on laser-molecular interactions and dynamics, which is one of the primary areas of research in Atomic, Molecular, Optical (AMO) Physics. Dr. Schafer has authored more than 130 journal articles, which have been cited more than 16,000 times. Schafer's early research helped launch and shape the entire field of ultrafast laser physics by showing how to convert infrared light to extreme ultraviolet and X-rays using ultrashort laser pulses aimed at particular atoms. Later work included advanced theory to support the use of ultrashort laser pulses to observe quantum dynamics of electrons and atomic nuclei during chemical reactions. The field he founded is sometimes called "attosecond physics" because the phenomena he uses and studies last approximately one attosecond. An attosecond is 0.000000000000000001 seconds: if we imagine stretching out time so that one second lasted the entire age of the universe, 13.8 billion years, a stretched attosecond would still only be about a half-second long. His programs have attracted more than $8 million in funding to LSU. He is largely the reason LSU is a global magnet in this field.

Schafer led the development of several multi-institution center proposals that combine the theory expertise of his group with forefront experimental capabilities, including a $12.5 million Multidisciplinary University Research Initiatives funded by the Department of Defense.

Schafer's accolades are unparalleled as they are evident in his many scholarly recognitions including the National Science Foundation Early Career Award, LSU Distinguished Faculty Award, LSU College of Basic Sciences Faculty Research Award, along with several other international recognitions from the countries of Sweden and Denmark. He is a fellow of the prestigious American Association for the Advancement of Science (AAAS), the Optical Society of America, and the American Physical Society.

"Dr. Schafer is an internationally renowned trailblazer in physics who has made huge impacts in the lives of students and junior researchers through mentorship and exceptionally clear, ordered and accessible instruction," said Executive Vice President & Provost Roy Haggerty. "Dr. Schafer has put LSU in a leadership position in a highly distinguished field, and is one of the most respected faculty members on our campus. He is highly deserving of this recognition."

In addition to his notable achievements and highly cited publications Schafer is an outstanding educator as noted by his always above-average student evaluations. His research program attracts top talent from around the world. His broad experience and thoughtful insight make his classes highly sought-after by students and young scientists.

GABRIELA GONZALEZ ELECTED VICE PRESIDENT OF AMERICAN PHYSICAL SOCIETY

"Dr. González's election as vice president of the American Physical Society (APS) is a remarkable achievement that reflects her leadership to advancing the field of physics," said Cynthia Peterson, Dean, LSU College of Science. "Her passion and dedication make her the perfect fit for this important role, and we are excited to see the impact of her leadership."

In her new role for APS, González aims to build a stronger, more engaged APS community. González's vice presidential term will begin on January 1, 2025; she will be APS President-Elect in 2026 and APS President in 2027.

"The American Physical Society is a global organization, but it should also be seen as "our" organization" said González. "Our members should view APS not only as a premier source for scientific information—through meetings, journals, newsletters, and magazines—but also as one of the best ways to engage with each other, learn from each other, and shape the future of physics."

"As a cohesive community, we will be able to thoughtfully address and influence issues that affect us—whether it's navigating DEI challenges, fostering international collaborations amidst regional conflicts, or addressing science budgets. And we must also support the new generation of physicists by implementing innovative teaching methods in schools, colleges, and graduate programs."

FACULTY AWARDS AND ACHIEVEMENTS


Jeffery Blackmon


Eric Burns


Mette Gaarde


Joseph Giaime


Kip Matthews


Ken Schafer


Param Singh


Phil Sprunger


Justin Wilson

Ivan Agullo – Department Graduate Faculty Award

Jeffrey Blackmon was selected to participate in the SECU2023-24 Academic Leadership Development Program Fellowship. ALDP seeks to identify, prepare and advance academic leaders for roles within SEC institutions and beyond. “Becoming a leader, being a leader”

Eric Burns received the LSU College of Science Non-Tenured Faculty Research Award

Catherine Deibel – Department Undergraduate Faculty Award, and received the College of Science award for Excellence in Mentoring (Tenure-Track Faculty) at the 2023 Choppin Honors Convocation

Mette Gaarde – Department Undergraduate Faculty Award,

Joseph Giaime – named 2023 AAAS Fellow

Kip Matthews – Southwest Regional Chapter of American Association of Physicists in Medicine inaugural “Kip Matthews SWAAPM Mentor Award,” named in his honor for his impressive mentorship of students pursuing careers in the field of medical physics

Ken Schafer – Department Graduate Faculty Award

Param Singh – Elected Vice President of LSU Faculty Senate

Phil Sprunger – LSU Distinguished Faculty Award, recognizing his accomplishments and acknowledging his superb teaching, research and service at LSU.

Justin Wilson – Five-year National Science Foundation Faculty Early Career Development, or CAREER, award to support research

FACULTY PROMOTIONS


Ivan Agullo


Tabetha Boyajian


Thomas Corbitt


Catherine Deibel


Omar Magaña-Loaiza


Daniel Sheehy

Ivan Agullo promoted to full professor. His research interests lie in the area of gravitational physics, quantum information and quantum technologies.

Tabetha Boyajian promoted to associate professor with tenure. Her research interest lies in fundamental properties of stars.

Thomas Corbitt, promoted to full professor, is involved with Experimental Gravitational Wave physics research.

Catherine Deibel promoted to full professor. Her main research interests are in experimental nuclear astrophysics.

Omar Magana-Loaiza promoted to associate professor with tenure. His research interests include optical physics, quantum optics, and quantum information science.

