A RACE AGAINST TIME

CST professor and airline CEO work to protect Grand Bois mountain and its vanishing wildlife
Your gift means more students get that experience. The Undergraduate Research Program offers top students the opportunity to work alongside experienced researchers from CST and across Temple University.

Out in the field, in the lab or at a powerful computer, students in URP learn what it takes to do advanced research: theoretical knowledge, technical skill, critical thinking and how to persevere through failure and build on success. The experience is essential to being accepted into a top graduate or professional school or to landing a high-paying job in geology, biotechnology, information science and other growing sectors.

Most universities simply don’t offer such an extraordinary opportunity for their undergraduates. CST does. But we need your support to offer URP to more students.

Make your gift at giving.temple.edu/URP.

To discuss giving options, contact Graham Smialowski, CST Major Gift Officer, at 215-204-8192 or graham.smialowski@temple.edu.

REAL-WORLD RESEARCH WITH WORLD-CLASS RESEARCHERS MEANS CST STUDENTS HAVE AN EDGE IN GRADUATE SCHOOL AND THE JOB MARKET
DEAN’S MESSAGE

Much of this issue of Outlook is devoted to collaborations and partnerships—among researchers, institutions, alumni and others—all working to advance the College of Science and Technology’s efforts in research and education.

Our cover story—“A Race Against Time”—details efforts by S. Blair Hedges, Laura H. Carnell Professor of Biodiversity, and an airline CEO to establish several national parks to preserve Haiti’s rapidly disappearing species. Their story, born from Hedges’ pioneering work to identify biodiversity “hot spots,” is a powerful reminder that CST’s research impact reaches far beyond the Temple University campus.

Another feature story chronicles CST faculty partnerships with colleagues from other universities, as well as Temple schools and colleges, to understand how: self-driving cars improve traffic and fuel efficiency; magnetics might be able to treat cardiovascular patients; and new materials can potentially decrease brain injuries in athletes and soldiers.

CST’s success in research and education is the result of many collaborative efforts. Our increasing research expenditures—up 85 percent in just five years—stem from CST scientists working across disciplines to look at scientific challenges from new angles. For example, CST earned a prestigious Keck Foundation grant for a new method to identify dark matter. Other CST researchers are making breakthroughs in detecting and destroying chemical weapons and investigating the anti-cancer properties of tomato extracts.

CST is also succeeding in educating the next generation of innovators. Our undergraduate enrollment is at 4,000 students, making us one of the largest colleges at Temple. The increase in graduate and post-baccalaureate enrollment is particularly dramatic, up 90 percent from a decade ago. Together, CST faculty, advisors and professional development staff craft exceptional educational experiences, such as the Undergraduate Research Program, professional science master’s degrees and a pre-health post-baccalaureate, that attract top students.

Some of our strongest partners are CST graduates and friends of the college. They volunteer for our Owl to Owl Mentor Program, serve on the Board of Visitors and invest in scholarships and faculty endowment. You can learn more about what inspires several supporters in this year’s Honor Roll section.

I am so grateful for the financial contributions and for the time and expertise our supporters share with CST. I look forward to working together as we grow the college, push the boundaries of discovery and prepare our students for what is next in science.

Sincerely,

Michael L. Klein, FRS
Dean and Laura H. Carnell Professor of Science
Nearly 500 graduates participated in CST’s spring 2017 graduation ceremony.

CST GRADUATION FEATURES GOLDEN OWL AND RESEARCH GIANT

On May 11, at Temple University’s McGonigle Hall, nearly 500 graduates were honored at the 2017 CST graduation ceremony. CST faculty presented bachelor’s, master’s, professional science master’s and doctoral degrees and, after years of hard work, graduates spent the day celebrating with friends, family and professors.

The ceremony began with remarks from Dean Michael L. Klein, FRS, who praised the graduates for their determination. Robert M. Fineman (BA ‘66, Chem), a medical doctor and clinical professor of pediatrics in the Department of Pediatrics at the University of Washington, Seattle, then delivered the keynote address.

Fineman, a Golden Owl for having graduated from Temple more than 50 years ago, is proof that “the work done [at Temple] makes all of us better human beings.” He is a passionate public health advocate, serving as dean of the Health and Human Services Department at North Seattle College from 2007 to 2012. In 2006, the Temple University Alumni Association awarded Fineman a Certificate of Honor for his achievements and dedication to Temple.

The ceremony’s student speaker was Colton Howard, an information science and technology major, who served as president of the National Association for Computing Machinery’s Temple chapter. After graduation, Howard took a position as a technical solution specialist at IBM.

In a first for the college, Dean Klein and Temple University Board Member Solomon Luo presented an honorary doctor of sciences degree to Professor C.N.R. Rao, FRS, for his extraordinary accomplishments in chemistry. Rao is National Research Professor, Linus Pauling Research Professor and honorary president at the Jawaharlal Nehru Centre for Advanced Scientific Research in Bangalore, India. He has more than 1,600 publications and has been awarded more than 70 honorary degrees from universities around the world.

—Hannah Amadio
NSF GRANT ENHANCES CAREER PREP FOR URBAN GEOSCIENCE STUDENTS

The Department of Earth & Environmental Science (EES) has received a three-year, $359,000 grant from the National Science Foundation’s GEOPATH program to enhance recruiting of undergraduate geology and environmental science majors and to enhance their career development. The goal is to entice students within CST’s EES Department and from across Temple University to pursue urban geoscience.

Three EES faculty members, Professor Jonathan Nyquist, Associate Professor Alix Davatzes and Professor Laura Toran, teamed up with Carol Brandt, an associate professor in the College of Education, on the successful grant proposal. One of NSF’s priorities is increasing student interest in pursuing STEM careers, with the GEOPATH program focusing on enhancing student engagement in the geosciences.

“We want students to realize that geology isn’t just about mapping mountains out West,” says Toran. “There are local problems that impact where students live, such as protecting impaired streams, working on chemical hazards found in urban soils and understanding coastal hazards caused by storms.”

The grant also includes a one-on-one math mentoring program in which EES student volunteers help students through the required math sequence; an enhanced curriculum geared toward providing job skills; an internship program that recently linked up its first cohort of students with participating employers; and, pending the approval of the Temple University Board of Trustees, an environmental professional certificate.

PROBING ASTEROID STRIKES BILLIONS OF YEARS OLD

Between 3.5 billion and 2.4 billion years ago, more than 10 large asteroids pulverized the Earth’s crust and mantle as deep as 16 kilometers. The impacts vaporized megatons of rock into the atmosphere, which then crystallized into rounded, hail-sized particles called spherules that coated the entire planet.

