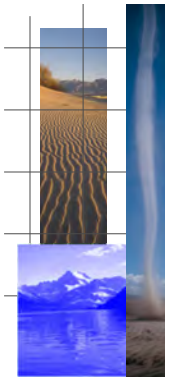

Schrödinger's Tiger

The Clemson University Physics and Astronomy Newsletter

Spring/Summer 2019 **Volume 14, Issue 1**

Mike Brown Wows the Crowd at Clemson

In this issue:

"Pluto isn't a planet and never should have been," said **Mike Brown**, the infamous "Pluto Killer," in his February 21st distinguished lecture at Clemson.

Although a seemingly harsh statement, Brown is the astronomer who's qualified to make it, for it was his research on the discovery of objects at the edge of our solar system that gave way for the demotion of Pluto in 2006.

Brown, a professor of planetary astronomy at the California Institute of Technology, gave two lectures at Clemson University on Feb. 21: an astronomy colloquium for the College of Science's 2019 Discover Science Lecture and a public lecture for the Tigers Advance Distinguished Speaker Series.

Mike Brown specializes in the discovery and study of bodies at the edge of the solar system. Image: Mike Brown

Each lecture took the audience through a chronicled history of how planets like Uranus and Neptune were discovered and how the (now) dwarf planet of Pluto was so easily misclassified for so long. Brown's 2005 discovery of Eris, the most massive object found in the solar system in 150 years, called into question just what a planet is and should be, leading the International Astronomical Union to propose a formal definition of a planet just one year later.

Brown spent the second part of his lectures describing his newest evidence for the existence of a true Planet 9, one that is about ten times more massive than Earth. It was the strange orbits of two planetary objects, Sedna and Biden, that first clued Brown into the search. He predicted that if a Planet 9 were to exist, it would likely have other objects in perpendicular orbit around it, and when he modeled where those objects would be – lo and behold, he discovered six of them.

"Everything we find continues to support the idea that there's a giant planet out there," Brown said. And it's a finding that could be made very soon, he said.

Both Brown's lectures were well attended by Clemson faculty, staff, students and the general public. For photos from the event, please visit the College of Science Facebook page.

(Adapted fromhttps://newsstand.clemson.edu/mike-brown-wows-the-crowd-at-clemson/)

A Message from the Chair

As I write this newsletter, it is hard to believe that the summer is nearly over! The first eight months as chair have been a whirlwind of exciting challenges, opportunities, and accomplishments that I hope you enjoy reading about in this newsletter. I deeply appreciate the work **Professors Tritt** and **Sosolik** have done guiding our department forward over the past three years. Their leadership has led to remarkable outcomes as we have seen a record number of students graduate from our department (twenty-two with a bachelor's degree and eleven with a Ph.D.). Our majors are going to graduate school at institutions such as MIT and Chicago, and Ph.D. students are headed to postdocs at places such as the University of Washington and Harvard. We are proud of all of our graduates and trust you will enjoy reading about their endeavors in this newsletter. These students are granted the opportunities they have because of the award-winning faculty that make up our department. I trust that you will enjoy reading about the awards **Drs. Ajello**, **Larsen**, and **Sanabria** have been recognized with this year. New faculty hire **Jonathan Zrake** will be featured in our fall edition. But we are not content to rest on our laurels. The success of our faculty is leading to additional growth among our undergraduates, graduate students, and postdocs and thus new faculty hires. Our goal is to grow to 200 physics majors, 100 graduate students, and thirty-five faculty by 2026. To this end, we are increasing our recruitment efforts and will be searching for two condensed matter scientists this year and a medical biophysicist next year!

Our success is thanks to the support you provide. If you are interested in networking with our recent graduates, please reach out to me, and I will be delighted to help you connect. I would also like to encourage you to consider a donation to our Physics Foundation Fund, which is one of the primary means we have for supporting our department's efforts. We also have a number of standing funds for scholarships, fellowships, and research that you can support. Let me close with an invitation to sign-up for our email updates if you haven't already done so and to encourage colleagues who do not already receive this newsletter to reach out to us to be added to our mailing list. We want all of our friends and alumni to have the opportunity to keep abreast of the exciting developments in our department.