Daniel Sheehy, promoted to full professor, studies the theoretical physics of quantum many-particle systems in which interactions are qualitatively important and lead to novel behavior.

NEW FACULTY

Ahana Chakraborty

Ahana Chakraborty, assistant professor of theoretical physics, whose research group, "Quantum Dynamics and Information," works in the interdisciplinary fields in theoretical condensed matter physics and quantum information science. Her research focuses on the non-equilibrium dynamics of quantum many-particle systems, especially in open quantum systems and disordered systems.

Prior to arriving at LSU, she was a Postdoctoral Fellowship at Rutgers University. Chakraborty received her PhD in 2019 in theoretical physics from Tata Institute of Fundamental Research, Mumbai India

Natalie Hinkel

Natalie Hinkel, assistant professor, is an astrophysicist who researches stellar elemental abundances, exoplanet interiors and mineralogy, M-dwarfs, balloon instrumentation, machine learning, and interdisciplinary study of planetary habitability. She is the architect and maintainer of the Hypatia Catalog: www.hypatiacatalog.com.

She came to LSU from Southwest Research Institute in San Antonio, where she was a lead scientist. Hinkel received her PhD in 2012 from Arizona State University.

Francois Mauger

Francois Mauger, assistant professor, research is broadly related to theoretical and applied ultrafast science, chemical physics, and their interaction with nonlinear dynamics. His research program is centered around theoretical and applied atomic, molecular, and optical physics with connections to computational physical chemistry and nonlinear dynamics. The LSU group studies quantum electron dynamics in atoms and molecules with a few to many degrees of freedom and their interaction with short and intense laser/light pulses. Specifically, we focus on ultrafast processes at the atto/femtosecond time scales (10-18/10-15 s) and the experimental techniques to observe those using advanced light sources.

Mauger received his PhD in Physics from Aix-Marseille Université, in 2012. Prior to arrving at LSU, Mauger was a postdoctoral researcher at the Université de Sherbrooke.

Alexis Mercenne

Alexis Mercenne, assistant professor, is a theoretical nuclear physicist. He specializes in the low-energy structure of the atomic nucleus, with a particular interest in nuclear reactions and their significance to astrophysics. His research in nuclear physics involves a variety of interesting and important topics, including the quantum many-body problem, open quantum systems, scattering theory, high-performance computing, and the application of machine learning and quantum computing to theoretical nuclear physics.

Prior to LSU, Mercenne was a postdoctoral research associate at Yale University. He received his PhD in 2016 from the University of Caen Normandy.

Michela Negro

Michela Negro, assistant professor, whose main research interests include combinations of the following topics: multimessenger and time-domain high-energy astrophysics, polarimetric studies of high-energy astrophysical sources and advanced machine learning techniques for data analysis and/or data reconstruction. In being a part of the biscovery of the brightest gamma ray burst of all time, Negro's team was able to probe the dust rings with NASA's Imaging X-ray Polarimetry Explorer to glimpse how the prompt emission was organized, which can give insights into how the jets form. In addition, a small degree of polarization observed in the afterglow phase confirms that we viewed the jet almost directly head-on.

Negro received her PhD in 2019 rom the University of Torino, in Italy. Prior to LSU, she worked as a research scientist at NASA GSFC, Greenbelt, USA

Constantin Schrade

Constantin Schrade, assistant professor,

Schrade's research group "Theory of Quantum Circuits & Materials", focuses on the vibrant intersection of superconducting quantum circuits and quantum materials. More specifically, they are interested in the development of novel superconducting qubits and Josephson devices with applications to quantum information processing and superconducting electronics. Although they are a theoretical research group, we maintain active collaborations with many experimental labs. Examples of current research topics include voltage-tunable superconducting qubits, novel qubit control protocols, quantum-limited amplifiers, Josephson diodes, and triple hybrid materials that combine superconductors, ferromagnets, and semiconductors.

Mette Gaarde Named LSU Distinguished Research Master

Mette Gaarde, the Les and Dot Broussard Alumni Professor, was recognized for her scholarship in science, technology, engineering and mathematics. Each year, LSU's Office of Research & Economic Development honors the exceptional research and scholarship of two LSU faculty as Distinguished Research Masters.

Gaarde's research adds critical knowledge on how electrons inside atoms, molecules and solids respond when exposed to short laser pulses. These electrons naturally move on the attosecond time scale, and their laser-driven motion leads to the production of attosecond light pulses—the shortest bursts of light ever made and the subject of the 2023 Nobel Prize in Physics. The ultrafast response of electrons to an attosecond light pulse represents the first few frames of a very short "molecular movie" that follows the evolution of a photochemical reaction from its very beginning. Gaarde uses high-performance computer simulations to study both the production of attosecond light pulses and the dynamics they initiate. One attosecond is one billionth of a billionth of a second, which means there are more attoseconds in one second than seconds since the beginning of our universe. The electron behavior Gaarde studies has implications for energy, health and defense technologies as well as the creation of new materials.

"Working closely with my colleagues and group members at LSU and around the world to discover new results and explain them together—that is my favorite thing about being a researcher," Gaarde said.

Gaarde has contributed to LSU and her profession through service at the highest level. In addition to a variety of committee work in the Department, College, and University, she is a leader in her field. Previously she served as Chair of the American Physical Society's (APS) Division of Atomic, Molecular and Optical Physics (DAMOP), and this year serves as Past-Chair. This is an elected position by the DAMOP membership, which is the second largest division of APS with over 3,300 members. She was also appointed as a member of the writing committee for the Decadal Assessment on Atomic, Molecular, and Optical Science 2020 conducted by the National Academy of Sciences. This latter report is very influential in the field (a "decadal"). Being elected by the broader DAMOP community to the highest leadership post and appointed to a National Academy Committee (with about half the committee being members of the National Academy of Sciences) reflects the very high regard in which Prof. Gaarde is held by both the broader community and leadership in the field.

