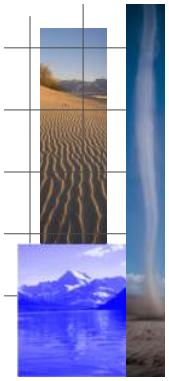

Schrödinger's Tiger

The Clemson University Physics and Astronomy Newsletter

Fall 2019 Volume 14, Issue 2

Clemson Scientists Further Refine How Quickly the Universe is Expanding

In This Issue:

Refining the Expansion of the Universe

Chairman's Message

CUWiP Conference Comes to Clemson in 2021

Clemson Hosts Quantum Workshop

Hugo Sanabria Selected for Presidential Leadership Institute

Educating S.C. Schools about the Benefits of Learning Physics

Feng Ding's Research Highlighted in *Nature*

Emil Alexov is New CUSHR Research Faculty Fellow

John Meriwether Elected Fellow of American Geophysical Union

Ramakrishna Podila Receives the Roaring10 Award

Matt Troutman Named Head of the Thomas Jefferson School

Department News

Wielding state-of-the-art technologies and techniques, a team of Clemson University astrophysicists has added a novel approach to quantifying one of the most fundamental laws of the universe.

In a paper published Friday, Nov. 8, 2019 in the *Astrophysical Journal*, Clemson scientists **Marco Ajello**, **Abhishek Desai**, **Lea Marcotulli** and **Dieter Hartmann** have collaborated with six other scientists around the world to devise a new measurement of the Hubble Constant, the unit of measure used to describe the rate of expansion of the universe.

From left: Clemson's Marco Ajello, Lea Marcotulli, Abhishek Desai and Dieter Hartmann were co-authors on a newly released paper in the *Astrophysical Journal*. Image Credit: College of Science

"Cosmology is about understanding the evolution of our universe – how it evolved in the past, what it is doing now and what will happen in the future," said Ajello, an associate professor in the College of Science's department of physics and astronomy. "Our knowledge rests on a number of parameters – including the Hubble Constant – that we strive to measure as precisely as possible. In this paper, our team analyzed data obtained from both orbiting and ground-based telescopes to come up with one of the newest measurements yet of how quickly the universe is expanding."

The concept of an expanding universe was advanced by the American astronomer **Edwin Hubble** (1889-1953), who is the namesake for the Hubble Space Telescope. In the early twentieth century, Hubble became one of the first astronomers to deduce that the universe was composed of multiple galaxies. His subsequent research led to his most renowned discovery: that galaxies were moving away from each other at a speed in proportion to their distance.

Hubble originally estimated the expansion rate to be 500 kilometers per second per megaparsec, with a megaparsec being equivalent to about 3.26 million light years. Hubble concluded that a galaxy two megaparsecs away from our galaxy is receding twice as fast as a galaxy only one megaparsec away. This estimate became known as the Hubble Constant, which proved for the first time that the universe was expanding. Astronomers have been recalibrating it – with mixed results – ever since.

Continued on page 3

A Message from the Chair

Happy New Year! It is hard to believe that a full year has passed since I started as chair. What a year it has been! We had a record number of students graduate at both the undergraduate and Ph.D. levels, and these students are going on to many exciting new endeavors. Perhaps, the most gratifying privilege of serving on the faculty is seeing our students mature emotionally and intellectually during their time with us. To better prepare our students for the "real" world, we have launched professional development seminars. These seminars are designed to help our students develop their soft skills, such as teamwork, communication, and personal presentation.

We have also launched three new searches. One of these will be an experimentalist in quantum computing; another will be a theorist in condensed matter physics; and, a third will be an astrophysicist. We are committed to pursuing three goals: 1) world-class research while mentoring undergraduates, graduate students, and postdocs; 2) growth in national prominence among physics departments in R1 universities; and, 3) leading the way in graduate education, student engagement, and community outreach, while improving the quality of life in the workplace. As we grow our faculty, we do so strategically, by aligning our hires with NSF's Big Ideas in the areas of astrophysics, atomic, molecular, optical, atmospheric and space, biophysics, and condensed matter physics. By 2026, we aim to comprise thirty-five faculty, twenty-five postdocs, 100 Ph.D. students, and 200 undergraduate majors. Moreover, we recognize that most of the students who earn a degree from us will not pursue an academic career. To prepare these students for the workforce, we are looking for industry partnerships for internship opportunities for our undergraduate and graduate students. If you work for a company interested in partnering with us, please contact me, and I will be happy to discuss how our students can benefit from our partnership with your company.