Sean Brittain, Chair
Department of Physics and Astronomy
Voice: (864) 656-3416/email: sbritt@clemson.edu

Creating a Legacy — Giving to Clemson Physics & Astronomy

You can create a lasting legacy through your donation to the Clemson University Physics and Astronomy Department Foundation. Endowments to Clemson assure the best faculty, the brightest students and the most creative research projects. A substantial endowment can transform a good university into a great one. As a non-profit organization, the Foundation is exempt from federal income tax under Section 501(c)(3) of the IRS Code, as amended. The Foundation has been classified by the IRS as a public charity operated for the benefit of a state university as defined in the Internal Revenue Code of 1986 Section 170(b)(1)(A)(iv). Contributions to the University through the Foundation by individuals, corporations, organizations and other foundations qualify as tax deductions. There are several ways to donate. You may send a check to the Clemson University Foundation, P.O. Box 1889, Clemson, SC 29633. Checks should be made payable to the Clemson University Foundation with Physics and Astronomy specified on the memo line. Alternately, you may visit the Clemson website: **https://cualumni.clemson.edu/give/physics-astronomy** and make a secure electronic donation.

Thank you, as always, for your continued support of the Department. You may contact the Annual Giving Office at (864) 656-5896, should you have any questions regarding your donations. If you have other questions you may contact the Department directly at (864) 656-3416.

NASA Awards Miguel Larsen Distinguished Public Service Medal

Miguel Larsen (left) has made pioneering advancements in atmospheric physics for which he is being honored by NASA.

Dr. Miguel Larsen has been selected by NASA as the 2019 recipient of the NASA Distinguished Public Service Medal, the highest honor that NASA bestows on a non-government partner who has contributed to the agency's advancement of United States' interests.

This is done in recognition of his pioneering research to measure vertical profiles of the Earth's upper atmospheric winds and leading over 100 NASA sounding rockets during forty years of research.

Larsen, a physics professor at Clemson University has dedicated his life's work to measuring and interpreting upper atmospheric winds using vapor trails released along sounding rocket trajectories. He has been the singular pioneer in the United States (and the world) developing the technique of using luminescent vapor trails, to provide the speed and direction of upper atmospheric winds for nighttime and daytime observations. By stationing observers at geographically distributed locations (including on NASA aircraft), who subsequently photograph the trails against the background stars, he has developed triangulation techniques to accurately determine wind profiles and their evolution over time.

Not only has Dr. Larsen pioneered the techniques to reveal the dynamics of the upper atmosphere, he has demonstrated that wind speeds of the Earth's upper atmosphere are significantly (and consistently) larger than expected, far exceeding those predicted by "tidal" models for both day and night conditions. Similar to discoveries of the jet stream in the lower stratosphere carried out with transcontinental airplanes after the Second World War, Dr. Larsen's discovery of intense, sustained wind speeds using vapor trails released on sounding rockets has fundamentally changed our appreciation of the Earth's upper atmosphere. Beyond advancing fundamental knowledge of our natural environment, these discoveries have important "space weather" implications for ionospheric coupling, as well. For example, for many years, observations of Space Shuttle exhaust products that appeared on the other wide of the world soon after launch perplexed researchers. It was largely based on Dr. Larsen's research that helped us to understand how gases such as these are globally transported so rapidly.

He is the undisputed world leader of wind profiles in the upper atmosphere and has designed and built experiments that were subsequently flown on over 100 NASA sounding rockets, launched at high, mid, and low latitudes. Accordingly, he is frequently sought by researchers throughout our nation whether from academia, NASA, or Department of Defense research organizations.

Larsen has also participated in many international research projects, most notably with Japanese and European research scientists. Dr. Larsen's distinguished abilities and vision have left an indelible impact on NASA's mission and our nation's atmospheric research community. The Department will hold a reception this fall to acknowledge Dr. Larsen's award and significant accomplishments in his field.

(NASA, August 10, 2019)

Clemson Cancer Research Featured in *Nature Communications*

Clemson University College of Science physicist **Hugo Sanabria's** collaborative research on a protein that is considered to be a suppressor of cancerous tumors has been featured in the journal *Nature Communications*. Sanabria is co-first author of the article titled "Dynamic anticipation by Cdk2/Cyclin A-bound p27 mediates signal integration in cell cycle regulation." Sanabria and an international team of scientists broke new ground on the structural dynamics of an intrinsically disorder protein (IDP) named p27 when bound in complex with cell division proteins.

