

# Quanta

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A publication for the faculty, staff, students, alumni, emeriti & friends of the  
Department of Physics at Virginia Tech

## Message from the Chair:



It is a pleasure to sit down near the end of the year and write this message. The only challenging part is that with so many talented, energetic people in the department and so many things going on, it is difficult to keep it to a single page!

This year has seen many accolades come our faculty's way. They are covered in more detail in this issue, but here I hit some highlights. At the beginning of the year, Professors Djordje Minic and Tatsu Takeuchi shared the Buchalter Cosmology Prize from the American Astronomical Society. In March, I was pleased to join College of Science Dean Morton and Assistant Dean of Advancement Wade Stokes at a luncheon in Richmond where it was announced that Professor Leo Piilonen was the recipient of one of this year's State Council of Higher Education for Virginia's Outstanding Faculty Awards. The award is the state's highest honor for faculty, and it recognizes commitment to excellence in teaching, research, knowledge integration, and public service. Leo was a double award winner this year. He also received the Alumni Award for Excellence in Research, which was presented by President Sands in a University event at the Moss Arts Center in May. In the spring, we found out that Professor Ed Barnes was the recipient of a National Science Foundation early CAREER award. In August, we were pleased to learn that three of our faculty members – Professors Sophia Economou, Patrick Huber, and Giti Khodaparast – were honored with faculty fellowships. Patrick was also honored this year as an American Physical Society Fellow.

The department continues to enjoy having distinguished speakers on campus supported by the generosity of Mark Sowers, a long-time supporter of the department and College of Science. This year, the J. Mark Sowers Distinguished Lecture Series brought Nobel Prize winner Professor Gerard 't Hooft to campus in September for a visit. Our faculty and students had enjoyable meals and meetings with him, and he gave a public lecture on "Gravitation and Black Holes in the Sub-Atomic World" that was attended by about 500 people.

The department benefits greatly from the generosity of many donors. We got to help celebrate with one of them in March as a 1950 graduate of our department, William E. Hassinger, celebrated his 90th birthday. Jenny Orzolek of the College of Science arranged a luncheon in Greensboro, North Carolina for Bill, and it was attended by several of our students and faculty who have benefitted from his generosity through student scholarships and faculty fellowships. We all had a great time chatting with him about his remarkable memories of his time here at Virginia Tech and his life and career since then. You can read more about two of the faculty fellowships he supports in this issue.

We welcomed two new faculty members this year. You can read more about Dr. Ian Shoemaker and Dr. Nadir Kaplan in this issue. Among students, we continue to have a thriving undergraduate and graduate student population. This year we had a total of 52 students receive the BS or BA degree, 2 received Masters, and 15 received Ph.D. degrees. You can read about honors for our students in this issue.

In staff news, we welcomed three new staff members – Savannah Haynes, Lorrie Mitchell, and Will Clark, who returns to us after having been a student here. In May, I was pleased to be in the audience as our own Diane Walker-Green, Director of Undergraduate Advising and Enrollment Management, received the President's Award for Excellence from President Sands, her second time receiving this award. Certainly this comes as no surprise to the legions of students that Diane has helped over the years!

I hope you enjoy this newsletter. Feel free to drop me a line or even better, should you be in Blacksburg come and see me in Robeson Hall. It would be great to catch up and introduce you to new arrivals since you left.

Happy Holidays!

## IN THIS ISSUE:

Faculty News p. 2

New Faculty p. 10

Student News p. 11

New Research  
Faculty p. 13

New Staff p. 14

In Short p. 14

COLLEGE OF SCIENCE



## **Giti Khodaparast, Sophia Economou receive fellowship from alumnus William Hassinger**

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Virginia Tech College of Science faculty members Sophia Economou and Giti Khodaparast have each been awarded a fellowship to support their efforts in research and teaching.

Funded by Virginia Tech alumnus William E. Hassinger Jr. '50, the awards were approved at the Aug. 25-26 meeting of the Board of Visitors.

The L.C. Hassinger Faculty Fellowship was created and named in honor of William Hassinger's grandfather. The three-year grant provides support for an outstanding faculty member who holds the rank of associate or full professor, and whose work in the field of nanoscience supports the missions of the college's Academy of Integrated Science (AIS). Recipients are nominated by the College of Science Dean Sally C. Morton with support from the Hassinger Faculty Fellowship selection committee, composed of AIS faculty members with expertise in nanoscience, and AIS director Michel Pleimling.

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The William E. Hassinger Jr. Senior Faculty Fellowship in Physics was established in 2007 by Hassinger to enhance the national and international prominence of Virginia Tech's Department of Physics. The three-year grant supports the teaching and research of a tenured faculty member of the physics department. Recipients are likewise nominated by Morton, concurring with the recommendation of a selection committee convened in the physics department and of the College of Science Honorifics Committee.