With a five-year, $445,000 NSF CAREER research grant, Associate Professor Alix Davatzes has been studying the environmental impacts of the asteroid strikes during the early evolution of life on earth. She is doing so in the only known areas of the world where these deposits can be found—in near-desert environments in Western Australia and near the South Africa-Swaziland border east of Johannesburg, which, at the time, were submerged under ocean waters.

“What we’re hoping to learn is how the impacts altered the atmospheric chemistry and surface conditions,” says Davatzes. “We’ve been able to make an argument that plate tectonics started possibly a quarter-billion years earlier than the previously agreed-upon evidence, as early as 3.25 billion years ago. Even though these impact sites don’t exist anymore—either because the sites have been covered by other layers of rock or recycled by plate tectonics—it’s really exciting that the remaining evidence of these impacts is giving us a glimpse of the Earth more than 3 billion years ago.”

—Bruce E. Beans
Professor Xiaoxing Xi's work will impact many electronic, magnetic and superconducting applications.

MATERIALS SCIENCE BREAKTHROUGH

In a materials science breakthrough, an international team of researchers led by Xiaoxing Xi, Laura H. Carnell Professor of Physics, has developed a novel technique to create nanoscale-level oxide interfaces and heterostructures.

The research, according to Xi, has potential electronic, magnetic and superconducting applications—including possibly creating new computing, detector and energy-production devices. In their study, published in *npj Quantum Materials*, an open-access *Nature* research journal, Xi and 16 colleagues from Temple and other institutions describe how they successfully constructed oxides with well-controlled chemical compositions and atomic-layer precision.

The new method is called atomic layer-by-layer laser molecular beam epitaxy (ALL-Laser MBE). It is built upon, and improves on, the combined strengths of the two most successful methods utilizing oxide interfaces to synthesize new artificial structures.

“There is a significantly enhanced capability to grow these oxide materials one atomic layer at a time, not just to make existing materials better but to also create materials that don’t exist naturally,” says Xi, whose research was funded by a three-year, $367,000 U.S. Department of Energy grant. “The method pushes current boundaries for growing new functional materials that are theoretically predicted but cannot be made with existing techniques.”

Other Physics Department researchers involved in the study include Qingyu Lei, Maryam Golalikhani, Guozhen Liu, Ravini Chandrasena, Weibing Yang, Alexander Gray, Qiao Qiao and Bruce Davidson.

—Bruce E. Beans
On April 20, the College of Science and Technology presented more than 100 awards, scholarships and other recognitions to the college’s graduate and undergraduate students at the annual Scholarships, Awards and Student Recognition Luncheon.

With nearly 200 attendees filling the Science Education and Research Center lobby, the luncheon celebrated the success of talented students from the college’s departments of Biology; Chemistry; Computer & Information Sciences; Earth & Environmental Science; Mathematics; and Physics, as well as from TU’Teach and the Undergraduate Research Program.

In attendance were many graduates and friends who established or contributed significantly to college scholarships and awards, including Sina Adibi (BA ’84, CIS; FOX ’86), CST Alumni Endowed Scholarship; Albert Brown (BA ’64, Chem) and Marie Koals (EDU ’63), Albert B. Brown Chemistry Scholarship; Arthur Dawson (BA ’67, PhD ’76, Chem), Hazel M. Tomlinson, Ph.D. Memorial Scholarship; Eva Havas, Peter Havas Humanitarian Scholarship for Outstanding Physics Graduate Students; Gerald Kean (BA ’65, Bio) and Marlene Chachkin, Chachkin-Kean Fund for Undergraduate Research; Guenadiy Lazarov (MA ’97, PhD ’00, Phys) and Physics Professor Emeritus Theodore Burkhardt, Stanislav Kotsev (CST ’99) Memorial Award; physics professor Mia Luehrmann, Natan Luehrmann-Cowen Memorial Award; Rosemary Poole, J.A. Poole Award for Exceptional Department Service by an Undergraduate; Seda Tarzian (BA ’48, Bio), Seda Tarzian Endowed Scholarship; Henry Harrison, James A. Harrison Memorial Award; and David Tepper (BA ’64, Math; CLA ’66, ’69), David Tepper and Elaine Kowalewski Scholarship in Mathematics.
CHELSEA WALTON NAMED A 2017 SLOAN RESEARCH FELLOW

The Alfred P. Sloan Foundation named Temple mathematician Chelsea Walton a 2017 Research Fellow, putting her in company with academicians from Stanford University, Massachusetts Institute of Technology and Princeton University. The highly competitive and prestigious honor identifies rising scientists who’ve made significant marks on their field and represent the next generation of leaders in the U.S. and Canada.

Walton’s work on such algebraic structures is part of her larger exploration of the field of noncommutative algebra. She explains that in noncommutative algebra, multiplication doesn’t behave as expected. “That is, a x b doesn’t have to be b x a. This occurs more often than one might think because functions are naturally noncommutative,” she says.

A 2011 recipient of a PhD in mathematics from the University of Michigan, Walton has presented her research widely, including at the Mathematical Sciences Research Institute in Berkeley, California. She comes to Temple from the Massachusetts Institute of Technology, where she was a National Science Foundation-funded postdoctoral fellow.

Walton joined Temple’s faculty in 2015 as a Selma Lee Bloch Brown Professor of Mathematics. She was drawn by the unusual number of experts in noncommutative algebra at Temple: five including herself and a postdoctoral fellow.

Walton is the fourth African American Sloan Fellow in mathematics since the award’s inception in 1955. She’s the first Sloan Fellow at Temple since 1989, when Lee-Yuan Liu-Chen was honored for neuroscience.

Walton plans to use the $60,000 grant from the fellowship to fund her travel for research as well as the research expenses of her postdoctoral fellow and her graduate and undergraduate students and mentees.

—Eryn Jellesiewicz

RESEARCHERS EXPLORE NEW WAYS TO DETECT AND DESTROY CHEMICAL WARFARE AGENTS

Department of Chemistry researchers have been awarded two different $1.5 million grants from a U.S. Department of Defense agency for the exploration of new technologies that could be used to detect and destroy chemical warfare agents, toxic industrial chemicals and nerve gas. Each three-year grant from the Defense Threat Reduction Agency’s (DTRA) Joint Science and Technology Office could also be extended another two years and increased by an additional $1 million.

Professor Eric Borguet is collaborating with a team of University of Pittsburgh researchers to develop more economical methods to sense and eliminate weapons of mass destruction. The researchers are investigating the use of what are called multifunctional, metal-organic frameworks (MOFs) with plasmonic cores comprised of metal nanoparticles.

“If we are successful in identifying metallic materials that are cheaper and more abundant than gold and silver, which are most commonly studied for these purposes,” says Borguet, “it could impact not only chemical warfare agents but also other plasmonic applications.”