In particular, the team studied the ternary complex of p27 with the Cdk2 tightly bound with Cyclin A. In this ternary complex, cell division progresses after several amino acids in p27 are phosphorylated, which were previously shown to be occluded in crystallographic structures. Phosphorylation is one of the ways in which cellular signaling occurs. Thus, the question that the team wanted to address from the beginning was how cell cycle could proceed if those important residues were found buried in previous structural studies.

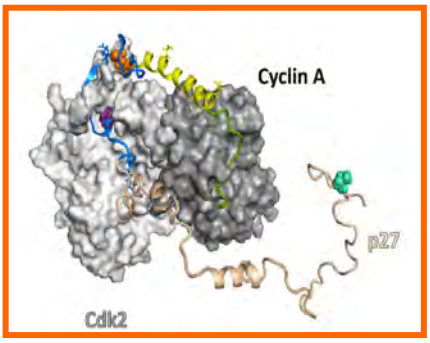

Illustration of the ternary complex of p27 with Cdk2 tightly bound with Cyclin A. Image: Hugo Sanabria

The team used an integrated approach from structural, biochemical, biophysical and single-molecule fluorescence methods, with Sanabria mostly contributing to the latter. The team introduced the "dynamic anticipation" model, in which p27 locally dissociates for short time intervals anticipating the phosphorylation steps. In this way, p27 provides access to kinases that target those phosphorylatable residues.

Only then, a series of cascade signals will lead to degradation of p27, driving cell division.

"p27 is an inhibitor of 'Cyclin-dependent Kinases (Cdk),' which controls cell cycle progression. As such, misregulation of p27 leads to diverse cancer types," said Sanabria, who is an assistant professor in the department of physics and astronomy. "Single molecule fluorescence experiments like the ones we do at Clemson are uniquely positioned to study these systems because of the upmost high temporal and spatial resolution."

Sanabria worked in collaboration with **Richard Kriwacki** at St. Jude Children's Research Hospital, **Claus Seidel** at Heinrich Heine University in Germany, and **Peter Tompa** in the VIB Center for Structural Biology at the Vrije Universiteit Brussels. Other authors included **Maksym Tsytlonok**, **Yuefeng Wang**, **Suren Felekyan**, **Katherina Hemmen**, **Aaron Phillips**, **Mi-Kung Yun**, **Michael Waddell**, **Cheon-Gil Park**, **Sivaraja Vaithiyalingam**, **Luigi Iconaru** and **Stephen White**.

Moreover, in February, the Board of Trustees recognized Sanabria with the 2018 Award for Excellence. The award acknowledges faculty and staff whose vision, accomplishments and efforts have brought honor to Clemson. Recognition was given to fifteen staff members and fifteen faculty members, who were named at a dinner held in conjunction with the winter meeting of the Board of Trustees.

(Adapted from https://newsstand.clemson.edu/.../sanabria-research-on-cell-cycle-regulation- featured-in-nature-communications/)

Hugo Sanabria Receives 2019 Young Fluorescence Investigator Award

College of Science physicist **Hugo Sanabria** has been named the recipient of the 2019 Young Fluorescence Investigator award by the Biophysical Society.

Hugo Sanabria was recently awarded the 2019 Young Fluorescence Investigator Award by the Biophysical Society.

The peer-nominated award is given to a pre-tenured investigator for outstanding achievements in the use of fluorescence methodologies in Biology and Biophysics, according to Horiba Scientific, which sponsors the prize. It consists of a $1,000 honorarium and an invitation to present a fifteen-minute research talk, which was held on the first day of the annual meeting of the Biophysical Society on March 2 in Baltimore.

"By looking at the list of past winners, it is a great honor to have been nominated and, even better, to be selected for this award," said Sanabria, an assistant professor in the department of physics and astronomy. "Previous awardees are researchers whom I have followed throughout my career, and I have tremendous respect for them. This would not have been possible without my mentors like professor **Neal M. Waxham** at the Science Center at Houston and professor **Claus A. M. Seidel** at Heinrich Heine University in Dusseldorf."

In 2018, Sanabria earned one of the National Science Foundation's most prestigious honors when he was named a recipient of the Faculty Early Career Development (CAREER) award. Sanabria joined Clemson University in 2014. He studies the structure, dynamics and function of biomolecules using state-of-the-art fluorescence spectroscopic tools. Among the biomolecules is the protein calmodulin that is responsible for regulating vital functions in the body, such as heart beating, muscle contractions, and learning and memory. His research program is funded primarily by NSF and National Institutes of Health.