### **L. C. Hassinger Faculty Fellowship**

A professor of physics, Khodaparast's research focuses on understanding the quantum states and charge/spin dynamics in low-dimensional systems. Her work has been supported by the National Science Foundation (NSF) and the U.S. Air Force Office of Scientific Research, the latter for a long-lasting and strong collaboration with the University of Florida, Texas A&M, and the University of Colorado Boulder on electro-optic and magneto-electric materials.

She is a core member of the nanoscience degree program and served on the committee that developed this innovative new degree program, one of only two of its kind in the United States. As part of her teaching efforts, she has mentored 27 undergraduate students, majoring either in physics or in nanoscience, and eight graduate students on various research projects.

Among her numerous awards are the 2018 International Association of Advanced Materials Certificate and the March 2016 Woman Physicist of the Month award from the American Physical Society's Committee on the Status of Women in Physics. A member of the National Research Council since 2014, she organized an international conference on narrow gap semiconductors at Virginia Tech in 2011, and co-led the 2017 American Physical Society Conference for Undergraduate Women in Physics, hosted by Virginia Tech for the first time. She has collaborations with national and international user facilities such as the National High Magnetic Field in Florida and the Megagauss Laboratory in Japan.

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**William E. Hassinger Jr. Senior Faculty Fellowship in Physics**

An associate professor of physics, Economou focuses her research on theoretical quantum information science, a widely popular field of science due to the technological revolution it could bring to communications and computing. She leads an active research group with seven graduate students and six postdoctoral fellows. She has created two new courses in quantum information technologies and quantum optics for undergraduate and graduate students.

Economou has played a key role in establishing a quantum information science program at Virginia Tech. Her research has been recognized with substantial funding. Since coming to Virginia Tech in 2015, she has been lead or colead investigator on 13 grants with a personal share of \$2.8 million from a variety of agencies including the NSF, the U.S. Department of Energy, the U.S. Army Research Office, and the Defense Advanced Projects Research Agency (DARPA).

She is the primary researcher on five of these grants, including two competitively solicited calls from the NSF: a \$2 million "Emerging Frontiers in Research and Innovation" grant on quantum communications, and a \$1 million "Research Advanced by Interdisciplinary Science and Engineering" grant on quantum simulation of chemical systems.

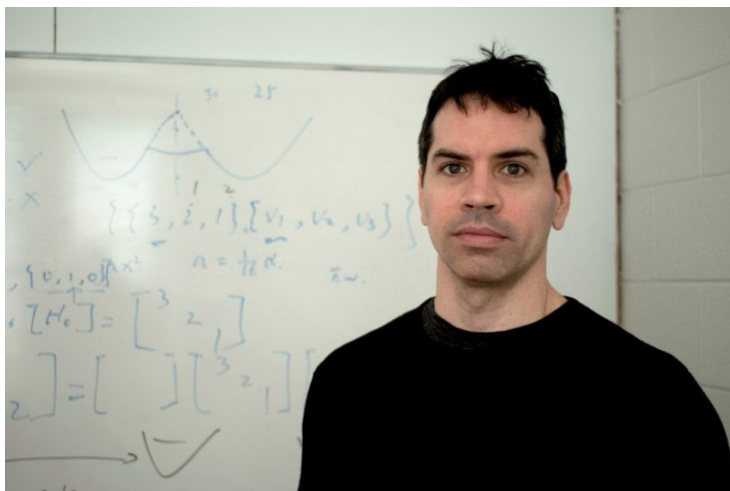
She has 52 publications in peer reviewed journals and 25 invited or keynote presentations at professional conferences. Her publications have garnered 1,900 citations to date. In 2017, she was the lead organizer of a NSF-sponsored Quantum Leap Workshop on Quantum Elements of Secure Communication held in Arlington, Virginia.



William E. Hassinger Jr.

## Physics' Ed Barnes to develop mathematical models for research into exotic topological materials

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Ed Barnes of the Virginia Tech Department of Physics will use a National Science Foundation CAREER grant to create mathematical models that will help scientists understand how electrical currents flow in special compounds that possess an exotic property known as topology.

The \$494,000 five-year grant will allow Barnes, an assistant professor in the Virginia Tech College of Science, to build a new mathematical framework that can be used to predict how currents induced by light or magnetic fields will flow in topological materials. The CAREER grant is considered the National Science Foundation's most prestigious award, given to creative junior faculty likely considered to become academic leaders of the future.

One class of these compounds, known as transition metal dichalcogenides, can form amazingly thin sheets only one-atom thick. This fact, along with the compound's topological properties, allows them to strongly absorb light and convert it into electrical currents, making them ideal for potential use in solar panels and other photo-electric technologies, such as fire alarms. But any breakthroughs are years off.

"Understanding how this process works in detail is challenging with existing mathematical techniques, which is my motivation to seek new approaches to study these compounds, which have such great potential for energy conversion," Barnes said.

Barnes will also look at two other types of topological materials, known as topological insulators and Weyl semimetals, the latter named after German mathematician and theoretical physicist Hermann Weyl.