Your generous giving makes much of this possible. Please consider a donation to our Physics Foundation Fund, which supports our department's efforts, scholarships, fellowships, and research. Let me close with an invitation to sign-up for our email updates if you haven't already done so and to encourage colleagues to reach out to us to be added to our mailing list. We want to keep all of our friends and alumni abreast of the exciting developments in our department.

Wishing you a very Happy New Year,

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.

The team's analysis paves the way for better measurements in the future using telescopes from the Cherenkov Telescope Array. Image Credit: Daniel López/IAC

With the help of skyrocketing technologies, astronomers came up with measurements that differed significantly from Hubble's original calculations – slowing the expansion rate down to between 50 and 100 kilometers per second per megaparsec.

In the past decade, ultra-sophisticated instruments, such as the Planck satellite, have increased the precision of Hubble's original measurements in a relatively dramatic fashion.

In a paper titled "A New Measurement of the Hubble Constant and Matter Content of the Universe using Extragalactic Background Light-Gamma Ray Attenuation," the collaborative team compared the latest gamma-ray attenuation data from the Fermi Gamma-ray Space Telescope and Imaging Atmospheric Cherenkov Telescopes to devise their estimates from extragalactic background light models. This novel strategy led to a measurement of approximately 67.5 kilometers per second per megaparsec.

"The astronomical community is investing a very large amount of money and resources in doing precision cosmology with all the different parameters, including the Hubble Constant," said **Dieter Hartmann**, a professor in physics and astronomy. "Our understanding of these fundamental constants has defined the universe as we now know it. When our understanding of laws becomes more precise, our definition of the universe also becomes more precise, which leads to new insights and discoveries."

Gamma rays are the most energetic form of light. Extragalactic background light (EBL) is a cosmic fog composed of all the ultraviolet, visible and infrared light emitted by stars or from dust in their vicinity. When gamma rays and EBL interact, they leave an observable imprint – a gradual loss of flow – that the scientists were able to analyze in formulating their hypothesis.

A common analogy of the expansion of the universe is a balloon dotted with spots, with each spot representing a galaxy. When the balloon is blown up, the spots spread farther and farther apart. "Some theorize that the balloon will expand to a particular point in time and then re-collapse," said **Desai**, a graduate research assistant in the department of physics and astronomy.

"But the most common belief is that the universe will continue to expand until everything is so far apart there will be no more observable light. At this point, the universe will suffer a cold death. But this is nothing for us to worry about. If this happens, it will be trillions of years from now." But if the balloon analogy is accurate, what is it, exactly, that is blowing up the balloon?

"Matter – the stars, the planets, even us – is just a small fraction of the universe's overall composition," Ajello explained. "The large majority of the universe is made up of dark energy and dark matter. And we believe it is dark energy that is 'blowing up the balloon.' Dark energy is pushing things away from each other. Gravity, which attracts objects toward each other, is the stronger force at the local level,

Continued on next page

which is why some galaxies continue to collide. But at cosmic distances, dark energy is the dominant force."

The other contributing authors are lead author **Alberto Dominguez** of the Complutense University of Madrid; **Radek Wojtak** of the University of Copenhagen; **Justin Finke** of the Naval Research Laboratory in Washington, D.C.; **Kari Helgason** of the University of Iceland; **Francisco Prada** of the Instituto de Astrofisica de Andalucia; and **Vaidehi Paliya**, a former postdoctoral researcher in Ajello's group at Clemson, who is now at Deutsches Elektronen-Synchrotron in Zeuthen, Germany.