"Prof. Gaarde's teaching record is equally impressive, where she consistently receives nearly perfect scores for the Overall Instructor question across a wide range of courses," said Jeffrey Blackmon, Chair, Department of Physics & Astronomy. "Prof. Gaarde is also well-regarded as a mentor, involving many undergraduate students in her research. In addition, she has been heavily involved in the Conferences for Undergraduate Women in Physics (CUWiP), first as chair of the LSU-hosted conference in 2014 and then in the Chair-line of the APS National Organizing Committee for CUWiP from 2014 – 2017."

Gaarde received her PhD in physics from the University of Copenhagen, Denmark, in 1997. Since joining the LSU faculty in 2003, she has published more than 100 papers and secured more than $4 million in research grants. Gaarde has received multiple LSU awards—most recently, the 2019 Distinguished Faculty Award. She has mentored dozens of undergraduate and graduate research students, including in collaboration with Anne L'Huillier, one of the 2023 laureates of the Nobel Prize in Physics, who was Gaarde's PhD advisor.

Gaarde and L'Huillier

NOBEL CONNECTIONS

LSU's Mette Gaarde, Les and Dot Broussard Alumni Professor of Physics pictured with 2023 Nobel Prize in Physics Laureate Anne L'Huillier at the Nobel Prize Award Ceremony in Stockholm, Sweden.

Gaarde, a 1997 University of Copenhagen in Denmark, Ph.D. did her doctoral research on "Temporal Coherence of Ultrashort High-Order Harmonic Pulses" under L'Huillier's direction.

L'Huillier is just the fifth woman to win the Nobel Prize in Physics. Gaarde says "She is a wonderful role model."

LSU RAINMAKERS

The LSU Office of Research & Economic Development, or ORED, recognizes excellence and outstanding achievement by faculty, who are leaders in their respective fields and balance their teaching and research responsibilities while extending the impact of their work to the world beyond academia.

Manos Chatzopoulos

Associate Professor Emmanouil (Manos) Chatzopoulos was selected as a 2023 recipient of the LSU Rainmaker Award in the Emerging Scholar for STEM.

Chatzopoulos received his BS from the University of Crete (Greece) in 2007 and his PhD from the University of Texas at Austin in 2013. He served as an Enrico Fermi Postdoctoral Fellow at The University of Chicago from 2013 until 2016, before joining LSU as an assistant professor in 2016. He was promoted to associate professor with tenure in 2022.

A theoretical and computational astrophysicist specializing in supercomputer simulations to understand extreme astrophysical events, such as supernovae and massive stellar evolution, Chatzopoulos currently works on a variety of research projects having a great impact on many different aspects of astrophysics and astronomy.

He conducts research aimed at better understanding the deaths of stars and the most luminous transient astrophysical events in the Universe. He is at the forefront of applying fully 3D numerical models in extreme environments and his results are impacting many different astrophysical problems.

“Manos is a rising star in the field of astrophysics,” said Don Q. Lamb, the Robert A. Millikan Distinguished Service Professor Emeritus in the University of Chicago’s Department of Astronomy & Astrophysics, The Enrico Fermi Institute and Harris School of Public Policy. “He has already made significant contributions to our understanding of the final stages of the evolution of massive stars and the violent events that can ensue, including pair-instability supernovae and super-luminous supernovae; and luminous outbursts that are the result of the merger of binary stars.”

He is one of the rare faculty members to have his research supported both by the National Science Foundation and by the U.S. Dept. of Energy through a prestigious Early Career Award. His current single investigator grants total about $1.2 million, an extraordinary level of funding for a theoretical research program by a single investigator.

Chatzopoulos is an internationally recognized young leader in these fields with a reputation for outstanding research. This is evidenced by his total citation count, about 2,000. His recent citation rate is about 250 per year, and he has 11 papers with more than 50 citations.

Catherine Deibel

The LSU Council on Research named Professor Catherine Deibel as a 2024 Rainmaker Mid-Career Scholar in the category of STEM.

Deibel’s research lies at the intersection of nuclear physics and astrophysics, studying the properties of short-lived atomic nuclei to understand astrophysical phenomena such as stellar explosions by determining the nuclear reactions that drive such explosions in hydrogen- and helium-rich environments. Deibel’s group develops, builds and tests state-of-the-art detectors on the LSU flagship campus, which she then brings to accelerator facilities around the world to measure nuclei and nuclear reactions.

“Dr. Deibel’s work encompasses the training of undergraduate and graduate students, first class scholarship as evidenced by high-impact publications, extremely robust federal funding, and the development of new instruments to push her research field forward,” said Jeffery Blackmon, Russell B. Long Professor and Department Chair.

“For me, the excitement of basic research lies in finding the answers to fundamental questions about the world around us,” Deibel said. “With our research, we are trying to answer one of the most basic questions: Where did we come from? Just a few minutes after the Big Bang, hydrogen, helium, and lithium were formed, but the oxygen in the air we breathe, the calcium in our bones, the iron in our blood, and all the other elements that make up our bodies and the world around us were foraged in stars.”