In these materials, electrical currents are able to flow with little resistance across the surface of the material due to topology. This feature offers the possibility of a new wave of electronics that require significantly less power to operate, reducing heating and energy consumption. Barnes seeks to understand how magnetic fields can be used to control the flow of currents in these materials and how impurities in the material might disrupt the benefits of topology.

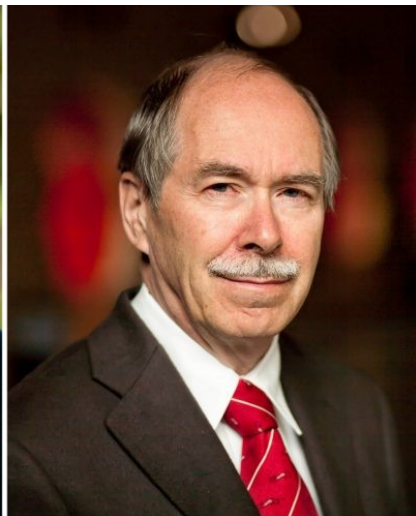
With new topological materials that can easily absorb light and carry currents, the impact on electronics, from cell phones to computers, could be great. Especially in the realm of energy conservation.

"Making these technologies a reality requires a deep understanding of their rich physics," Barnes said in his NSF proposal. "The goal of this project is to develop new theoretical techniques that can be used to make accurate predictions about the behavior of currents in these materials in the presence of applied electric fields, magnetic fields, or lasers. These predictions could then be used to guide further progress toward new experiments, technological applications, and advances in our fundamental understanding of topological materials and materials more generally."

Working with Barnes will be physics graduate students Kuangyin Deng from Chongqing, China, and Arian Vezvaei from Tehran, Iran.

## College of Science presenting two 2019 Sowers Lecture Series events on game theory and black holes

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The Virginia Tech College of Science is presenting two J. Mark Sowers Distinguished Lecture Series events this month with Colin Camerer speaking about game theory and its use in the sciences and Gerard 't Hooft discussing gravity and black holes in the subatomic world.

Camerer is the Robert Kirby Professor of Behavioral Economics, the T&C Chen Center for Social and Decision Neuroscience leadership chair, and director of the T&C Chen Center for Social and Decision Neuroscience at Caltech. He is considered a pioneer in behavioral economics and neuroeconomics, with his research focusing on how psychological forces and their deeper

neuroscientific foundations influence economic decisions involving individuals and markets. He is a past president of the Society for Neuroeconomics, serving 2005 to 2006; was named a MacArthur Fellow in 2013; and is author of the book "Behavioral Game Theory: Experiments in Strategic Interaction." His talk will focus on "Game theory in the laboratory, field, and in the brain." It will take place at 7:30 p.m. Sept. 12 at the Graduate Life Center Auditorium on the Virginia Tech campus.

A co-winner of the 1999 Nobel Prize in Physics, 't Hooft is a Dutch theoretical physicist and professor at Utrecht University in The Netherlands. His Nobel came for his work in "elucidating the quantum structure of electroweak interactions," or two of the known fundamental interactions of nature.

"All experimental observations and theoretical reconstructions point towards one well accepted picture of the sub-atomic world: there are three types of particles, united in the Standard Model," 't Hooft said. "This model is clean and logically coherent. In contrast, gravitational forces acting on individual particles are far too weak to observe, and a completely consistent theoretical description of these is not known. Even more mysterious is the question what role the tiniest possible black holes should play in the world of the elementary particles. Wild speculations abound, but we are making progress." His talk will focus on that progress. His talk will take place at 7:30 p.m. Sept. 16, also at the Graduate Life Center Auditorium.

Both lectures are free and open to the public. No RSVP is needed.

The Sowers lecture series launched in 2017 with debut speaker Professor David Reitze, physicist and executive director of the Laser Interferometer Gravitational-Wave Observatory Project at California Institute of Technology. Since then, eight other renowned scientists, including Steven Strogatz of Cornell University, have visited Virginia Tech to share innovative ideas in scientific fields. The lecture series is funded by Sowers, a Richmond, Virginia-based businessman and long-time supporter of the College of Science, and his wife, Debi. "I hope that people will be inspired by the lecture series and to bring attention to Virginia Tech and its brilliant researchers for the advancement of fundamental physics," Sowers has said of the events.

Additional speakers for 2019 include: Geraldine Richmond, presidential chair in science with the University of Oregon's Department of Chemistry, who will speak on Oct. 24. A programming committee for the series is composed of faculty from across the College of Science.