(Adapted from newsstand.clemson.edu/sanabria-receives-2019-young-fluorescence- investigator-award/)

Jordan Eagle Becomes Fellow at the Harvard-Smithsonian Center for Astrophysics

Our students continue to excel! Second-year graduate student **Jordan Eagle** has been awarded the Chandra X-ray Observatory Predoctoral Fellowship at the Harvard-Smithsonian Center for Astrophysics. The Chandra X-ray Center is the Science and Operations Center for the Chandra X-ray Observatory, operated for NASA by the Smithsonian Astrophysical Observatory (SAO) at the Harvard-Smithsonian Center for Astrophysics (CfA). After completing her coursework at Clemson, she will spend two years doing research at the forefront of high-energy astrophysics.

Please join us in congratulating Jordan for this well-deserved honor.

Jordan Eagle will be a predoctoral fellow at the Harvard-Smithsonian Astrophysical Observatory.

Direct Descendant of Newton's Famous Apple Tree Finds a Home at Clemson

A living slice of history has found a new home in an epicenter of scientific achievement. A public ceremony marked the planting of a direct descendant of the Newton Apple Tree in a patch of soil surrounded by three buildings – Kinard, Martin and Long halls on Wednesday, February 27.

Included among the sixty or so in attendance were department chair **Sean Brittain**, professor **Endre Takacs** and doctoral candidate **Bishwambhar Sengupta** from the College of Science's Department of Physics and Astronomy. Sengupta spent months securing the germplasm of the tree for Clemson. "I managed to find the USDA repository in Geneva (New York), where they have about 5,000 apple trees on their farm," Sengupta said during the ceremony. "One of them was from Newton's tree. And that is where we received our genetic material."

Doctoral student Bishwambhar Sengupta played a critical role in bringing the tree to Clemson. Image: Jim Melvin

"I believe that this tree is a great symbol for the College of Science here at Clemson," Takacs added. "It has healthy roots that originate from a community here in the Carolinas. But the branch is the direct descendant of the famous tree that initiated a great scientific idea. This tree is a living symbol of the slogan of our College – locally relevant and globally impactful."

Clemson's tree, which is about seven feet tall and as thin as a stick, is not expected to produce fruit for at least three years. But as the time passes from season to season, it should grow many times larger. Also, it is genetically ancient, which means it will require extra-special care.

From left: Sean Brittain, Endre Takacs, Bishwambhar Sengupta, Jeff Hopkins and Tommy Fallaw Image: Jim Melvin

"This whole project has been a blessing for me," said **Tommy Fallaw**, director of landscaping services. "It's been a joy to be a part of it. And I think the best part is that it has brought people together who normally might never interact."

For several centuries, **Sir Isaac Newton** (1642-1727) has been regarded as the father of modern physics. He conceived that the same force that caused the apple to fall straight down from the tree was also the force that governed the motion of the moon and planets.

But his achievements in the physical sciences were matched by his innovations in mathematical research, and he is credited by many as the creator of calculus.

"The tree we're planting – at least the top of it – is a molecular clone with the same genetic material as the tree that Sir Isaac Newton sat under in the 1600s when a falling apple caused him to consider the force of gravity," said **Julia Frugoli**, Associate Dean for Inclusive Excellence and Graduate Education in the College of Science and a longtime plant geneticist. "Students of science – especially those sweating it out in calculus and physics – have Newton to thank for the equations that explain why the world works the way it does, at least on a large scale."

(*Adapted from Jim Melvin, College of Science, February 27, 2019*)

Biophysics Group Update

The Physics Department's four biophysics labs are active, with several new hires, awards, graduations, research projects, progress, and publications.

Early in March, representatives from all four Clemson biophysics labs attended the Biophysical Society Annual Meeting in Baltimore. **Dr. Hugo Sanabria** chaired a member-organized session on integrative modelling. **Swagata Pahari**, a post-doctoral fellow in **Dr. Emil Alexov's** lab, also chaired a session, and several students presented posters.