Since joining the LSU faculty in 2011, she has continued her research on the synthesis of elements in a variety of stellar explosions, including supernovae, x-ray bursts and classical novae. Specifically, she has developed experimental devices and techniques to measure the nuclear reactions responsible for this nucleosynthesis and employed them at accelerator laboratories around the country and abroad, including the installation of a 35-ton magnetic spectrograph at Florida State University supported by a Major Research Instrumentation Award from the National Science Foundation.

Deibel has been a prolific researcher, with almost 80 publications during her time at LSU. Her internationally recognized work has been cited over 3000 times, and she has been continually funded as the PI or co-PI on U.S. Department of Energy and National Science Foundation research grants, totaling over $5.5M in funding.

Hogstrom Superior Graduate Student Scholarship

The LSU-Mary Bird Perkins Cancer Center Dr. Charles M. Smith Medical and Health Physics Program has announced Chia-Lung Chien and Richard Lesieur as recipients of the prestigious Kenneth R. Hogstrom Superior Graduate Student Scholarship.

Established in honor of Professor Emeritus Kenneth R. Hogstrom's outstanding research, scholarship, and mentorship of graduate students, the scholarship supports medical physics graduate students participating in clinical research on radiation oncology at Mary Bird Perkins Cancer Center.

"Chia-Lung's research is highly significant, as it will increase the confidence of VMAT and adaptive radiotherapy, catch and remedy errors during radiotherapy, allow personalized escalation of tumor dose and reduce radiation toxicity," said Dr. Rui Zhang.

"This award will help me advance the research we are working on. It is an inspiration that encourages me to be confident in that our projects will benefit the clinical radiotherapy. In addition, this award boosts me to expand my horizon in this field, providing me more opportunities with participations in radiotherapy, and making me more competent as a medical physicist in the future. I really appreciate Dr. Hogstrom and all members who made efforts creating this scholarship."

"It is an honor to have received this recognition, and I look forward to completing my project on a Comparison of Log File Based Dose Reconstruction to Measurement for Patient Specific QA, with the financial assistance of this award," said Lesieur.

Currently Lesieur is working on a thesis project using log files for patient specific IMRT QA for his MS degree, supervised by 2019 LSU PhD alumnus Dr. Christopher Schneider at Mary Bird Perkins Cancer Center. After defending his MS thesis Lesieur intends on pursuing his PhD in medical physics at LSU.

"Richard's project is an important part of ensuring we offer the highest possible quality of care in our leading edge adaptive radiation therapy program. I couldn't be more proud of him and the great work he is doing. As a product of the LSU Medical Physics program myself, Dr. Hogstrom is a mentor of mine, and so for Richard to receive an award bearing his name is truly a full circle moment," said Dr. Schneider.

Maxwell Cole Awarded Charles M. Smith Superior Graduate Student

LSU's Medical Physics and Health Physics Program has announced Maxwell Cole as the 2024 recipient of the prestigious Charles M. Smith Superior Graduate Student Scholarship. Established from the estate of the late Dr. Charles M. Smith of Sulphur, Louisiana, the scholarship represents Dr. Smith's commitment to significantly enhance medical physics education and research programs by supporting graduate students to ensure a continued pipeline of highly qualified medical physicists.

"On behalf of the LSU Mary Bird Perkins Medical & Health Physics, program I am pleased to announce that Max has been selected to receive the Charles M. Smith Superior Graduate Student Award. This award will provide critical support for Max as he completes his research-based PhD dissertation," said Kip Matthews, Professor and Interim Program Director, Medical Physics & Health Physics at LSU.

Cole, a 2020 LSU BS in physics alumnus, describes the importance of this award as he advances his career.

"I am honored to be the recipient of the Charles M. Smith Superior Graduate Student Scholarship. I aspire to uphold Dr. Smith's altruistic values and his devotion to humanitarianism. This award will assist in supporting me as I complete my dissertation and progress in my medical physics career," said Cole.

Currently, Cole is in the LSU Medical Physics Program working on his doctoral dissertation project, supervised by Dr. Wayne Newhauser. His research focuses on the development of a cardiovascular digital twin. The project involves a first-principles approach to modeling the effects of radiation on the vascular system and blood flow in the entire human body. After completing his PhD, Cole plans to attend a therapeutic medical physics residency program.

2 PHD CANDIDATES TO CONDUCT RESEARCH AT NATIONAL LABORATORIES

The Department of Energy's (DOE's) Office of Science has selected two LSU Physics & Astronomy graduate students for the Office of Science Graduate Student Research (SCGSR) program's 2023 Solicitation 2 cycle. Through world-class training and access to state-of-the-art facilities and resources at DOE National Laboratories, SCGSR prepares graduate students to enter jobs of critical importance to the DOE mission and secures our national position at the forefront of discovery and innovation. DOE selected 86 graduate students representing 31 states and Puerto Rico. The LSU recipients are:

Jacob Goudeau's research, with Associate Professor Martin Tzanov, involves particle physics in experimental neutrino physics researc, Goudeau will conduct his thesis research at Fermi National Accelerator Laboratory (FNAL), HEP - Experimental Research in High Energy Physics for Experimental Physics Projects

A native of Culpeper, Virginia, Goudeau earned his BS in 2021 from the University of Virginia

For Goudeau, the award is for his proposed SCGSR experimental research in high energy physics research project, "Characterization and Calibration of Cold Electronics for the DUNE Experiment," to be conducted at FNAL in Batavia, IL.