Meanwhile, a Temple-led team that includes two Department of Chemistry professors and researchers from UCLA and the Army Medical Research Institute of Chemical Defense (AMRICD) is exploring a new technology that has the potential to convert highly toxic organophosphate nerve agents into harmless phosphates.

Professor and principal investigator Christian Schafmeister’s team plans to synthesize complex, shape-programmable macromolecules called “spiroligomers” or “molecule Lego.” Much more robust and stable than currently used enzymes, Schafmeister says that these metal-containing macromolecules would be able to bind organophosphorus nerve agents and greatly speed up their breakdown into harmless compounds—and not generate immune responses in humans.

—Bruce E. Beans
C.N.R. Rao Delivers Inaugural Sheikh Saud Lecture

The College of Science and Technology and Temple Materials Institute (TMI) hosted the inaugural Sheikh Saud Lecture on Advanced Materials in May featuring Professor C.N.R. Rao, FRS, National Research Professor, Linus Pauling Research Professor and honorary president at Jawaharlal Nehru Centre (JNC) for Advanced Scientific Research, India, and director of JNC’s International Centre for Materials Science.

As one of the world’s preeminent chemists, Rao is the author of more than 1,600 research papers and recipient of some of the top honors in his field. During the Sheikh Saud Lecture, he discussed his work with inorganic graphene analogues. Graphene is one of the most sensational discoveries of recent years, with applications for superconductivity, transistors and electrocatalysts.

TMI is the focal point for materials research at Temple University, enabling collaborative interdisciplinary research on advanced materials ranging from complex functional solids and fluids to novel thin-film superconductors and materials for strategic applications.

The Sheikh Saud Lecture on Advanced Materials is named for H.H. Sheikh Saud bin Saqr Al Qasimi, United Arab Emirates (UAE) Supreme Council Member and Ruler of Ras Al Khaimah, a northern UAE emirate. The Sheikh Saud bin Saqr Al Qasimi Foundation for Policy Research was established in 2009 and aims to establish relationships with talented scholars and world-class universities, innovative public-policy research centers, established government institutions, and strategic partners in the private and nongovernmental sectors.

Chemistry Legend Franklin Davis Retires

Professor Franklin A. Davis, winner of the Cope Scholar Award and the John Scott Medal and Fellow of the American Chemical Society and the Royal Society of Chemistry, retired in 2017. He joined the Department of Chemistry in 1995, coming from Drexel University. At that time he was considering several offers, and while Temple had real advantages, there were also shortcomings.

"While the department had a high-field NMR (nuclear magnetic resonance spectrometer), it lacked X-ray and mass spectrometry facilities and operational support for instrumentation," says Davis. "The laboratories were old and the heating and air conditioning were erratic. Chemistry is now considered one of the top departments in the university."

The chemistry that Davis developed is regularly used by academic and industrial laboratories worldwide. His sulfur-nitrogen compounds (i.e., "Davis reagents") include N-sulfonyl oxaziridines for oxidations and asymmetric hydroxylations and N-sulfinyl imines (sulfiminines) for asymmetric synthesis of chiral amine derivatives.

"Beyond Frank’s commitment to research, he always found time to be a tremendous mentor and supporter of students and colleagues,” said Professor Daniel Strongin, Chemistry Department chair. "The lively lunchtime conversations with Frank over the years will be missed."

Davis says that he will not miss writing another proposal or even another paper. "What I will miss,” he says, “are my colleagues and the many students I have had the honor and pleasure to teach and mentor over many years."

Other recent retirements at CST include Professor David Dalton of the Department of Chemistry and Professor Theodore Burkhardt and Professor Dieter Forster of the Department of Physics.

—Bruce E. Beans
NEW PSM DEGREES IN SCIENTIFIC WRITING AND CYBER DEFENSE

CST has introduced two new Professional Science Master’s (PSMs), scientific writing and cyber defense and information assurance. PSMs offer students the professional skills highly valued by top employers as well as advanced technical training. The new programs join CST’s existing PSMs in bioinformatics, biotechnology, forensic chemistry, and cyber security.

The new program in scientific writing was developed in response to the growing need of companies, nonprofit organizations and news outlets to communicate science clearly and succinctly. Students with diverse STEM backgrounds will be able to develop the expertise to pursue scientific writing careers. It also gives professionals currently employed in science and technology fields an opportunity to broaden their skills for their career advancement.

With the rise of cybercrime and terrorism and their impact on privacy, finance and national security, the new PSM in cyber defense and information assurance provides professionals with the skills necessary to protect organizations from these increasing cyber threats. The curriculum is technology-intensive, yet also bridges the increasing gap between cybersecurity technology and the overarching cybersecurity standards and policies. Information on CST’s PSM program is available at cst.temple.edu/psm.

DANIEL SZYLD’S WORK EARNAMS AMS AND SIAM RECOGNITION

Daniel Szyld, professor in the Department of Mathematics, has been elected to the 2017 Class of Fellows of the American Mathematical Society (AMS) and to the 2017 Class of Fellows of the Society for Industrial and Applied Mathematics (SIAM). The honors recognize his contributions to numerical and applied linear algebra and his exemplary research and service to the community.

Szyld’s research, which has been funded by the National Science Foundation and the Department of Energy, utilizes computational linear algebra and applied linear algebra to explore a variety of complex systems arising in biology, physics or engineering.

Szyld’s work with his colleague, Professor Isaac Klapper, has examined the metabolism of bacteria in microbial communities, for example, on ponds in Yellowstone National Park. Another of his research projects is computing the gravitational potential of the Yucatan’s Chicxulub crater area, thought to have been formed by the impact of the meteorite responsible for the demise of the dinosaurs. With a grant from Temple’s Office of Vice Provost for Research, Szyld is working with Tonia Hsieh, associate professor in the Department of Biology, to study lizard locomotion across complex, natural surfaces.

Szyld is Temple University’s first SIAM Fellow. Along with Professors Shiferaw Berhanu, Irina Mitrea and Igor Rivin, Szyld is the fourth Temple mathematics professor to become an AMS fellow in the past three years.

— Greg Fornia, KLN’ 92
CST’S NEW TENURE-TRACK FACULTY

Jocelyn Behm
ASSISTANT PROFESSOR, DEPARTMENT OF BIOLOGY

Jocelyn Behm earned her MS and PhD in ecology and biodiversity conservation from the University of Wisconsin-Madison after graduating summa cum laude from Drexel University with a BS in environmental science. She was an adjunct professor at Ursinus College in 2015 and brings more than 10 years of teaching experience to her new position at CST. She has received more than $750,000 in grants for her research in ecology, especially in regard to lizards, frogs, molecular ecology and species extinction. Behm has dedicated her time to mentoring undergraduate and master’s students in various aspects of her research. She has been awarded both the NWO Dutch Aspasia Women in Science Fellowship and the Fulbright Institute of International Education Fellowship. Her natural history notes have been published in the Herpetological Review, and she has published a field guide to the frogs of southwest China. At Temple, she will be studying patterns of biodiversity and invasive species in both the Caribbean and southeastern Pennsylvania.