Many of the same techniques used in the current paper correlate to previous work conducted by Ajello and his counterparts. In an earlier project that appeared in the journal *Science*, Ajello and his team were able to measure all of the starlight ever emitted in the history of the universe.

"What we know is that gamma-ray photons from extragalactic sources travel in the universe toward Earth, where they can be absorbed by interacting with the photons from starlight," Ajello said. "The rate of interaction depends on the length that they travel in the universe. And the length that they travel depends on expansion. If the expansion is low, they travel a small distance. If the expansion is large, they travel a very large distance. So the amount of absorption that we measured depended very strongly on the value of the Hubble Constant. What we did was turn this around and use it to constrain the expansion rate of the universe."

(*Adapted from article by Jim Melvin, College of Science*)

Clemson to Host CUWiP Conference in 2021

Clemson University will be one of the regional hosts for the American Physical Society Conference for Undergraduate Women in Physics (CUWiP) January 15-17, 2021. The conference is open to undergraduate physics majors and seeks to educate majors on the breadth of education and career paths open to them, while providing ample opportunities for students to network with professional physicists, both in academia and industry. Along with one keynote speaker shared virtually among all thirteen participating sites, the meeting will host local talks, panel discussions and workshops on applying for summer research, graduate school and professional development.

The meeting will also include a poster session for the students to present their own work and a networking fair for them to learn about local graduate schools and industries, as well as social activities.

This last year, Clemson undergrads attended the CUWiP meeting at the University of Maryland. From left to right: Sam Hardin, Robin Conner, Morgan Merriman, Brantley Kerns, and Nicole Hardin

The first CUWiP was held in 2006 and has been growing in scope and attendance with more than 2,000 students attending last year. The 2021 meeting will be the first time that Clemson University will host this meeting. The Clemson University Department of Physics and Astronomy and the CU Women in Physics group are excited about welcoming 150 undergraduate students to campus to share this experience and to introduce them to physics and astronomy here at Clemson.

Clemson Hosts Physics Quantum Workshop for Teachers

Dr. Anthony Rizzi's textbook on Quantum Mechanics was featured in Clemson's outreach to teachers of college and high school physics.

Dr. Murray Daw of Physics and Astronomy hosted a teacher's workshop on Oct 19, 2019 on a new undergraduate quantum mechanics textbook by **Dr. Anthony Rizzi**, formerly a senior scientist on the LIGO team. The textbook is the third volume in the "Physics for Realists" series that is used as the introductory physics sequence for physics majors at Clemson. The textbook series grounds physics (even quantum mechanics) in common sense.

Twenty-six participants from colleges (and some high schools) in the region (from as far away as Texas and Virginia) listened to the day of presentations by Drs. Rizzi and Daw that included practicing explanations and role-playing for classroom implementation.

Dr. Daniel Welch, professor of physics at Wofford College opined that "this textbook builds QM on the Ensemble Interpretation in a proper way and is much more sensible than any other undergrad QM textbook. No longer do we have to say that the cat is both alive and dead, or that Elvis is alive in a parallel universe! I've known for years that this book was in the works and it is everything that I hoped for. It was very good to have these experiences with other teachers!"

Likewise, student attendees found the workshop tremendously rewarding. "My perspective of the subject has shifted from some other-worldly montage of theories to something far more real and grounded. Even the dialogues between professors were extremely enlightening, even entertaining, as a richly deep and complicated subject was discussed," said **Daniel Cole**, a Clemson undergraduate physics major who acted as a student assistant for the workshop.

Hugo Sanabria Selected to Participate in the President's Leadership Institute

Hugo Sanabria of Physics and Astronomy has been selected to participate in the President's Leadership Institute. The President's Leadership Institute is a nine-month leadership development program that is designed to support and develop professional and personal leadership within a diverse and inclusive community of faculty and staff at Clemson University. The Institute enables participants to build individual effectiveness, understand the power of critical thinking and communication, learn directly from **President Jim Clements** and embrace their own ability to lead within the Clemson community. Each cohort consists of twenty-five faculty and staff nominated by university leadership. Please join us in congratulating Hugo for being selected for the President's Leadership Institute.