David He's research, with Associate Professor Scott Marley, "Commissioning of the MUlti- Segment Electron Spectrometer for Studies of Nuclear Shape Coexistence" will be conducted at Oak Ridge National Laboratory (ORNL), in the Nuclear Structure and Nuclear Astrophysics, Physics Division

A native of Bonita Springs, FL, He earned his BS in 2020 from the University of South Florida, Tampa. While pursuing his PhD at LSU, He works with Dr. Scott Marley in the experimental nuclear physics research group.

"At ORNL David will be commissioning a new detector system for internal conversion electron spectroscopy with reactor-activated samples under the mentorship of Dr. James M. Allmond." said Associate Professor Scott Marley, LSU Department of Physics & Astronomy. "David is an excellent graduate researcher and we are excited for his opportunity to perform research at a leading national laboratory through the SCGSR program. His dissertation research will contribute to building the state-of-the-art instrumentation necessary to make detailed studies of structure of atomic nuclei at ORNL and beyond."

PHD CANDIDATE AARON TRIGG RECEIVES NASA'S PRESTIGIOUS FINESST FELLOWSHIP

Future Investigators in NASA Earth and Space Science and Technology (FINESST) has awarded LSU graduate student Aaron Trigg with a fellowship to design and perform research projects that contribute to the NASA Science Mission Directorate's science, technology, and exploration goals.

Trigg is pursuing a career in astronomy with a desire to gain experience as a research assistant and make a meaningful contribution in the field of astrophysics.

"It is truly exciting to have been awarded the FINESST fellowship," said Trigg. "I have so many questions about the cosmos and our place in it. This award allows me to explore those questions and share the answers with the world."

Under the fellowship, Trigg will have the primary initiative to define the proposed FINESST research project and be the primary author. FINESST awards are research grants for up to three years and up to $50K per year.

Trigg's proposal is titled "Identifying a Population of Magnetar Giant Flares." Trigg's mentor, LSU Assistant Professor Eric Burns said "Aaron's proposal will help us identify additional magnetar giant flares. These are gargantuan outbursts of energy from the strongest magnets in the Universe, which are powerful enough to affect Earth's atmosphere. His work will help us better understand these sources."

PHD ALUMNUS DIMITRIOS KRANAS RECEIVES 2024 DISTINGUISHED DISSERTATION AWARD

(l-to-r) Ivan Agullo and Dimitrios Kranas

The LSU Alumni Association 2024 Distinguished Dissertation Award in STEM was awarded to Dimitrios Kranas from Thessaloniki, Greece, who joined LSU and the Hearne Institute of Theoretical Physics under the mentorship of Associate Professor of Physics Ivan Agullo in 2018.

His dissertation, "Entanglement in the Hawking Effect: From Astrophysical to Optical Black Holes," opens a promising window for the observability of the quantum origin of the Hawking effect in the lab using different input quantum states of light.

"In essence, Dr. Kranas' dissertation stands out as the most exemplary PhD thesis produced under my guidance," said Agullo. "Dr. Kranas' dissertation is exceptional, incorporating innovative, multi-disciplinary work that bridges gravity, quantum information, optics, and condensed matter. His research connects theoretical developments with experiments in analog gravity systems, yielding a powerful set of tools applicable to diverse collaborations, including experimental groups. It is a rare accomplishment for a graduate student's theoretical work to reach such heights."

2017 BS alumnus from Aristotle University of Thessaloniki, Kranas received his PhD in physics from the LSU College of Science in August 2023 and now works as a postdoctoral researcher at Ecole Normale Supérieure in Paris, France.

"It was in the lively ambiance of the enchanting city of Thessaloniki in northern Greece I first developed a passion for solving riddles and understanding the mysteries of nature," Kranas said. "This led me to pursue a degree in physics and delve deeper into theoretical physics."

Kranas investigates the confluence of field theory, general relativity and quantum information.

"At the heart of theoretical physics lies the tantalizing challenge of reconciling Einstein's theory of relativity with the enigmatic realm of quantum mechanics," Kranas said. "My scholarly pursuits are centered on unraveling this intricate connection, with a specific focus on investigating the quantum properties of matter in the presence of gravitational influences, such as particle creation in the vicinity of black holes and during the cosmic expansion."

2013 PHD ALUMNA RECEIVES FIAP CAREER LECTURESHIP AWARD

The American Physical Society has named 2013 PhD alumna Azadeh Keivani as the recipient of the FIAP Career Lectureship Award, which recognizes physicists in industrial and other non-academic careers for their significant contributions to the advancement of physics of a technical, industrial, or entrepreneurial nature and for their demonstrated ability to give interesting and engaging lectures to both experts and non-experts.

Keivani, a senior data scientist at New York-Presbyterian Hospital, earned the award "for the development and application of artificial intelligence techniques to problems ranging from education to clinical studies in cancer and heart disease, and for enthusiasm in the translation of esoteric academic research training into solutions for pressing real-world problems."

In her current role, Keivani uses deep learning to develop and deploy models that detect cardiac diseases at an earlier stage. She is also the co-founder of the Digital Age Academy Inc., an educational technology initiative that empowers youth for the future of work through online project-based digital workforce and entrepreneurial development programs. In addition, she is a social impact entrepreneur with several years of experience in applying machine learning techniques in different scientific disciplines, education, and business.

"Azadeh and I have stayed in touch since she earned her PhD at LSU," said LSU Professor Emeritus James Matthews. "Her thesis work in astrophysics was very clever and original. It's no surprise to me that she was able to apply her abilities in a different field with great success. LSU and our Department attract graduate students of the highest caliber; Azadeh was in the first rank of that group. It was a great pleasure for me to have worked with her."