## Two College of Science faculty members receive 2019 SCHEV Outstanding Faculty Award

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Sterling Nesbitt, an assistant professor with the Department of Geosciences, and Leo Piilonen, a professor with the Department of Physics, are recipients of the State Council of Higher Education for Virginia's 2019 Outstanding Faculty Awards. The award is the commonwealth's highest honor for faculty at Virginia's public and private colleges and universities, recognizing commitment to excellence in teaching, research, knowledge integration, and public service. Since 1987, 33 Virginia Tech faculty members have received the award from the State Council of Higher Education for Virginia (SCHEV). Nominees are selected by the institutions, reviewed by a panel of peers, and chosen by a committee of leaders from both public and private sectors. In all, 86 nominations were submitted this year, with a total of 13 recipients selected, according to SCHEV. Piilonen and Nesbitt, each part of the Virginia Tech College of Science, will be honored at a luncheon March 7 at The Jefferson Hotel in Richmond.

### Leo Piilonen

A member of the Department of Physics for 31 years, Piilonen said he is "inspired by the quest to discover the rules of the natural world and the opportunity to convey this love of physics to his students." Raised in a small Canadian village with a one-room cabin schoolhouse until he was in junior high, Piilonen would later earn a bachelor's in physics from the University of Toronto in 1978 and a Ph.D. in physics from Princeton University in 1985. He joined Virginia Tech in 1987, later serving as chair of the Department of Physics from 2012 to 2015. Since the late 1990s, his research has been carried out with the Belle and Belle II detectors, highly detailed "digital cameras" that observe the byproducts of the energetic collisions produced by the SuperKEKB particle accelerator in Tsukuba, Japan. He is co-author of more than 500 peer-reviewed papers and is a Fellow of the American Physical Society, and was a recipient of the 2016 Breakthrough Prize in Fundamental Physics. He has won multiple university awards for teaching – including the William E. Wine Award, the university's highest teaching honor – and for his efforts in access and inclusion for students with disabilities. "In his over three decades at Virginia Tech, Leo has been a consummate faculty member, consistently achieving excellence in all aspects of the faculty mission," said Mark Pitt, chair of the Department of Physics. "We are lucky to have him on our faculty and grateful to SCHEV for this recognition he so richly deserves."

## Six College of Science faculty receive fellowships from Board of Visitors to support research

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Six faculty members in the Virginia Tech College of Science were honored with faculty fellowships by the Virginia Tech Board of Visitors.

The awards were approved at the August meeting of the Board of Visitors. Each of the three-year fellowships is dedicated to recognizing faculty for extraordinary research and teaching, and for recruiting scholars with exceptional records of achievement. All recipients were nominated by College of Science Dean Sally C. Morton and the College of Science Honorifics Committee.

“Our nationally renowned faculty are working every day to address problems that challenge our society, and they bring visibility and recognition to Virginia Tech,” said Sally C. Morton, dean of the College of Science. “It’s my privilege to award these fellowships, which wouldn’t be possible without the alumni who support us.”

### Roger Moore and Mojdeh Khatam-Moore Faculty Fellowship

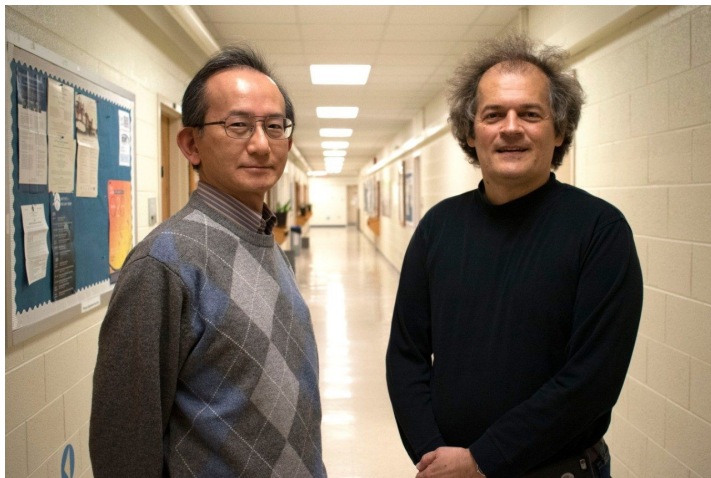
The Roger Moore and Mojdeh Khatam-Moore Faculty Fellowship was established in 2019 by a donation from its namesakes, Roger Moore '64 and his wife, Mojdeh Khatam-Moore.

Patrick Huber, a professor in the Department of Physics, focuses on neutrino physics. Since joining Virginia Tech in 2008 Huber has helped to build a world-leading program in neutrino physics, both in basic science and in global and national security. As part of the Center for Neutrino Physics at Virginia Tech, Huber co-authored the Light Sterile Neutrino White Paper, which has since received more than 600 citations and eventually paved the way for the Intermediate Neutrino Program, which led to the PROSPECT experiment. Additionally, the GLoBES software package that he co-developed is the standard for computing the physics sensitivity of many large neutrino experiments.

Huber is the director of the Center for Neutrino Physics and was named director of the Integrated Security Education and Research Center in 2017. His research has received more than \$2 million in federal funding. His many awards include the Fermilab Distinguished Scholarship and the Breakthrough Prize in Fundamental Physics, both in 2016. He earned a bachelor’s degree in general physics in 2000 and a Ph.D. in theoretical particle physics in 2003, both from Technical University Munich.