Clemson Professors to Help Educate S.C. Students and Teachers about the Benefits of Learning Physics

Physics majors in Clemson University's College of Science can soon be part of an innovative program that is on the leading edge of classroom enrichment and teacher retention in high school physics and K-12 science education. Professors **Sean Brittain** and **Chad Sosolik** have been named to the second cohort of PhysTEC Fellows, a two-year program of the Physics Teacher Education Coalition, whose mission is to improve and promote the education of future physics teachers. The College of Science team is one of five chosen for this cohort to receive support to build and enhance high school physics teacher education programs. The remaining teams are from Bridgewater State University, Colgate University, the University of Texas - Rio Grande Valley and the University of Washington at Bothell.

Chad Sosolik (right) works with teachers to instill a better understanding of the value of a physics education.

"PhysTEC is an organization of the American Physical Society that is aimed at helping physics departments recruit and train physics educators," said Brittain, chair of the Department of Physics and Astronomy.

"We have a huge shortage of qualified physics teachers for high schools. Often, the teachers teaching physics are doing the best they can, but that's not their area of expertise. What we would really like is for every high school to have a person there who is passionate about teaching physics and spreading that enthusiasm to students."

Part of Brittain's mission is to change the perception of physics and let educators know how important its study can be for students.

"Our fundamental belief as physicists is that learning physics and how to think like a physicist has benefits for everybody," Brittain said. "Unfortunately, there's sort of a reputation about physics that you have to be a genius or a savant in order to major in physics or that it's only for people like you see on 'The Big Bang Theory.' Our view is that physics is for everybody and it prepares people for a wide range of jobs. Not everybody who majors in physics has to go on to grad school."

In fact, many will head to the classroom as teachers. Clemson's PhysTEC fellows aim to help them be better prepared for that career and to help those who are already teaching enhance their content knowledge and find support. A Learning Assistant program will be a big part of that effort. The hope is to begin this fall. "The Learning Assistant program is to get undergraduate physics majors into the classroom," Brittain said.

The program will help those undergraduates gain experience and confidence as they facilitate interactive programs in the classroom and work directly with students. It will benefit those serving in large introductory physics classes by providing an extra person to help with instruction.

Continued on next page

"The whole point of the program is to increase the output of students who graduate and who are certified to teach physics in South Carolina," said Sosolik, professor of physics and astronomy. "Who better to do that than the physics department? In order to do that, we have as our goal to look at the structures we have in place, which are jointly administered with the College of Education. We already discussed with them getting the bare essentials in place without making it onerous for students to get that certification." The goal is to make it easier and more streamlined for physics majors to become physics teachers, filling a need in South Carolina and across the country.

"Over several years, we have put a flexible degree option into our physics program, which about half of our majors are using right now," Sosolik said. "It has really freed up for us the ability to be creative in how we offer our elective choices. The plan is to take that flexibility and apply it to a track within our degree which basically rolls in certification for teaching. We want to certify more teachers." Brittain said the program will also offer a master teacher-in-residence opportunity for an experienced high school physics teacher who will work with students and give advice on teaching. Research Experiences for Teachers (RET) will bring teachers into the physics department to do research. And as fellows, Brittain and Sosolik will be a part of the 2020 and 2021 PhysTEC conferences and participate in video conferences to exchange ideas and updates with others in their cohort.

Sosolik said it was shocking to stand in front of a class for the first time when he was a graduate student. He came to Clemson as a researcher, but worked with Brittain to offer content education for K-12 teachers in Laurens County. "That's probably one of the most rewarding things either of us has ever done," Sosolik said. "We were teaching teachers who didn't necessarily have exposure to physics." Sosolik sees the PhysTEC fellowship as an extension of that approach – one that can have far-reaching benefit. "It really benefits the state and it benefits our department in turn, if we can actually educate the population and up-and-coming students with proper science training," he said. "It's needed for the 21st century workforce. For me to impact twenty-five or thirty majors every year, which is sort of one of our classes, that's good. But if I can send one or two of those students out every year back into classrooms where they're connecting with hundreds and hundreds of students throughout their entire career, at least getting them exposed to physics, I think that's better for South Carolina."