TWO LSU PHYSICS ALUMNI RECEIVE NSF GRFP

Jeanne Garriz and Madison LeBlanc, both 2022 LSU BS in Physics alumni, have been awarded the prestigious and highly competitive National Science Foundation Graduate Research Fellowship that supports outstanding graduate research across the country.

The purpose of the NSF GRFP is to help ensure the quality, vitality, and diversity of the scientific and engineering workforce of the United States. A goal of the program is to broaden participation of the full spectrum of diverse talents in STEM. The five-year fellowship provides three years of financial support inclusive of an annual stipend of $37,000.

Daphne, AL native and alumni of McGill-Toolen Catholic High School in Mobile, AL, Garriz, is a PhD candidate in physics at Michigan State University's College of Natural Science. Their current research involves working on data acquisition hardware and software for the Pacific Ocean Neutrino Experiment (P-ONE) under the guidance of MSU Associate Professor Nathan Whitehorn.

Lafayette, La. native and Ovey Comeaux High School alumna, LeBlanc is a PhD candidate in astronomy at Georgia State University in the College of Arts & Sciences. Her current research, titled "A Comprehensive View of Companions to M Dwarfs," involves M dwarf multiplicity exploration under GSU Distinguished University Professor Todd J. Henry.

While at LSU, both Garriz and LeBlanc were involved with a variety of high-level research.

Garriz's research at LSU focused on student ballooning programs funded by the Louisiana NASA EPSCoR Program. The projects used a student-designed payload to collect data in the upper atmosphere. "I worked on two different student-led high altitude balloon payloads over three years. These payloads were designed, built, and tested by student groups and I learned very valuable hardware and data acquisition techniques from this experience." For their senior thesis, Garriz worked with LSU Professor Catherine Deibel to design a metal piece to block high energy reaction products from the focal plane of a split-pole spectrograph. In their freshman year, they studied alongside LSU Professor Emeritus Michael Cherry detecting terrestrial gamma flashes.

"Jeanne was an excellent undergraduate researcher in our group during their senior year and significantly expanded the scope of research we are able to undertake with the Super-Enge Spit-Pole Spectrograph," said Deibel. "I have no doubt that Jeanne will continue to grow as a physicist and be successful. I look forward to following their career for years to come - very well deserved!"

During her tenure at LSU, LeBlanc conducted research focused on finding the orbital period of the objects using data from the Transiting Exoplanet Survey Satellite (TESS). She also studied Boyajian's Star, KIC 8462852, with LSU Associate Professor Tabetha Boyajian. Boyajian's Star is known to have abnormal fluctuations of light due to unknown objects orbiting it. LeBlanc's work resulted in a Fall 2021 and Spring 2022 LSU Discover Undergraduate Research Project Grant for "Transit Model Fitting of Tabby's Star." In addition, LeBlanc was a fellow at Georgia State University, using data from the Center for High Angular Resolution Astronomy (CHARA) to stimulate images of young stars and the accretion disks that surround them.

"Working with Madison has been an absolute pleasure," said Boyajian. "Her drive for excellence was evident throughout their undergraduate studies as well as doing research with me during her time at LSU. Winning the NSF GRFP is a testament to her hard work and exceptional abilities. I have no doubt that she will continue to achieve great things in her graduate studies and beyond."

GRFP was developed by the NSF to create a highly motivated and capable workforce dedicated to ensuring the nation's leadership in advancing STEM-related innovations. The selected fellows are expected to become respected thought leaders and knowledge experts in their given fields. Recipients also benefit from opportunities for international research and professional development and the freedom to conduct their own research at any accredited U.S. institution of graduate education they choose.

The National Science Foundation's Graduate Research Fellowship Program, or GRFP, is the oldest graduate fellowship of its kind. Fellows are anticipated to become life-long leaders that contribute significantly to scientific innovation and teaching, help maintain and advance the nation's technological infrastructure and national security, as well as contribute to the economic well-being of society at large.

ALUMNI RETURN TO CAMPUS

2019 BS alumnus **Benjamin Cassin**, Analytical Technician for Dow, talked with potential BS majors and their families about his experience as an LSU physics major.

2011 PhD alumnus **Herbert Fotso**, Associate Professor of Physics at the University of Buffalo, gave a colloquium talk titled 'Nonequilibrium Dynamics of Correlated Quantum Systems, from Transient to Steady State'

2014 PhD alumnus **Brajesh Gupt**, Quantum Applied Scientist at Amazon Web Services, gave a colloquium talk titled 'Quantum Computing: Where we are and where we are going.'

2019 PhD alumna **Terra Hardwick**, Aerospace Technology Optical Engineer at NASA Goddard, gave a colloquium titled 'Mars Sample Return: Seeing and sterilizing Martian samples inside the Capture, Containment, and Return System.'

2019 BS alumnus **Hunter McDaniel**, Associate Start-Up Manager for Lab Corp, talked with physics majors about his experience as an LSU physics major and career path.

2009 BS alumnus **John Schnake**, Software Development Engineer for Amazon talked with current students about his career path with his BS degree in physics

College of Science Hall of Distinction Honorees

Diola Bagayoko, PhD - Chancellor's Fellow and SU System Distinguished Professor Emeritus of Physics

Dr. Diola Bagayoko, an alumnus and supporter of LSU's Department of Physics & Astronomy, has distinguished himself in condensed matter research and demonstrated a strong commitment to STEM education. His notable academic achievements include founding the Timbuktu Academy in 1990, which has mentored over 2300 undergraduate students in STEM fields. Supported by major organizations like NSF, NASA, and the Office of Naval Research, this initiative has had a significant impact on STEM education across Louisiana.