## Physics Researchers Win Cosmology Prize for Research About Dark Matter and Dark Energy

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Two Virginia Tech Department of Physics researchers recently won a Buchalter Cosmology Prize from the American Astronomical Society for a new paper that tackles the puzzles of dark matter and dark energy, the two mysterious components of the universe that respectively comprise about 26 percent and 69 percent of the content of the universe.

Physics Professor Djordje Minic and Associate Professor Tatsu Takeuchi, both in the Virginia Tech College of Science, won second place for their paper, “Modified Dark Matter: Relating Dark Energy, Dark Matter and Baryonic Matter.” It introduces a new model called modified dark matter, which postulates that the ratio of ordinary matter to dark matter

is governed by dark energy. (That remaining 5 percent of the universe’s makeup? That’s everything we can see.)

“The hypothesized dark matter is completely shrouded in mystery,” Minic said. “Dark matter cannot be observed electromagnetically and hence the term ‘dark’ as opposed to the familiar visible matter, also known as baryonic matter,” he added. “However, dark matter makes its presence known unambiguously via gravitational effects at different length scales.

“Suggestions that the abundances of baryonic and dark matter at the galactic scale may be related via an acceleration scale set by dark energy has been made previously. What is new in our model is that we are extending that premise to all scales, to the scale of galaxy clusters, and even to the cosmological scale,” Minic said. “And we are supporting this hypothesis with a careful analysis of astronomical data.”

The judging committee recognized the publication as “an imaginative and courageous paper that proposes new ideas to address long unresolved fundamental questions” in the study of the universe’s origin.

The five-member team behind the paper has more Hokie connections than Minic and Takeuchi, with Doug Edmonds, a Ph.D. graduate from the Department of Physics, and former Virginia Tech faculty member Duncan Farrah – now at the University of Hawaii. Rounding out the team is Jack Ng, a professor at the University of North Carolina at Chapel Hill and a regular collaborator of the Virginia Tech group.

“We’re seeking an understanding of dark matter that goes beyond the current view of dark matter as some unknown particle,” Minic said. “I also expect that our research will one day provide a better understanding of quantum gravity – a unification of quantum theory and Albert Einstein’s theory of gravity. We also hope to see our work on modified dark matter more closely related to many new and detailed astronomical observations.”

Takeuchi added, “In five years, we not only will have more astronomical data in addition to the already vast database of existing data, but also a better idea of how to process that data in order to extract more information about the properties of dark matter. Whether our findings are surprising or mundane, we expect to gain a deeper understanding of what kind of dark matter is really out there.”

The prize was announced at the 233rd meeting of the American Astronomical Society (AAS), a major organization of professional astronomers in North America. The award is named for astrophysicist-turned-businessman Ari Buchalter, who founded the information technology firm Intersection Co. It honors “new ideas or discoveries that have the potential to produce a breakthrough advance in our understanding of the origin, structure, and evolution of the universe beyond current standard cosmological models,” according to the AAS.

Written by Steven Mackay

VT News April 29, 2019



## American Physical Society names Physics' Patrick Huber as Fellow

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The American Physical Society has elected Professor Patrick Huber of the Virginia Tech Department of Physics as a 2019 Fellow.

The fellowship program recognizes members who have made exceptional contributions to physics research, the applications of physics, leadership in or service to the field, or significant contributions to physics education, according to the society's website. Each year, no more than one half of 1 percent of the society membership is recognized as a Fellow. Huber is one of 168 physicists to be recognized in 2019.

Huber, a member of the Virginia Tech College of Science faculty, was honored for his "helping shape the U.S. and global experimental neutrino oscillation program through contributions to the phenomenology of long-baseline neutrino oscillations and the development of the GLoBES software package and for seminal work on reactor neutrino science and its use in nuclear security."

Huber recently was honored with a Roger Moore and Mojdeh Khatam-Moore Faculty Fellowship by the Virginia Tech Board of Visitors.

Since joining Virginia Tech in 2008, he has helped build the college's neutrino physics program, both in basic science and in global and national security. He is director of the Center for Neutrino Physics and has served as chair of the Department of Physics and director of the Integrated Security Education and Research Center from 2017 to 2019. His research has received more than \$2 million in federal funding. His other awards include the Fermilab Distinguished Scholarship and the Breakthrough Prize in Fundamental Physics, both in 2016.

Huber brings to five the total number of current Department of Physics faculty who are American Physical Society Fellows. The others are Leo Piilonen, Michel Pleimling, Uwe Tauber, and Bruce Vogelaar.