Last year, **Drs. Josh Alper** and Sanabria received NSF funding to host a Research Experience for Undergraduates (REU) site in biophysics at Clemson. The REU will involve all four biophysics faculty, other Physics and Astronomy Department professors **Drs. Endre Takacs** and **Ramakrishna Podila**, and faculty from bioengineering, biological sciences, genetics and biochemistry, and materials science. The ten students will be divided into groups of two to work on separate, but collaborative, projects with faculty mentors from two different departments. We're excited to have welcomed these students from around the country to campus this summer!

Dr. Sanabria's group recently joined the South Carolina Translational Research Improving Musculoskeletal Health (SC-TRIHM) initiative, in collaboration with the Clemson University School of Health Research (CUSHR), Clemson University Biomedical Engineering Innovation Campus (CUBEInC), Greenville Health System (GHS), and the Medical University of South Carolina (MUSC). SC-TRIHM is focused on applying new research findings on musculoskeletal diseases to actual medical practice.

Several members of the biophysics groups have recently received prestigious awards. In May, **Dr. Alexov** was awarded the 2018 Alumni Award for Outstanding Achievement in Research. This award is given annually by the university and represents one of the highest honors for faculty researchers at Clemson. Last fall, Dr. Sanabria received the NSF Career Award from the NSF Division of Molecular and Cellular Bioscience. And earlier this spring, the Clemson Board of Trustees recognized him with the 2018 Award for Excellence. More recently, he was awarded the Young Fluorescence Investigator Award from the Biological Fluorescence subgroup of the Biophysical Society. The award recognizes an outstanding researcher early in his or her career who has contributed significant advances to fluorescence methodologies. At Clemson, **Arghya (Argo) Chakravorty**, a graduate student in Dr. Alexov's lab, was recently honored with the department's Outstanding Graduate Research Assistant Award. Congratulations to Dr. Alexov, Dr. Sanabria, and Argo.

There have also been several new additions to the biophysics labs. Post-doctoral fellows **Ashok Pabbathi** and **Apurba Paul** both joined Dr. Alper's lab in the last year, and Dr. Sanabria recently hired **Dr. Narendar Kolimi**.

Students in the biophysics groups have also been active, moving forward in their careers. **Xinewi Ge**, a student in **Dr. Feng Ding's** lab, received his Ph.D. last summer and has begun a new position as a data scientist in a biotech company. Another member of Dr. Ding's lab, post-doc **Yunxing Sun**, recently received a job offer as an associate professor at Ningbo University, China. One of Dr. Alexov's Ph.D. students and a former recipient of the Outstanding Graduate Research Award, **Yunhui Peng**, also recently graduated. He has accepted a job at the National Institutes of Health. Former members of Dr. Alper's lab have gone on to take positions at NIH, Carnegie Mellon, MUSC, USC, Baylor College of Medicine, and Eurofins.

Additionally, several students participated in exciting summer opportunities. **George Hamilton**, a Ph.D. student in Dr. Sanabria's lab, spent the summer in Germany at the Heinrich Heine University in Dusseldorf as part of a three-month fellowship. **Argo Chakravorty**, from Dr. Alexov's lab, took an internship in Manchester Institute of Biotechnology (UK) in the lab of **Prof. Richard Henchman**. Undergraduate students **Hailey Lovelace** (Dr. Alper's lab) and **Gabriella Wheeler** (Dr. Sanabria's lab), both participated in NSF REU programs at Lehigh University and Indiana University, respectively.

The biophysics group also sponsors a student chapter of the Biophysical Society. Student chapter members **Gabriella Wheeler**, **Hailey Lovelace**, and **Mikael Toye** presented about the successes and challenges in outreach activities at the annual meeting of the student chapters during the BPS conference. Other members of the student chapter include **George Hamilton** and **Jeremy Moore** from Dr. Sanabria's lab and **Subash Godar** and **Kaytlin Kilian** from Dr. Alper's lab. The chapter hosted several exciting events for Biophysics Week, which is the last week in March. The biophysics group is excited to celebrate the many achievements of its members and we're looking forward to exciting upcoming projects and events.

Clemson Undergraduates Attend Conference for Women in Physics

Left to right: Abbey Marek, Gabriella Wheeler, Emily Faber, Jessica Zanetti, Brantley Kerns, Erin Thompson, and Hailey Lovelace

The Conference for Undergraduate Women in Physics (CUWiP) is a series of regional conferences held simultaneously around the United States and Canada for undergraduate women interested in physics. The 2019 conferences were held from January 18– 20 at multiple venues throughout both countries. Seven undergraduates (pictured at left) from Physics and Astronomy attended the conference held at the University of Alabama at Tuscaloosa.