Bagayoko has also played a crucial role in creating the Joint Faculty Appointment Program (JFAP), which aims to foster collaboration between Louisiana's Historically Black Colleges and Universities (HBCUs) and majority White institutions. The LSU-Southern JFAP program was the first in the state and is now the longest-lasting, largely due to Bagayoko's efforts and dedication.

Bagayoko's leadership and advocacy for STEM education have earned him prestigious awards such as the U.S. Presidential Award for Excellence in Science Mentoring and the Mentor Award for Lifetime Achievement from AAAS. His tireless efforts continue to inspire generations of students and researchers, leaving a lasting impact on STEM education and academic collaboration.

E. Ward Plummer, Boyd Professor, Physics & Astronomy (posthumously)

Dr. E. Ward Plummer was one of the world's leading experts in electron spectroscopy and its application to the study of the electronic, vibrational, and atomic structure of a range of materials, with a particular emphasis on surface properties. His research spanned a wide range of materials from fundamental properties of metal surfaces to surface chemistry of catalytic materials, to interfacial/surface quantum phenomena of transition metal oxide materials. He was a central part of the team that developed single-electron spectroscopy, which enabled the first-ever glimpse into electronic energy levels of atoms at the surface of a metal.

He earned his B.A. in physics and mathematics from Lewis and Clark College in 1962, followed by his Ph.D. in physics at Cornell University in 1967. Plummer held professional and academic positions at the National Institute of Standards and Technology (NIST), the University of Pennsylvania, the University of Tennessee, and the Oak Ridge National Laboratory before joining the LSU Department of Physics and Astronomy in 2009.

Over his 11 years at LSU, Plummer led the way to transform the fragmented materials efforts at LSU into a more coherent collaboration by developing the Institute for Advanced Materials and the Shared Instrumentation Facility (SIF) at LSU. This formed a partnership between LSU's Office of Research & Economic Development (ORED), the Colleges of Science and Engineering, 13 departments, and over 100 faculty involved in Materials Research and Engineering on the LSU campus. The collaboration between interdisciplinary materials researchers was instrumental in bringing a DOE Neutron Scattering Center to LSU. In 2017, Plummer was given LSU's highest, most prestigious honor of being named a Boyd Professor. Ward

IN MEMORIAM

J. Gregory Stacy

LSU lost one of its beloved professors, John Gregory Stacy, on January 1, 2025 in Baton Rouge, Louisiana. He died at the age of 73 from pancreatic cancer at home surrounded by family while in hospice care.

Stacy was born on November 26, 1951 in Bethesda, Maryland just outside Washington, D.C. He graduated from the University of Notre Dame in 1974 with a degree in physics. Following graduation, Stacy served as a Peace Corps volunteer in Zaire (DRC) where he met his future wife, Jeanne Marie Paul, as a fellow volunteer. They both served for three years as education volunteers, regional representatives, and trainers.

In 1985, Stacy received his PhD in Physics and Astronomy from the University of Maryland, College Park, while conducting research in high-energy astrophysics at NASA's Goddard Space Flight Center.

He held a research associateship at the Center for Astrophysics in Cambridge, Massachusetts before joining the Compton Gamma Ray Observatory Science Port Center and was assigned to the CGRO/COMPTEL instrument team at the University of New Hampshire in 1990.

In 1997 he joined the faculty of LSU and Southern University as one of the first Board of Regents joint faculty appointees in Physics & Astronomy. He was always grateful for the unwavering support he received from colleagues on both campuses over the course of his joint faculty tenure.

His research interests included gamma-ray astronomy, high-energy astrophysics, and instrument development. In addition, he was a long-time telescope operator and speaker during open house nights at the Highland Road Park Observatory, brought to the public by BREC, LSU's Department of Physics and Astronomy and the Baton Rouge Astronomical Society.

As he noted "The future of gamma-ray astronomy looks very bright indeed, as the next generation of gamma-ray telescopes and missions stands poised to extend our knowledge of the high-energy sky. Over the past decade gamma-ray astronomy has become firmly established as a productive and dynamic discipline of modern observational astrophysics."

In his obituary, Dr. Stacy acknowledged his former students, colleagues, and friends in Africa who, among many other things, taught him that it is wise never to get caught between a Hippo and water.

One of his former students reflected on Dr. Stacy's teaching style, "Professor Stacy is amazing! Go to his office hours, ask questions, schedule one on one appointments to go over tests or any textbook/homework problems you don't understand and you'll be set for the tests! Cares so much about students and always trying to be the nicest he can when explaining."

Gregory Stacy, Professor
LSU and Southern University

Memory from Dr. Marx Mbonye

I was one of of Dr. Stacy's very first graduate students. I met Greg in my junior year of college. I'd just completed an exciting summer internship at NASA Goddard and had returned to Southern for my senior year and was excited to continue research in field of astronomy.

I signed up for Greg's Astronomy class and learned a ton. Greg was excellent at succinctly explaining difficult concepts while keeping the class engaged.

One of the syllabi items were evening trips to the Baton rouge observatory at least once a week.There he taught students star tracking with a cool giant telescope, and recognizing various star constellations. This was a ton of fun!

Dr Stacy was most popular for a program he kicked off at Southern named LaAces. It was an atmospheric balloon project that brought together students from various disciplines to work on a payload that could fly on a scientific ballooon. The year I was part of the program (I believe 2004) our team programmed a PCBA board that would collect atmospheric data while the scientific balloon was flying. This was an exciting multi month group project for the students, and provided them with research experience they otherwise would not have gotten while at Southern.