Ultimately, the physics majors they inspire to become teachers may inspire their students to major in physics and even come to Clemson University. "There's going to be a long fuse to that process," Sosolik said. "We realize it may take some time to reap extra benefits here, but that's OK because we're going to help South Carolina now."

(*Adapted from article by Chris Worthy, Special to the College of Science*)

Feng Ding's Research Highlighted in *Nature*

Professor Feng Ding, (pictured standing) a professor of computational biophysics at Clemson, published a paper in the August 25, 2019 edition of *Nature Communications* titled "Inhibition of amyloid beta toxicity in zebrafish with a chaperone-gold nanoparticle dual strategy." Ding's lab describes the use of casein coated-gold nanoparticles to eliminate the toxicity of amyloid beta in a zebra fish. Amyloid beta is associated with various neurodegenerative disorders in humans such as Alzheimer's disease. We extend our congratulations to Dr. Ding on his publication.

Dr. Deng's new research has been published in *Nature*.

Emil Alexov Selected as New Clemson School of Health Research Faculty Fellow

Dr. Emil Alexov (center) was named the CUSHR fellow for the summer and fall of 2019.

Dr. Emil Alexov was awarded the Clemson University School of Health Research (CUSHR) fellowship for the summer and fall semesters of 2019.The goal of the fellowship is to develop the research relationship between Clemson University and Prisma Health and to build the health research agendas for both institutions.

His partner at Prisma Health is **Dr. William Hand**, an anesthesiology specialist at Greenville Memorial Hospital who cooperates with many other doctors and specialists in the Prisma Health University Medical Group.

Drs. Alexov and Hand's collaboration focuses on opioid addiction. Opioid medications are useful for treating acute pain; however, over the past two decades, their use has been liberalized and their addictive potential has been underestimated. This has resulted in approximately 116 million people with opioid-prescription dependency. Opioid addiction comes in many forms, but a non-trivial portion are first prescribed opioid-based pain medicine after surgery. Several recent studies have estimated between 5-10% of patients will demonstrate persistent opioid use after low-risk surgery.

One such example has been confirmed on the campus at Greenville Hospital System (GHS). A retrospective analysis of patients having laparoscopic cholecystectomy (a low-risk surgery with minimal postoperative pain) showed ~5% of patients with an active opioid prescription six months after surgery (opioid naïve patients before surgery). While there are various causes of this persistent use (addiction), including clinical care decisions, social risk factors, and genetic predisposition, this proposal focuses on the last one - the genetic component of opioid addiction.

Dr. Alexov and Dr. Hand will use the existing patient records at GHS to recruit two cohorts: one of patients who had active prescriptions for opioids (addicted) and another who did not, despite both cohorts originally receiving opioid-based pain medicine after surgery. Samples provided by these individuals will be subjected to Whole Genome Sequencing (WGS), in order to target genes and variants that are known to be associated with opioid addiction. As mentioned previously, opioid addiction is a complex disease resulting from variants in multiple genes with relatively small effects, along with environmental and developmental factors. Thus, a genetic variant found in a given subset of an addicted population may not be found in an addicted population of a different background.

To avoid the aforementioned difficulties, they will attempt to match patients in each cohort to be of similar background (age, gender, race, ethnics) and surgical procedure, all of whom were prescribed the same oral opioid analgesic. This will allow them to better identify a genetic component of addiction. Once the known variants are confirmed in the cohort of addicted patients and new ones identified in the same genes, they will perform a biophysics analysis to reveal mechanistic roles of these variants. Such an analysis will identify what is the major mechanistic effect for given gene/variants that likely influence vulnerability to addiction.

Continued on next page

The outcome of the study will be used to develop an algorithm that (given a patient variant in these opioid addiction-linked genes) can predict the addiction risk with respect to specific opioid medications and to possibly select the drug with lowest risk for addiction.