"I attended the 2019 CUWiP and was pretty nervous about spending an entire weekend there without knowing anyone. However, I was able to create great friendships with other female physics majors at Clemson and was also able to create friendships with women in physics at other universities. Not only friendships with other students, but also with professors and women working in national labs, with large- scale astrophysical research, and other various areas. It also really helped me to understand my graduate school and career options. It was an enlightening experience and created connections that will be really beneficial in the future. I can't wait to go back next year!" said **Brantley Kerns**, a Clemson physics undergraduate.

Hosted by **Dr. Joan Marler**, Clemson WiP holds monthly lunches and other informal social gatherings for the female members (undergrad, graduate, postdoc, staff and faculty) of our department. They discuss articles related to physics, gender and education to discuss, as well as providing a supportive environment for one another here at Clemson. Men and non-current Clemson students may attend. For more information visit their Facebook page at:

https://www.facebook.com/groups/1622911714604680/?ref=bookmarks

Two Clemson Sounding Rocket Proposals Selected by NASA

Dr. Gerald Lehmacher's project "VortEx" will study mesoscale turbulence around 100 km altitude, an important coupling region in the Earth's atmosphere. It comprises the launch of four sounding rockets from northern Norway and complementary observations with state-of-the-art airglow imagers, meteor radars and lidars.

Dr. Steve Kaeppler's project "INCAA" will study the coupling between ions and neutral to understand the altitude distribution of how energy is transferred during active auroral conditions. Both Lehmacher's and Kaeppler's proposals have been selected and funded by NASA.

Norway is a principal site for the launching of sounding rockets to study atmospheric turbulence.

Research Professor Miguel Larsen is Co-Investigator on both projects, and **Dr. Xian Lu** will use the Palmetto Supercomputer to provide modeling results for the INCAA mission. Other co-investigators are at Utah State University, Embry-Riddle Aeronautical University, University of California - Berkeley, University of Alaska - Fairbanks, and University of Calgary. Both projects provide exciting research opportunities for undergraduates and graduate students who want to be involved in all aspects of a NASA rocket mission from design to data analysis. The projects will begin in 2019, and the launches are planned for 2021. The total three-year research funding for both projects is over 2.6 million dollars.

Physicist Rao Named Fellow of the National Academy of Inventors

In a 2018 TedX talk, Rao explained how his team used flaws in carbon nanomaterials to maximize energy capacity.

Clemson University physicist **Apparao Rao** has been named a fellow of the National Academy of Inventors.

Rao, founding director of the Clemson Nanomaterials Institute and Associate Dean for Discovery in the College of Science, leads research focused on understanding and exploiting the properties of nanomaterials, such as carbon nanotubes and graphene, with applications spanning as varied as green energy to health care.

Rao is the third Clemson faculty member to be elected to the NAI.

John Ballato, a professor of materials science and engineering, was elected in 2015. **Ken Marcus**, University Professor of Chemistry, was elected in 2017. Rao joined Clemson in 2000. He is also the R. A. Bowen Professor of Physics and is also a fellow of the American Physical Society and of the American Academy for the Advancement of Science.

The NAI says fellow status "is the highest professional distinction accorded solely to academic inventors

(*Continued on next page*)

who have demonstrated a prolific spirit of innovation in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development and the welfare of society." The 2018 NAI Fellows class are named inventors on nearly 4,000 issued U.S. patents. They will be inducted at the Space Center Houston in April at the Eighth Annual Meeting of the NAI.

"Dr. Rao represents the best of academic researchers. He is committed to educating and mentoring students, helping his faculty peers reach their potential and improving society by leading research that can be readily translated to commercial development," said **Cynthia Young**, Dean of the College of Science. "We are thrilled that the NAI saw fit to recognize Dr. Rao's contributions as an inventor."

In March 2017, Rao's and his colleague **Rama Podila** invented the ultra-simple triboelectric nanogenerator, or U-TENG, a small device made of plastic and tape that generates electricity from motion and vibrations. When the two materials are brought together — through such actions as clapping hands or tapping feet — they generate voltage that is detected by a wired, external circuit. Electrical energy, by way of the circuit, is then stored in a capacitor or a battery until it's needed.