## Welcome Our New Faculty Members

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**Ian Shoemaker** joined us as an assistant professor in January 2019. He is a theoretical particle physicist who is a member of our Center for Neutrino Physics. Before arriving at Virginia Tech, Ian was an assistant professor in the Department of Physics at the University of South Dakota. His research focuses on the physics of dark matter and neutrinos, two aspects of the real world where “our standard theory of particle physics fails”, as Ian says. Ian has also held postdoctoral positions at Los Alamos National Laboratory, at the CP-3 Origins Center of the University of Southern Denmark, and Penn State University. He earned a bachelor’s degree from Brandeis University and a doctorate from UCLA, both in physics.



**Nadir Kaplan** joined us as an assistant professor in August 2019. He is a theoretical condensed matter physicist who is a member of our Center for Soft Matter and Biological Physics. Before arriving at Virginia Tech, Nadir was a postdoctoral research associate at Harvard University. His research uses theory and computation to elucidate the interplay between the material composition, dynamics, form, and emergent function in living systems and their synthetic analogs. He has established a Biological and Bioinspired Materials Theory Lab in our department. Nadir earned a bachelor’s degree in engineering physics from Istanbul Technical University in Turkey and a doctorate in physics from Brandeis University.

## Junior Julie Nguyen wins best poster award at CUWiP 2019

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Junior physics major **Julie Nguyen** won a best poster award at the 2019 Conference for Undergraduate Women in Physics (CUWiP) at the College of William and Mary. Her poster was titled "Phase transitions in DMPC/DSPC mixtures". Congratulations, Julie!



### Applause, Applause!

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-Congratulations to our Society of Physics Students chapter (advisor Alma Robinson and 2018-19 President Erika Birnbaum) for being named an Outstanding SPS Chapter for 2018 – 19.

-Graduate students Rebekah Pestes and Zachary Stottler were both recipients of Department of Energy Office of Science Graduate Student Research Awards.

-Undergraduate student Ada Morral was a recipient of a Clare Booth Luce Summer Research Fellowship.

-Graduate students Shadisadat Esmaili and Bart Brown along with Professor Michel Pleimling were featured in Physical Review E Kaleidoscope.

### Awards Day

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On Friday, April 5, 2019, the department held its annual awards day luncheon. Awards and scholarships were presented to students in honor of their academic excellence in undergraduate and graduate studies. We are grateful to the generous donors who make these awards and scholarships possible for our students.

## Cadet Brett Smith named a national ROTC Student of the Year

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Cadet Brett Smith has wanted to be a fighter pilot for the U.S. Air Force for as long as he can remember. Smith, a Virginia Tech Corps of Cadets senior majoring in physics through the Virginia Tech Honors College with minors in mathematics and leadership studies, comes from an Air Force family. His mother is a retired chief master sergeant who worked as a chaplain's assistant. His father, a retired senior master sergeant, was a jet propulsion expert who worked on aircraft. Smith grew up admiring the Air Force's jets and their pilots. "From the outside looking in, it's the best community in the Air Force," Smith said. "I want to be

part of that community because it's tight-knit and offers a lot of opportunity for mentorship. Plus, the impact you have on the Air Force's mission is unparalleled." During his four years at Virginia Tech, Smith has taken advantage of opportunities to travel abroad, to expand his leadership skills, and to give back to his community. This month, Smith was named one of two national Navy Federal Credit Union ROTC All-American Scholarship winners who tied for Students of the Year. The competition showcases the pillars of the ROTC program: leadership, military excellence, scholarship, and service. The honor comes with a \$6,500 scholarship for Smith and a \$7,500 enrichment donation for Virginia Tech's ROTC programs, and Smith will be recognized during the Military Bowl, featuring the Hokies vs. Cincinnati, on Dec. 31. Col. Eric Dorminey, professor of aerospace studies and head of Virginia Tech's Air Force ROTC Detachment 875, said Smith takes advantage of leadership training offered by his ROTC and the corps like few others. "He has tried a variety of leadership techniques within both organizations, and in most cases he has succeeded," Dorminey said. "Most impressively, however, is that in the cases that he has failed, he has picked himself up, dusted himself off, and pressed forward, emerging wiser and more effective than before. In my mind, this is what makes him stand out from his peers." During the fall semester, Smith commanded the corps' Golf Company, overseeing a unit of 85 students, including 28 first-year cadets. The corps' 13 company commanders also serve as resident advisors, responsible 24/7 for the health and well-being of their cadets. The most important lesson he learned is the importance of compassion. "You have to be compassionate about your people. You have to be their advocate, and you have to build trust," he said. This spring, Smith will be the cadet wing commander for the Air Force ROTC. It's the top position a student can hold, responsible for 275 ROTC students. His tasks will include preparing sophomores for summer field training — the summer leadership evaluation course attended by all Air Force cadets between their sophomore and junior years — and preparing seniors for commissioning. Smith himself is a distinguished graduate of summer field training, a designation given to the top 10 percent of cadets. He also earned recommendations to serve as a cadet training assistant in future summers. He has traveled to France to study the Allied invasion of Normandy during World War II with the corps' Global Scholars Program, and he traveled to Panama through Olmsted Cadet Travel and Cultural Immersion Program, designed to help prepare future military officers for international assignment. He continues to be an active volunteer for community service projects with the corps and the Air Force ROTC. He is a member of the leadership honor society Omicron Delta Kappa, the military honor society Scabbard and Blade, and the Robert Femoyer Service Squadron.