Their collaboration focuses on translating laboratory science to clinical medicine, with the intent of developing a series of molecular assays related to common drugs used in the practice of clinical medicine. The potential of such research is significant, since it can offer a preventive measure to patients before they are given anesthesia. As mentioned before, opioid addiction is a complex disease, originating from many factors and, most probably, has a complex genetic signature. However, while the genetic component may be unique for each individual, the molecular mechanism associated with addiction should be following a common trend. This is the main focus of this research: to identify what are the common mechanisms causing addition. The advantage of such an approach is that novel genetic variants, not seen in other patients, can be classified as either neutral (not disease-causing) or causal (causing elevated risk of addition). This will be done by mapping genetic variants onto the structure of the corresponding proteins and protein-DNA complexes and using physics-based methods to assess the effects of mutations on thermodynamic properties of biological macromolecules.

John Meriwether Elected Fellow of American Geophysical Union

John Meriwether, professor emeritus of physics and astronomy in the College of Science, has been elected a fellow of the American Geophysical Union (AGU), which boasts more than 62,000 members from 144 countries.

P&A emeritus professor John Meriwether has been selected as a fellow of the American Geophysical Union.

Meriwether was one of 62 fellows in the AGU's Class of 2019. The organization hosts international conferences, publishes twenty-one highly regarded global journals and promotes science by helping to communicate how science improves the lives of people, the well-being of communities, and the health of our planet. "I have had several great mentors in my career trajectory, as well as wonderful colleagues and students whom I have had the good fortune to collaborate with, so much credit goes to them," said Meriwether, who retired in July 2018. "AGU is a wonderful professional society with huge numbers of men and women members who serve their professions with high dedication, whether glaciology, geology, hydrology, seismology, tectonics, and aeronomy/space physics – my field – to name a few. As a group we are probably the most experienced world travelers, because we need to go where the science is, whether polar, equatorial or mid-latitudes."

Meriwether's research focuses on the study of atmospheric dynamics with ground-based remote sensing techniques that can observe the winds, temperature and density of the upper atmosphere. This area is an important part of the disciplinary topic called aeronomy (physics and chemistry of the upper atmosphere).

"Dr. Meriwether is one of the world's leading experts on the study of the upper atmosphere," said **Sean Brittain**, chair of the Department of Physics and Astronomy. "We are delighted to learn of this well-deserved recognition of his excellent research."

(Article by College of Science)

The Clemson Young Alumni Council Has Recognized Ramakrishna Podila with the Roaring10 Award

Ramakrishna Podila has been honored as an influential graduate of the University.

Each year, the Clemson Young Alumni Council names ten alumni to its "Roaring 10," recognizing outstanding young alumni for their influence in business, leadership, community, education and philanthropic endeavors. The honor is given to individuals who exemplify Clemson University's core values of honesty, integrity and respect and who have graduated from Clemson within the last ten years. **Ramakrishna Podila** of Physics and Astronomy has been recognized with this award.

Podila graduated from Clemson University with his Ph.D. in 2011 and is an assistant professor in the Clemson physics and astronomy department. He is a tenure-track faculty member with a postdoctoral focus on biochemistry and the investigation of the physiological response to engineered nanomaterials. In his career, Podila has authored more than 60 original peer-reviewed publications in high-impact journals and holds two patents on novel roll-to-roll production for nano-based supercapacitors and self-powered wireless sensors. He has helped to establish the Clemson Nanomaterials Institute, serves as the lead organizer of the annual "Nano Day" at Roper Mountain Science Center and was recently selected as a "Faculty Fellow" by **His Holiness Dalai Lama** to teach physics for Buddhist monks. At Clemson Podila has helped bring new courses to life, such as electrochemistry and methods of spectroscopy.

The 2019 Roaring10 class was honored by the Clemson Alumni Association and the Clemson Young Alumni Council at a ceremony on October 11, 2019 at the Madren Conference Center on Clemson's campus. The Roaring10 award program was developed in 2012 by the Clemson Young Alumni Council. The primary mission of Clemson Young Alumni Council is to support the goals of the Clemson Alumni Association specifically on matters pertaining to young alumni. The Council exists to connect young alumni with the university, assist young alumni in the transition from active student to alumnus, to facilitate fellowship, personal growth and professional development opportunities for young alumni, and to formally represent young alumni interests to the Clemson Alumni Council. The purpose of these efforts is to effect seminal influence on young alumni, so they may continue to be connected and contributing alumni for a better Clemson throughout their lives. To learn more, please visit alumni.clemson.edu/roaring10.