Nine months later, in a paper published in the journal *Advanced Energy Materials*, the researchers reported that they had created a wireless TENG, called the W-TENG, which greatly expands the applications of the technology.

Director of the Clemson University Research Foundation **Chris Gesswein** and Vice-President for Research **Tanju Karanfil** championed Rao's nomination. In nominating Rao, they said, "This is a well-deserved recognition for Rao for a lifetime body of work developing and commercializing innovations throughout his career."

(newsstand.clemson.edu/.../physicist-rao-named-fellow-of-national-academy- of-inventors/)

Clemson Hosts the Southeastern Laboratory Astrophysics Community (SELAC) Meeting

The Department of Physics and Astronomy hosted the latest meeting of the Southeastern Laboratory Astrophysics Community (SELAC) from May 13-16, 2019 at the Madren Conference Center on the shores of Lake Hartwell.

SELAC conferees gather at the Madren Center to discuss opportunities for astrophysics in the Southeast.

The meeting kicked off on Monday, May 13th with a graduate student symposium featuring graduate student presenters, as well as panel discussions from faculty who discussed job and research opportunities in the field of laboratory astrophysics. The full SELAC meeting ran from Tuesday to Thursday and featured speakers from several of our southeastern colleagues, as well as from NIST-Gaithersburg, Los Alamos National Laboratory and the National Ignition Facility. Participants took time for a short outing into the South Carolina Botanical Gardens, and the meeting closed with a vibrant discussion of future plans for the community to bring additional laboratory astrophysics opportunities to the Southeast.

Physics and Astronomy Students Honored for Academic Success

Dr. Sean Brittain (center front) and award recipients after the annual awards ceremony in Kinard Hall.

This year's Department of Physics and Astronomy awards ceremony was held on April 10, 2019 in Kinard Hall.

In addition to department awards, the Society of Physics Students bestowed its SPS Senior Award upon **Benjamin Hetherington**.

Later that day, the College of Science conferred awards upon two Physics and Astronomy undergraduates during a college-level ceremony held at the Madren Conference Center.

The Outstanding Undergraduate in Discovery Award went to **Adam Miller**, and the Outstanding Senior in Science Award was given to **Daniel Fox**.

The following students received awards:

Sophomore L.D. Huff – **Scott Driggers** & **Andrew Wetzel**

Junior L.D. Huff – **Benjamin Slimmer** & **Erin Thompson**

SPS Senior – **Benjamin Hetherington**

Samantha Cawthorne '10 – **Hailey Lovelace**

Graduate Teaching Assistant – **Bishwambhar Sengupta**

Graduate Research Assistant – **Fengjiao Liu**, **Arghya Chakravorty**, and **Abhishek Desai**

Marco Aiello Recognized as the Rising Star in Discovery by the College of Science

Marco Ajello has been awarded the Rising Star in Discovery by the College of Science. This award recognizes excellence in forefront research performed at Clemson University by a junior faculty member. Ajello is interested in understanding the evolution of supermassive black holes and different types of high-energy phenomena in the universe, with particular emphasis on astro-particle physics and cosmology.

Please join us in congratulating the success of our colleague.

Marco Ajello is on his way to being a world leader in high-energy astrophysics.

The Clemson University Physics and Astronomy Newsletter

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Department News

Bishwambhar Sengupta, a Ph.D. student with Dr. Endre Takacs, has just accepted an offer for a post-doctoral position at the University of Washington in Seattle. He will join the group of Eric Floyd in the Department of Radiation Oncology. Let's congratulate Bishwambhar on this excellent next step in his career.

Graduate student Komal Kumari has been elected student representative to the NSF CEDAR Science Steering Committee, where she will serve a two-year term. The Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR) Program, funded by NSF's Atmospheric and Geospace Sciences Division, studies the interaction region of the Earth's tenuous upper atmosphere.

Congratulations to Jaclyn D'Avanzo and Allen Benton on the birth of their son Dominic Allen Benton on February 9, 2019. Jacclyn is a graduate student of Dr. Endre Takacs, and Allen is a graduate student with Dr. Jian He's group.

Welcome to Kathy Barnett, who will replace administrative assistant Debra Helvie, who retired at the end of last semester. Kathy will be the new "face" of the department, and we welcome her to Physics and Astronomy family!

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