Written by Shay Barnhart

VT News December 19, 2018



## Welcome our New Research Faculty

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**Paul Hilaire** -After a PhD in Experimental Quantum Optics in France, I've joined Edwin Barnes and Sophia Economou group for a theoretical PostDoc in July 2019. My research interests include quantum information with solid-state systems, light-matter interfacing and their applications for quantum processing and quantum communications.

**Libo Jiang**- My name is Libo Jiang, originally from China. Currently, I am a collaborator of DUNE/ protoDUNE, MicroBooNE, GENIE; and I am working on neutrino experimental physics including experimental data analysis, neutrino interaction simulation and reconstruction .

**Churna Bhandari**-is a Postdoctoral Associate in Professor Kyungwha Park's Theoretical Condensed Matter Physics group at the Department of Physics Virginia Tech. He did his Ph. D. in Condensed Matter Physics from Case Western Reserve University, Cleveland OH 44106 USA. His primary research interest is on: 2D materials, correlated electron system, large spin-orbital coupled complex oxides, and defects system. His expertise is on quasi-particle GW theory and beyond, the electron-phonon coupling effect to the energy band structure of highly polar materials arising from Fröhlich contribution to the screened Coulomb interaction. In addition to research, he loves teaching.

**Abhishek Kumar Singh**-I am a postdoctoral researcher at the Dept of Physics, Virginia Tech. I am working on the dynamics of water molecules in the hydration shells of biomolecules employing terahertz spectroscopy. I did my PhD from School of Physical Sciences, Jawaharlal Nehru University, New Delhi. I was a postdoc thereafter at Division of Photonics, Centro de Investigaciones en Optica, Leon, Mexico, and was working on applications of terahertz time-domain spectroscopy and imaging techniques in chemical, biological, and plant sciences.

**Shuang Wu**-I earned my Ph.D. in experimental condensed matter physics from the University of Alabama in August 2019 and joined Dr. Satoru Emori's group as a postdoctoral researcher this October. My main research interests include experimental studies of magnetization dynamics and micromagnetic simulations for thin-film systems.

**Junhua Zhang**-Junhua Zhang is a postdoctoral researcher in Professor Vito Scarola's group at Virginia Tech. She earned her PhD in Theoretical Condensed Matter Physics from Iowa State University.

**Natalia Angelica Tapia Arellano**- Postdoc at Virginia Tech within the Center for Neutrino Physics, starting fall 2019. PhD at University of Santiago de Chile.

**John Van Dyke**— I am a postdoctoral researcher in the groups of Ed Barnes and Sophia Economou. My interests lie at the intersection of quantum information science and condensed matter theory; using ideas from each field to help understand the other. I received my PhD from the University of Illinois-Chicago in 2016 and was previously a postdoc at Iowa State University.



## Welcome our New Staff

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**Savannah Haynes, Program Support Technician** - Joined the department as Program Support Technician in July 2019. I am from Blacksburg, VA but currently live in Pembroke. I enjoy spending time with my friends, family, and my animals. I live with my many animals and my Fiancé, Logan. When I am not working or doing homework, I am most likely at home curled up with my animals or spending time with my siblings. I have previous experience in banking and customer service. I am so excited to be apart of the Physics Department.

**Lorrie Mitchell, Program Support Technician Center for Neutrino Physics**– Became a part of the Physics department as a CNP Program Support Technician in January 2019. I am originally from Wythe County, however I have spent most of my adult life in Giles County where I worked for local government for about 25 years before deciding it was time to make a career change . I have a wonderful daughter and son-n-law, Hannah and Tyler, and I am a proud Maw Maw of two precious little girls, Emalyn and Everleigh who I enjoy spending as much time as possible with and spoiling them whenever I can. My first year in the Physics Department has been very enjoyable and rewarding, and I look forward to many more years to come.

**Will Clark, Laboratory Technician**- Will attended Virginia Tech and graduated in 2016 with a Major in Physics and a Minor in Astronomy. He continued to work within the Physics Department post-graduation. In 2018 he left Virginia Tech to start a real estate appraisal business. He returned to Tech to accept his current position in August of this year.

## In Short

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**Professor Rana Ashkar** received a Ralph E. Powe Junior Faculty Enhancement Award from Oak Ridge Associated Universities.

**Professors Lara Anderson, Ed Barnes, and James Gray** were promoted by the Virginia Tech Board of Visitors to associate professor with tenure.

**Professors Giti Khodaparast and Kyungwha Park** were promoted by the Virginia Tech Board of Visitors to full professor.

**Professor Patrick Huber** was quoted in a Science magazine article about the ICARUS detector's new mission at Fermilab.