Samuel J. Taylor
ASSISTANT PROFESSOR, DEPARTMENT OF MATHEMATICS

Samuel Taylor, a Philadelphia-area native, comes to Temple from the Yale University Department of Mathematics. At Yale, he held the title of Gibbs Assistant Professor and was awarded an NSF Postdoctoral Research Fellowship in 2014. Taylor earned BAs in mathematics and economics in 2009 from The College of New Jersey, and a PhD in mathematics from the University of Texas at Austin in 2014. He has also conducted research at the Mathematical Sciences Research Institute in Berkeley, California. Taylor’s research interests include geometric typology and geometric group theory with a focus on hyperbolic geometry and dynamics. In particular, he has studied the geometry of bundles as well as various statistical properties of geometrically significant groups. A passionate educator, Taylor has a deep interest in helping students succeed. He works to foster an interest in mathematics among younger students, and has participated in math groups open to the public during his time teaching at both Yale and UT-Austin.

Kai Zhang
ASSISTANT PROFESSOR, DEPARTMENT OF COMPUTER & INFORMATION SCIENCES

Kai Zhang, a former research staff member at NEC Labs America, scientist at Siemens Corporate Research and guest researcher with Lawrence Berkeley National Laboratories, has devoted his research to big-data mining, machine learning, bioinformatics and time series/complex network modeling. Zhang earned his PhD in computer science in 2008 from the Hong Kong University of Science and Technology and his master’s degree in pattern recognition from the Institute of Automation, Chinese Academy of Sciences. Zhang is a winner of the NEC Labs America 2016 Business Contribution award and 2016 Best Paper Runner-up awarded by the ACM Knowledge Discovery and Data Mining special-interest group. His research in brain functional networks was an editor’s choice cover story in Brain: A Journal of Neurology. Currently, Zhang is collaborating with the largest brain initiative in China to uncover the underlying mechanism of the human brain network in information processing and various mental disorders.

—Hannah Amadio
TOMATO EXTRACT MAY PREVENT AND TREAT STOMACH CANCER

Researchers at CST’s Sbarro Institute for Cancer Research and Molecular Medicine have found that whole extracts from two varieties of tomatoes blocked the growth of stomach cancer cells and dampened their malignant characteristics. Their findings were published in the Journal of Cellular Physiology.

According to the American Cancer Society, there are more than 20,000 cases of stomach cancer, also known as gastric cancer, diagnosed in the U.S. each year. It is most common among older adults; around 60 percent of adults diagnosed are aged 65 or older. Previous studies have suggested that compounds found in tomatoes, such as lycopene, a carotenoid that gives tomatoes their red color, may help to fight cancer.

However, Antonio Giordano, professor and Sbarro Institute director, noted that few studies have investigated the anti-cancer effects of whole tomatoes, a research gap they set out to address with their new study.

To reach their findings, the researchers tested the effects of whole extracts from San Marzano and Corbarino tomatoes on stomach cancer cell lines. They found that each extract not only halted the growth of gastric cancer cells, but they also interfered with cell migration, whereby cancer cells begin to move away from the primary tumor to invade surrounding tissues, and led to cancer-cell death.
Dysfunctional nuclear transport through the sub-micrometer nuclear pore complex (NPC) connecting the cytoplasm with the nucleoplasm in human cells, has been linked to various cancers, including leukemia.

By developing and employing high-speed super-resolution microscopy techniques, Associate Professor Weidong Yang and his research team have successfully tracked individual proteins or RNAs as they move through the NPCs—providing 3-D, super-resolution information for molecular transport kinetics and routes in leukemia and other cancer cells. Widely published in high-profile journals, Yang’s laboratory has received more than $2 million since 2010 from NIH and other funding agencies.

Yang’s related collaborations with researchers from the University of Michigan and the University of California, Berkeley have received another $2.2 million grant; and he recently received a five-year, $2 million National Institute of General Medicine grant.

Slobodan Vucetic
• Incorporating Residential Histories into Space-Time Models for Health Geographic Analysis, NSF
• SBIR Phase II: Using Data Mining to Optimal Customize Therapy for Individuals with Autism, Guiding Technologies Corporation

Anduo Wang
• CRII, NeT S: Towards a Database-defined Network, NSF
• Student Travel Support for the ACM SDSR 2017 Conference, NSF

Jie Wu
• NeTs: Medium: Collaborative Research: Coexistence of Heterogeneous Wireless Access Technologies in the 5 GHz Bands, NSF

Earth & Environmental Science
Alexandra Davatzes
• Understanding and Promoting Spatial Learning Processes in the Geosciences, NSF

Alexandra Davatzes, Jonathan Nyquist and Laura Toran
• GP-IMPACT: Career Paths for Urban Geoscientists: Recruitment, Retention and Apprenticeship, NSF

Sujith Ravi
• Meeting SunShot Cost and Deployment Targets Through Innovative Site Preparation and Impact Reductions on the Environment (InSPIRE), DOE/National Renewable Energy Lab

Laura Toran
• Assessment of Storm Water Controls in the Upstream Suburban Philadelphia Cluster, William Penn Foundation

Physics
A. Marjatta Lyra
• Molecular Quantum Control by Coherence Effects, NSF

Andreas Metz
• Coordinated Theoretical Approach to Transverse Momentum Dependent Hadron Structure in QCD, US Department of Energy

Mathematics
Shiferaw Berhanu
• The Regularity of Cauchy-Riemann Mappings and Solutions of Systems of Nonlinear Differential Equations, NSF

Vasily Dolgushev and Chelsea Walton
• Algebra Extravaganzan, NSF

David Futer and Matthew Stover
• Graduate Student Conference in Algebra, Geometry, and Topology, NSF

Cristian Gutiérrez
• OP: Monge-Ampère Type Equations and Geometric Optics, NSF

Axel Kohlmeyer
• Continuous Integration and GitHub Project Management for the LAMMPS Molecular Dynamics Software, Sandia National Laboratories

Brian Rider
• Operator Limits of Random Matrices, NSF

Benjamin Seibold and Dong Zhou
• Collaborative Research: Overcoming Order Reduction and Stability Restrictions in High-order Time-stepping, NSF

Matthew Stover
• Discrete Groups and Character Varieties, Simons Foundation

Daniel Szyld
• Asynchronous Iterative Solvers for Extreme-Scale Computing, US Department of Energy

Samuel Taylor
• Negative Curvature in Fiber Bundles and Counting Problems, NSF

Chelsea Walton
• Quantum Symmetry, NSF

James Napolitano
• Fundamental Physics Experiments with Reactor Neutrinos, US Department of Energy

John Perdew
• Density Functional Theory of Electronic Structure, NSF

Adrienn Ruzsinszky
• CAREER: Electron Correlation and Optical Spectra with a Nonlocal Energy-Optimized (NEO) Kernel, NSF

Cristian Gutiérrez
• Toward the Chemical Accuracy for the Description of the Catalytic Desulfurization Process, American Chemical Society Petroleum Research Fund

Nikolaos Sparveris
• Collaborative Research: Equipment for PSI MUSE Experiment, NSF

Rongjia Tao
• Demonstration of Viscosity Reduction with Saudi Aramco Crude Oil Samples, QS Energy, Inc.