As a nano-biophysics scientist with formal training in physics, Podila actively leads the establishment and development of research programs in biomedical applications of nanomaterials at Clemson. He and his research group are transforming healthcare with the development of smartphone-based nano-biosensors, which facilitate rapid diagnosis without long waiting times.

His lab is also developing new multiphoton probes based on ZnO nanoparticles for cancer imaging. Lastly, his lab is also identifying fundamental mechanisms of nanotoxicity to alleviate adverse physiological response and make personalized nanomedicine a reality.

(*Adapted from Clemson Media Release*)

Clemson Physics Grad Matthew Troutman Named Head of the Thomas Jefferson School

The Thomas Jefferson School in Sunset Hills, Missouri has named **Matthew Troutman** as its fifth head of the institution. Troutman's new leadership begins on July 1, 2020.

Clemson grad Matthew Troutman to head the Thomas Jefferson School.

Troutman is already a well-established member of the Thomas Jefferson community, having served on the faculty since 2011. The Thomas Jefferson School is a co-educational, non-sectarian, independent day and boarding school located in suburban St. Louis, and it educates a diverse and deliberately-sized group of academically talented students from seventh to twelfth grade.

Troutman earned a B.S. in physics from Roanoke College, an M.S. and a Ph.D. in physics from Clemson University, and an M.Ed. from the Klingenstein Center for Independent School Leadership at Teachers College at Columbia University.

In addition to his current position as director of teaching and learning, Troutman has served as associate director of academics, chair of the mathematics department, and assistant college counselor. He also serves on the school's committee on diversity, inclusion, equity, and social justice; the admissions and enrollment committee; the student travel committee; and previously represented Thomas Jefferson for the Independent Schools of St. Louis' committee on professional development. Kudos this great Clemson grad!

Xingchen (Dawn) Shen is a visiting Ph.D. student who has worked in **Dr. Jian He's** group since September 2018. Shen was awarded the International Society of Thermoelectrics 2019 Summer Fellowship Award (with a cash prize of $5,000). She will continue her research in Dr. He's lab through April 2020 and then defend her Ph.D. thesis at Chongqing University, China.

Senior **Daniel Fox** (front row, first from left) is the recipient of the College of Science *Outstanding Senior in Science Award* for 2019.

Fox has been working in **Dr. Joan Marler** and **Dr. Jian He's** labs for one and two years, respectively and is pursuing a master's degree in materials science and engineering.

The Clemson University Physics and Astronomy Newsletter

118 Kinard Laboratory
Box 340978
Clemson, SC 29634-0978

Tel: (864) 636-3416
Fax: (864) 656-0805
E-mail: sbritt@clemson.edu

CLEMSON
PHYSICS AND ASTRONOMY

Nonprofit Organization
U.S. POSTAGE PAID
Clemson, S.C.
Permit No. 10

Department News

Daniel Thompson, the lab coordinator, and his wife Heather welcomed a new baby girl, Naomi Ruth to their family on November 19, 2019 at 2:52 a.m. In addition to Naomi Ruth, Daniel and Heather have a son, Micah, age 5. Congratulations to the Thompson family!

Clemson's astrophysics group has had a long tradition of visiting Nick's, the downtown watering hole. This past summer, they were joined by **Dr. Mounib El Eid**, a new adjunct professor with the department and full-time professor of physics and astronomy at the American University in Beirut, Lebanon.

Pictured left to right: Drs. Mark Leising, Dieter Hartmann, Mounib El Eid, Brad Meyer and Jason Brown.

To subscribe or unsubscribe to *Schrödinger's Tiger*, please go to our mail list at:
https://lists.clemson.edu/mailman/listinfo/panda-newsletter

We're on the Web!
http://www.clemson.edu/science/departments/physics-astro/