## In Short Continued

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**Professor Leo Piilonen** received the Alumni Award for Excellence in Research. The award is sponsored by the Virginia Tech Alumni Association, and it is awarded annually to faculty who exhibit excellence in research.

Staff member **Diane Walker-Green**, director of undergraduate advising and enrollment management, received the President's Award for Excellence. This is awarded annually to Virginia Tech employees who have made extraordinary contributions by consistent excellence in the performance of their job. The award read in part: "During her time at Virginia Tech, Walker-Green has worked hard to ensure that all students are expertly advised, fairly treated by their peers and professors, and not held back due to extenuating circumstances."

**Professors Sophia Economou and Djordje Minic** were named as American Physical Society Outstanding Referees for 2019.

**Professor Michel Pleimling** was appointed to the editorial board for the journal *Entropy* for the *Statistical Physics* and *Complexity* sections.

**Professor Uwe Täuber** was appointed to the editorial board of *Journal of Physics A: Mathematical and Theoretical*, and *Symmetry*. He was also reappointed for another three-year term to the editorial board of *Physical Review E*.

**Professor Vito Scarola** organized the ARO and AFOSR funded *Workshop on Building Entanglement for Quantum Information Processing: Opportunities and Challenges* at the Virginia Tech Research Center in Arlington.

The department successfully ran its first summer of the National Science Foundation supported Research Experience for Undergraduates (REU) program. Seven students from across the United States did research with faculty in our Center for Neutrino Physics. The program was headed by **Professor Camillo Mariani** with administrative support from staff member **Betty Wilkins**.

The department received a "5+ Club" award from the Physics Teacher Education Coalition (PhysTEC) for graduating five well-prepared physics teachers in the 2018 – 2019 academic year. The PhysTEC program in our department is headed by **Professor John Simonetti** and teacher-in-residence **Alma Robinson**.

**VT Physics alumna Annalisa Pawlosky** and her company Google provided a donation to support the Ladies of Robeson, our organization for female physicists in the department.

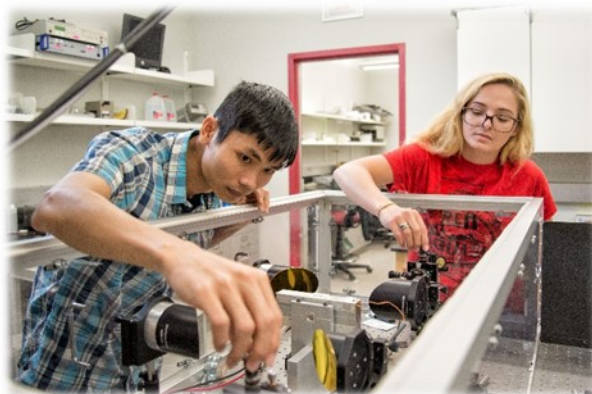
**VT Physics alumna Erica Grant** has launched a startup company Quantum Lock that aims to combine the use of a smart lock, smartphone, and quantum computing to make hotel door keys more secure.

## Department of Physics Annual Fund



### *Your Support helps Invent the Future*

**The Department of Physics** continues to increase the quality and prominence of its research and educational programs. Our nationally and internationally recognized faculty, pursuing research in the areas of particle and nuclear physics, hard and soft condensed matter physics, biophysics and astrophysics while providing our students with a sound education that melds fundamental principles with current research, are helping Virginia Tech improve its standing as one of the top STEM schools in the country.



**Your support is critical for our success.** Contributions from our alumni, parents, and friends aid our deserving students, enhance our state-of-the-art facilities, and allow our students to explore a wide array of career opportunities. Gifts to the Annual Fund allow the departmental leadership to respond to opportunities immediately and to allocate resources where they can have the greatest impact.

**Every gift counts – no matter the size.** Our goal this year is to increase overall alumni participation. A gift to the Department of Physics is the clearest signal our alumni and friends can give to show their support of the great work of our faculty and increasing the quality of experience for our students. When all of us give, the collective contribution makes a significant difference.

When you receive your College of Science Annual Fund letter or phone call, please earmark your support for the Department of Physics Annual Fund (881383). Simply make a notation on the gift card or let the caller know that you want to direct your donation to Physics! To make an immediate contribution, you may visit the university's website at [givingto.vt.edu](http://givingto.vt.edu) or contact the Office of Gift Accounting at (800) 533-1144

For more information or to learn about other ways to support the College of Science, please contact Wade Stokes, Assistant Dean of Advancement, at (540) 231-4033 or [lwstokes@vt.edu](mailto:lwstokes@vt.edu).

**We thank you in advance for your support!**

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### ***Physics in Your Neighborhood!***

**Alumni Reunion** – 2020 March Meeting of the APS in Denver, CO (Time and Place TBD)

For more information, go to <https://www.phys.vt.edu/About/alumni/Reunions.html>

### *Quanta 2019*

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