Xiaoxing Xi
• Coating of Magnesium Diboride on 3 GHz Cavities, Argonne National Laboratory

Sujith Ravi and another EES faculty member, Associate Professor Ilya Buynevich, worked with researchers from Indiana University-Purdue University and the National Museum of Namibia. Their work was published in the Journal of Geophysical Research: Biogeoosciences, a peer-reviewed journal of the American Geophysical Union.

The team's results provide support to the self-organization hypothesis of fairy-circle formation. Self-organization theory says that the circular vegetation pattern is created by plant competition for scarce water. It's believed that the bare patches of soil ringed by tall grasses. The origins of the circles have long been debated by researchers.

"This study provides some 'fresh eyes' for looking at the existing debate, using new field methodologies and data for a less studied location," said Sujith Ravi, lead author of the study and assistant professor in the Department of Earth & Environmental Science (EES). "It's a major contribution to resolving the fairy circles enigma."

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Numbering in the millions, the so-called fairy circles are in the eastern interior of the coastal Namib Desert, stretching from southern Angola to northern South Africa. Ranging in size from about 12 feet to more than 100 feet, they are bare patches of soil ringed by tall grasses. The origins of the circles have long been debated by researchers.

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— Greg Femia, KLN’92
Working with scientists from across Temple and beyond, CST faculty make advances in traffic flow, heart disease and more
To quote an old Motown song, “it takes two”—or sometimes three or four researchers—to tackle a scientific puzzle.

As an applied mathematician, for example, Associate Professor Benjamin Seibold knows a lot about creating traffic models and computer simulations, but little about self-driving cars. As a physicist, Professor Rongjia Tao knows a lot about how electrical fields can enhance the flow and viscosity of everything from crude oil to melted chocolate, but less about how blood flows through the human body.

That’s why these professors and others are among the many CST faculty members who are partnering with researchers from other Temple colleges and schools and from other universities.

Seibold and researchers from three other American universities recently demonstrated that just a few self-driving cars can dramatically improve traffic flow for everyone. Such vehicles can eliminate stop-and-go traffic jams caused by human drivers—along with the accident risks, fuel inefficiencies and increased pollution that such driving causes.

Funded by a National Science Foundation’s Cyber-Physical Systems Synergy grant, the research indicates that self-driving cars and related technology may be even closer to revolutionizing traffic control than previously thought. The study, says Seibold, wouldn’t have been possible if he had not collaborated with researchers from Rutgers University, Camden; the University of Illinois at Urbana-Champaign; and the University of Arizona. “For research like this to have any chance of working, we needed to bring together four disciplines that included traffic models and computer simulations, control theory, someone with autonomous car expertise and civil engineering experts,” says Seibold.

“Vehicles are becoming increasingly automated, electrified and shared (Uber and Lyft), and designing for these transitions or making predictions about how they will modify transportation as we know it can be extremely difficult. It is not a one-person, one-perspective job,” says Daniel Work, another researcher on the project and an assistant professor in civil and environmental engineering at the University of Illinois at Urbana-Champaign.

Seibold’s simulations indicated that it would be possible to eliminate phantom traffic jams if just one in every 20 to 25 vehicles were self-driving. “Our traffic models factor in how humans drive and behave generally, but the results of any such simulation must be taken with a grain of salt because of the unpredictable ways people actually drive in the real world,” he says. “Ultimately, only an experiment involving real human drivers can reveal whether the ideas work.”

Seibold’s predictions were confirmed on a circular test track in Arizona, when—for the first time—researchers were able to demonstrate that just one self-driving car, whose pace was controlled via algorithms based, in part, on Seibold’s models and simulations, can smooth out the traffic flow of 22 other cars driven by humans. They also concluded that eliminating stop-and-go traffic waves, or jamitons, could reduce total fuel consumption by up to 40 percent.

Due to many technological, market and policy constraints, it will be years before fully autonomous cars make up a majority of motor vehicles. However, understanding and predicting the near-term scenario, when just a few self-driving cars will be intermixed with mostly human drivers, is even more challenging, according to Seibold.

“The proper design of autonomous vehicles requires a profound understanding of how humans will react to them,” he says, “and traffic experiments like the one we conducted play a crucial role in understanding this interplay of human and robotic agents.”

As northbound I-95 traffic whizzed above their heads, a small group of researchers were busily assessing the effectiveness of a newly built two-block-long storm-water retention basin. Near the Girard Avenue interchange, the basin is sandwiched between the interstate and brick rowhomes in Philadelphia’s Fishtown neighborhood.

Professor Laura Toran, a groundwater geologist with CST’s Department of Earth & Environmental Science (EES), and one of her postdoctoral fellows, Rob Rossi, were opening small well holes to measure groundwater levels, which average about 17 feet below the surface. At 1,000 feet from the Delaware River, these groundwater levels can fluctuate depending on tidal influences.

Meanwhile, Sasha Eisenman, associate professor in the Tyler School of Art’s Department of Landscape Architecture and Horticulture, was leading about half a dozen researchers from Temple and Rutgers University in assessing the condition of nine of the 63 different plant species that PennDOT planted within and on the edge of the shallow retention basin. These included reed grass;
flowers such as daylilies, milkweed and bee balm; and shrubs and trees such as redosier dogwood and river birch.

To gauge the plants’ health, Eisenman’s team was utilizing five $50,000 portable photosynthesis gas exchange devices. By placing a sensor-equipped clamp on a leaf, they were able to determine, among other things, how much carbon dioxide each plant was taking in and how much water it was releasing in the process.

The PennDOT-funded research project also includes EES Professor Jonathan Nyquist, who has conducted laser-based LIDAR (Light Detection and Ranging) surveys of the basin’s surface topography; Temple faculty from the College of Engineering who are focusing on water quality and pollution impacts; and Villanova University researchers who are analyzing the impact of the quantity of the storm-water runoff.