I worked with Dr. Stacy on my master's thesis in '05-'06. He had a very good understanding of observational astronomy and working with him spurred me to want to pursue a phd. I eventually completed my PhD at Rice Univ and landed a great job in the semiconductor industry.

Unfortunately after my Phd, I did not get a chance to meet Dr. Stacy in person. We had exchanged emails where I thanked him for the excellent direction he gave me on career pursuit. Without his guidance I likely would have struggled thru my PhD, but with his help and advice I was successful.

In conclusion, Dr. Stacy had a significant impact on various students such as myself. He will be greatly missed. May his soul rest in peace.

IN MEMORIAM

Edward Zganjar

The LSU community lost one of its most respected faculty members when retired Alumni Professor and Professor of Physics Emeritus Edward F. Zganjar passed away on February 8, 2024. He was 85 years old.

Born July 31,1938 in Gilbert, Minnesota, Zganjar was an eminent researcher in experimental nuclear physics whose study of the astrophysical processes that shaped our universe provided a window into understanding the early universe.

Zganjar graduated with a Bachelor of Science degree in physics and mathematics, Cum Laude in 1960 from St. John's University in Collegeville, Minn., followed by a master's and Ph.D. in nuclear physics from Vanderbilt University in 1966 under the direction of Professor Joseph Hamilton.

Dr. Zganjar was known in the nuclear physics community for systematic analysis of complex nuclear spectroscopic data, for designing and building state-of-the-art nuclear spectroscopic instrumentation, and for his contribution to the establishment of a university consortium and laboratory within the Holifield nuclear facility at the Oak Ridge National Laboratory.

Zganjar is recognized as an expert on conversion-electron spectroscopy (a nuclear decay process), both for the instrumentation he developed and for its application. His instrumentation has been utilized in many U.S. laboratories, Canada, and Europe. His systematic investigation of nuclear electric monopole transitions in heavy nuclei, for example, led to the first definitive connection between those transitions and nuclear shape coexistence.

He is a founding member of the UNISOR consortium (University Isotope Separator at Oak Ridge) established 45 years ago. This consortium, involving a dozen or more universities, established a university nuclear physics laboratory within the Holifield facility at the Oak Ridge National Laboratory. This was a breakthrough in cooperation between university and national laboratory scientists and served as a model for future university/national laboratory cooperation.

Following a year-long post-doctoral fellowship at the National Reactor Testing Station in Idaho Falls, Zganjar joined the faculty of the LSU Department of Physics and Astronomy in 1962.

During his early years at LSU, Zganjar's major research interest involved the study of the fundamental structure of the atomic nucleus. He conceived, participated in, and directed numerous research projects that included many different institutions and physicists, all while teaching graduate and undergraduate courses in physics at LSU. Prof. Zganjar loved teaching and had a great impact on many students and young scientists throughout his career.

He was promoted to associate professor in 1970 and full professor in 1975. Zganjar served as Department Chair from 1982 to 1985 and Associate Vice Chancellor for Research and Economic Development from 1990 to 1994.

Edward Zganjar Professor Emeritus of Physics & Astronomy

Zganjar served on numerous LSU committees during his tenure. For the College of Basic Sciences, he chaired the Courses and Curriculum Committee, the Academic Standards and Honors Committee, and the Policy Committee. He was a member of the Council on Research for the LSU Office of Research and Graduate School, the University Academic Standards and Honor Committee, the University Budget Committee, and the LSU Faculty Senate.

Nuclear astrophysics was the emphasis of his later research. He was active as a member of LSU's experimental nuclear/experimental astrophysics group, and he designed and constructed highly specialized spectrometers and spectroscopic equipment to conduct his research and to facilitate the research of his colleagues. His research helped provide an understanding of the astrophysical processes that shaped our early universe.

Professor Zganjar published over 142 journal articles, 220 published conference contributions, and maintained continuous external funding throughout his career. His research was continually funded by the U.S. Department of Energy from 1970 to 2017.

He compiled a rich portfolio of research and scholarship, authoring more than 300 articles published in peer-reviewed journals and providing more than 230 presentations at conferences and conference proceedings.

Zganjar received many prestigious awards during his career. He was named a Fellow in the American Physical Society (APS) in 1982 and received the 2014 Francis G. Slack Award for outstanding service from the Southeastern Section of the APS. In 2015, he was inducted into the LSU College of Science Hall of Distinction in recognition for his "immeasurable contributions to science education and research."

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Support from Tigers like you has always been important in providing the margin of excellence for our students and faculty. In today's challenging economic times, LSU relies even more on our alumni and friends to make a vital investment in the future. Gifts to the Department of Physics & Astronomy will be used to enhance our teaching program and facilitate scientific discoveries that shape the future.

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Alumni are Always Welcomed Back at LSU

(l-to-r) PhD alumni Alex Laminack, Robert Baker, Erin Good, Amber Lauer-Coles, Professor Catherine Deibel and Department Chair Jeffery Blackmon

The Department of Physics & Astronomy would like to invite our alumni to visit their alma mater, reconnect with former professors, and share their career path with current students.

Let us know if you are planning a trip to campus and we can set up a tour of the Department of Physics & Astronomy.

You can reach out to your former classmates via Facebook, Instagram, Twitter, and Linkedin!

Email pawebmaster@lsu.edu or call 225-578-2261.