The PennDOT project ultimately will involve rebuilding the entire I-95 corridor through Philadelphia. “It’s likely to be a long-term project that involves lots of miles and dollars, and we’re essentially creating a living urban laboratory,” says Toran. “PennDOT wants to put in storm-water controls that are more effective, so we are assessing what’s already been built and using what we learn to help improve PennDOT’s future designs.”

For Toran, this is real-world collaboration, not just talk. “With everybody bringing their expertise to bear and everyone having slightly different approaches to doing things,” explains Toran, “it enhances the questions and answers you can come up with and really enriches your research.”

Tyler’s Eisenman agrees. “We each have a focus area, and when we combine these we can look at the broader functionality of systems—such as heavy-metal analysis from Temple’s Environmental Engineering and hydrology from EES,” he says. “By coordinating and combining data sets and expertise, we can really get the broader picture beyond what we could do alone.”

**Funded by the American Heart Association**, Professor Rongjia Tao is collaborating with Michael Autieri, associate director and professor of the Cardiovascular Research Center at Temple’s Lewis Katz School of Medicine, to determine if magnetics could improve the health of cardiovascular patients—and serve as a safer alternative to aspirin and other heart medications. “Recent research indicates that high blood viscosity and turbulence are two key factors in heart attacks and strokes,” says Tao, whose previous research tackled similar flow issues with oil in pipelines and chocolate in the sweets manufacturing process.

Red blood cells contain iron. In preliminary experiments using human blood samples, the researchers have demonstrated that exposing blood plasma to a magnetic field for 15 to 20 minutes polarizes red blood cells and organizes them into short chains—chains that align themselves parallel to the direction of the blood flow.

“This magneto-rheology technique significantly reduces both blood viscosity and turbulence,” says Tao. In addition, the reduction in viscosity and turbulence lasts for 24 hours after a single treatment. Autieri, whose research focuses on vascular inflammation, is conducting experiments to see how effective the technique would be in mice who have been fed high-fat diets for three months. Tao, meanwhile, is awaiting approval to conduct clinical trials. The study’s subjects would place one of their arms in a magnetized collar for 15 to 20 minutes a day.

In 2016, several weeks after Tao first contacted him, Autieri saw Tao on a TV news program discussing how electrical fields can reduce both viscosity and fat content in the production of chocolate.

“People take all types of medicines to reduce cardiovascular risk, but most can lead to bleeding disorders,” says Autieri. “This treatment could reduce blood viscosity and accomplish the same thing without those risks. This could be paradigm-changing.”

—Bruce E. Beans

**INTERDISCIPLINARY TEAM FOCUSES ON MATERIALS, BRAIN INJURY**

In one of the largest cooperative agreements for research in the university’s history, an interdisciplinary team of CST and Temple faculty is participating in a $20 million, two-year agreement with other universities and the U.S. Army Research Laboratory (ARL).

Temple is working with ARL in three major research areas: understanding and improving the performance of materials through the use of computational modeling; understanding the mechanisms and thresholds of traumatic brain injury by reviewing clinical, behavioral and biochemical changes related to traumatic brain injuries and concussions; and exploring new ways to improve protection against ballistics impacts. Other collaborators include the University of Southern California, the University of Southern Mississippi and the University of North Texas.

CST’s researchers include Michael L. Klein, FRS, Dean and Laura H. Carnell Professor of Science, and John Perdew, Laura H. Carnell Professor of Physics and Chemistry. Other Temple researchers are T. Dianne Langford of Temple’s Lewis Katz School of Medicine and Ryan Tierney in the College of Public Health.

The research effort, which aims to create a new class of materials for use in personal protective equipment and decrease brain injuries, will leverage CST’s Center for Computational Design of Functional Layered Materials and Temple Materials Institute to develop and test new materials, as well as the university’s varied expertise in monitoring and understanding the consequences of head injuries.

“This award evidences that by working together across schools, colleges and universities, Temple’s faculty is able to provide national leadership in the design, development and measurement of advanced materials to protect army personnel as well as athletes,” says Michele Masucci, Temple’s vice president for research. “Through improving our knowledge of the protective effects of such materials by conducting clinical studies of their use, we hope to dramatically improve the safety of individuals at risk for traumatic brain injury.”
Abhirup Patra is motivated by the most immediate impacts his research can have on the world. "I love looking at materials right in front of us, right now, and looking for ways we can improve them," says the PhD candidate in physics.

Patra began his doctoral studies at Tulane University with John Perdew, Laura H. Carnell Professor of Physics and Chemistry, but came to CST when Perdew joined Temple. His research involves computation of metal surface properties and the catalysis of chemical reactions. "In our group, we are lucky to study with Professor Perdew, who is the most-cited physicist on density functional theory," Patra says. "We basically create new functionals to improve the accuracy and predictive power of the method and use them to study matter at different phases and examine its structure at a subatomic level."

Patra tests the newly developed density functionals, such as SCAN+rVV10, for CST’s Center for Computational Design of Functional Layered Materials (CCDM). "Each new functional gives you better approximates for the physical and chemical properties of materials," says Patra. "I look at the surfaces, which are of immense technical importance, such as the surface of a gold sheet."

Patra’s other research involves bonding of biomolecules and finding a new method to predict the weak interactions of molecules. He applied the method he developed to noble gasses such as argon and crypton. He’s also working on hydrogen evolution reaction. "At the center, we’re looking at how to create new materials and ways to use them, such as producing hydrogen by means of photocatalysis of water. Using hydrogen fuel in cars would be far less polluting."

It’s exciting to be part of a field that is constantly innovating research methods and technologies. Patra revels in the practical potential for his electronic structure calculations. "This work helps create better technologies, extend human life and helps us sustain our environment," he says. "It’s research we need for our future."

Young CST researchers—postdocs, grad students and recent graduates—embark on promising research careers

People think that the periodic table is a fixed set of data, but in the past few years, scientists have been breaking barriers and discovering new properties from old elements that have a lot of promise for different applications," says Jefferson Bates, a recent postdoctorate fellow in the Physics Department. "The work I’m doing is like creating specialty paint brushes that can elucidate a new level of detail in a painting."

Bates has always worked at the nexus between disciplines. He started out as a chemist and received a hybrid chemistry and material physics PhD at the University of California, Irvine before coming to Temple in 2015. In August 2017, he began a new position as an assistant professor in the chemistry department at Appalachian State University.

Bates’ research focuses on theories of electronic structure, which he has used to study a variety of topics involving atoms, molecules and bulk materials. By creating new computational methods to obtain more accurate results and predictions, he can guide experiments to both test the properties of existing materials and create new ones. "The nice thing about electronic structure theory is that it can be used in so many ways, such as to study the reactions of producing ammonia from atmospheric nitrogen for fertilizer, or how to better convert sunlight to useful energy."

At Temple, he worked with Adrienn Ruzsinszky, Selma Lee Bloch Brown Professor in Physics, to create accurate methods to study surface properties and catalysis.

At Appalachian State, Bates’ work will focus on studying magnetic materials for improving data storage and other energy
and electronic applications. "My dream is to come up with a new computational method to accurately describe the magnetic properties of the Lanthanides, some of nature’s heavy metals," he says.

As Bates gears up for the next phase of his career, he's grateful for the groundwork at CST. "Temple is an excellent institution that's rapidly grown its computational resources in the last few years, and provides untold opportunities in both teaching and research for postdocs and students," he says. "Coming here and being able to participate in these projects, to collaborate with both theorists and experimentalists on complex problems has solidified my drive to work in this field."

Advancing Green Computing

Dawei Li realized early on that as a computer scientist he could have an impact on improving energy usage and sustainability in the IT industry. "These are critical issues in human society," he says.

Li chose to pursue his PhD at Temple because he wanted to work with Jie Wu, Laura H. Carnell Professor of Computer Engineering, who eventually became his advisor. "I started working on energy-related problems in small-scale systems (multi-processor platforms) and gradually moved to large-scale systems, data centers and cloud computing."

During his time in CST’s computer and information sciences program, he worked across three different research areas: green computing and energy-aware scheduling on multiprocessor platforms; data-center networks; and cloud computing, including virtual-machine placement, cloud-application scheduling and cloudlet deployment for mobile cloud computing.

During his time in CST’s computer and information sciences program, he worked across three different research areas: green computing and energy-aware scheduling on multiprocessor platforms; data-center networks; and cloud computing, including virtual-machine placement, cloud-application scheduling and cloudlet deployment for mobile cloud computing. That versatility, he says, served him well because it gave him a chance to explore multiple topics of interest while helping him shape distinct areas of expertise.

Ultimately, Li wrote his thesis on the design and analysis of large-scale data-center network architecture, looking at flow scheduling with software-defined networking technologies. After completing his degree in 2017, he accepted an instructional specialist position at Montclair State University and recently began a tenure-track position there as an assistant professor. "Both teaching and having excellent teachers at Temple prepared me well for this position," says Li.

For his future research projects, Li plans to expand out into software-defined networking and big-data processing, where there is potential for big impact. "The methodology developed from my research can definitely help people build greener systems in the real world," he says.

Improving Healthcare With Analytics

A duo in research and in life, Djordje Gligorijevic and Jelena Stojanovic met as students at the University of Belgrade in Serbia. They came to CST in 2013, after sitting in on an inspiring talk on bioinformatics by Zoran Obradovic, Laura H. Carnell Professor of Data Analytics.

“We knew at Temple we’d be exposed to state-of-the-art research and interact with top thinkers. Temple has given us all of those opportunities and more,” says Gligorijevic. “We’ve been thrilled to have so many collaborative research projects and the guidance of Professor Obradovic as our advisor.”

As PhD students in computer and information sciences, the pair have focused much of their research on healthcare data mining, including disease-disease and disease-gene associations; characterizing quality of healthcare; and estimating customer engagement with data science, with the goal of creating automated and smart systems that provide useful and timely information for both patients and doctors.

“We’ve worked with the emergency department at Temple University Hospital to learn more about patients and how to infer better ways to prioritize their care,” Stojanovic says. A new project involves collaborating with pharmaceutical companies on clinical trials and finding ways to help connect patients with caregivers.

As they approach the end of their dissertation research, Gligorijevic and Stojanovic are looking ahead to potential career paths. In 2016, they both worked as interns at Yahoo Research Labs, a valuable professional experience, and they think they will eventually land in the private sector.

Whether they will end up working together after their studies is unknown, but the newly-wed couple hopes to continue apace, Stojanovic says. "We make a good team, and having two people think about the same problems is always better than one.”

—Elisa Ludwig
A RACE AGAINST TIME

CST professor and airline CEO work to protect Grand Bois mountain and its vanishing wildlife
In a pursuit to preserve Haiti’s disappearing species, a CST professor and a Haitian CEO have teamed up to establish private nature reserves. Now, the first such park has been purchased: Morne Grand Bois, a mountain in the southwest of Haiti with rare and endangered plants and animals.

“Haiti is on the brink of a mass extinction due to deforestation,” says Professor S. Blair Hedges, director of Temple University’s Center for Biodiversity, who has been surveying the last remaining tracts of Haiti’s original forests before they disappear. Using a helicopter to access mountaintop tracts, he has identified a dozen biodiversity “hot spots” where original forests and their species still exist. “Even here, as well as across the nation, the widespread cutting of trees for energy and agriculture is threatening the survival of Haiti’s native species and creating an environmental disaster for its people as well.”

Hedges’ groundbreaking research identified a shortlist of hot spots throughout Haiti. His partner in the effort is Haitian businessman Philippe Bayard, CEO of Sunrise Airways and president of the leading conservation group in Haiti, Société Audubon Haiti. Since they teamed up six years ago, Hedges and Bayard raised public awareness about Haiti’s disappearing species through video, brochures and public lectures, as well as the distribution of 80,000 printed calendars throughout Haiti and the production of a documentary film titled *Extinction in Progress*.

Haiti’s government took notice. In 2015, Haiti declared Grand Bois a national park, identifying it as a priority for conservation and validating the critical need to acquire and protect the area. Parks were also created for Deux Mamelles and Grand Colline, other hot spots in southwestern Haiti. There are, however, little or no resources from the Haitian government for protection of large and remote areas. Some hot spots are privately owned, so unchecked tree cutting continues.

“The cutting of nearly all of Haiti’s original forests—for building materials, slash-and-burn agriculture, and charcoal production—has resulted in fatal floods, compromised water quality and tremendous threats to biodiversity,” says Hedges, Laura H. Carnell Professor of Biodiversity. “Protecting Grand Bois mountain and its forests is a first step to thwarting environmental catastrophe and protecting the country’s unique biodiversity.”

To assemble the mountain tracts, Bayard and Hedges sought donors to purchase private land and help pay for park management. Two experienced conservation organizations, Global Wildlife Conservation and Rainforest Trust, joined the effort. The Grand Bois purchase was finalized in summer 2017. “It is a jewel of biodiversity with about one half of the original forest intact above 1,000 meters of elevation,” explains Hedges. “Its more than 1,200 acres hold 68 species of vertebrates, including species found nowhere else and other plants and animals thought to be extinct, such as the Ekman’s magnolia tree and the Tiburon stream frog.”

In 2015, Haiti declared Grand Bois a national park, identifying it as a priority for conservation and validating the critical need to acquire and protect the area.

“That Grand Bois and the two other areas were named as national parks based on our work has been very gratifying,” says Hedges. “Now with funding from Global Wildlife Conservation and Rainforest Trust, we are beginning the process of land purchase and management to build a network of private nature reserves in the country.”

Bayard and Hedges continue to work closely with the Haitian government. The pair recently founded Haiti National Trust to preserve the country’s natural environment and biodiversity. “When I first landed on Grand Bois mountain with Professor Hedges, I knew it needed to be protected,” said Audubon Society of Haiti President Bayard. “But it could not have happened without this special partnership of scientists, business and nongovernmental organizations working together to save habitat and species in Haiti.”

Morne Grand Bois is found in Haiti’s Massif de la Hotte mountain range, the number-one-priority conservation site in the country and one of the most important sites for amphibians in the world. Because 17 amphibians here are critically endangered, the Massif de la Hotte is an Alliance for Zero Extinction site and also a Key Biodiversity Area, which is a nationally identified site of global significance.

In addition to his research and conservation work in Haiti, Hedges has collaborated with the Philadelphia Zoo to keep alive and/or captively breed 10 of the most endangered frog species still found in the country. As head of Temple’s Center for Biodiversity, Hedges coordinates research that seeks to understand how species evolved, what species currently exist, how species interact with each other and the environment, and how scientists and society can save species from extinction.

—Greg Fornia, KLN ’92
In May 2017, I represented the Alumni Board at the college’s graduation ceremony, speaking to CST faculty, families and students.

With me on stage were remarkable CST researchers, some of the most accomplished scientists in their fields. They are elevating our college and Temple University into the ranks of the world’s premier research institutions. Before me sat hundreds of talented students who had already achieved so much but were prepared for new challenges in graduate or professional school and in promising careers.

CST alumni played a role in the success of many 2017 graduates. Several earned a CST Alumni Board Scholarship or benefited from alumni support of OwlCrowd campaigns that funded student attendance at professional conferences. Many graduates participated in the Owl to Owl Mentor Program, where alumni work one-to-one with students to map out career paths. Others connected with CST graduates at one of the college’s job fairs.

In my remarks, I urged graduates to take on a few more tasks. Whether you graduated five or 50 years ago, I think they apply to all of us who love this university. Be proud of Temple and promote it every chance you get. Participate in alumni events, from Homecoming to regional club activities. Finally, invest in CST, financially or with your time through programs such as Owl to Owl.

With each new graduating class, Temple alumni remain committed to helping the next generation of Owls succeed.

Sincerely,

Sina Adibi (BA ’84, CIS; FOX ’86)

Jennifer Gresh (BS ’98, EES) and Victoria Samuelsen (BS ’15, EES):
Owls make a connection

When Jennifer Gresh graduated from Temple in 1998 with a geology degree, women in her field were relatively scarce. After graduate school, she started working for Duffield Associates, a geoscience and engineering firm where the reality of working in a traditionally male domain hit home.

“When I went on a construction site it wasn’t always easy. Right away, I knew one of my goals would be to help other women succeed in geology,” she says.

As Gresh rose through the ranks from staff geologist to senior consultant to Philadelphia Services Leader, she saw a way to do just that—she joined CST’s Owl to Owl Mentor Program. One of her early protégés was a friend and classmate of Victoria Samuelsen. Samuelsen reached out to Gresh and asked her if she had room for another mentee. “We struck up a friendship and she would reach out to me over the course of her school career and during her first job,” Gresh says. “Eventually we were able to bring her onboard here as a project geologist.”

At Duffield, which provides consulting services for land development and acquisition, Samuelsen currently conducts phase-one and phase-two environmental site assessments, testing groundwater and soil samples. “I get my hands wet out in the field,” Samuelsen says. “It’s a different project every day, so I’m still learning all the time.”

For Gresh, hiring a Temple alum was a win-win. “Temple’s Geology Program is very field-oriented, and it positioned me well for this work. I knew that Tori would be well-prepared,” she says. “I have a strong love for the school, and nurturing these connections is a wonderful investment in the future.”

On Samuelsen’s side, the mentorship experience prepared her for the transition to the professional world. “I knew exactly what I was signing up for when I took this job, which is invaluable. It’s been amazing to watch a strong woman like Jen in action, because I have learned so much from her, on the construction site and beyond.”

—Elisa Ludwig
The College of Science and Technology hosted several of the most well-attended events during Temple University’s 2017 Alumni Weekend celebration.

More than 60 alumni and friends enjoyed Chemistry of Wine. Robert J. Levis, CST senior associate dean and professor of chemistry, deconstructed the interplay of chemical reactions that occur in producing delicious wines. Following the presentation, Greg Moore, president of Moore Brothers Wine Company, lead the group in a tasting of select wines and a discussion on the culture of winemaking.

Cryptography for Kids, which attracted more than 80 young people, explored the science of making and breaking secret codes that is used in virtually every aspect of our computer-based world. CST also hosted an alumni reception in the Science Education and Research Center just before Temple University’s Dîner en Cherry gathering.
Vladan Radosavljevic (PhD ’11, CIS), Nemanja Djuric (PhD ’14, CIS) and Michael Molnar (BS ’13, CIS): Uber and Google successes

Vladan Radosavljevic (PhD ’11, CIS) and Nemanja Djuric (PhD ’14, CIS) are part of the team Uber has assembled to develop an autonomous vehicle. Michael Molnar (BS ’13, CIS) is a technical program manager for Google.

Radosavljevic and Djuric initially worked for Yahoo Labs. About a year ago, the two Serbian natives joined Uber’s Advanced Technology Group in Pittsburgh. “Both of us are working on machine-learning problems related to self-driving cars, such as mapping, perception, prediction and safety,” says Djuric. “It’s really fun working directly on the car as we implement methods and solve problems.”

Adds Radosavljevic: “There are just a handful of groups in the world working on these problems, and we are one of them. It’s challenging, but we have a chance to change the world, improve the quality of life and save the lives of motorists and pedestrians.”

Molnar, who has worked for Google since graduating three-and-a-half years ago, first managed IT projects in Silicon Valley. Since last June, he has been a technical program manager in Google’s Manhattan office. “It’s great to be surrounded by smart, caring people who are just as passionate about what we are doing as I am,” he says. “It’s rewarding to see how our work impacts millions of lives each day.”

Uber’s Djuric also credits Temple for laying a foundation for their success. “Basically, everything we learned during our time at Temple regarding machine learning methods and tools we are now using in the real world,” he says.

Molnar, whose paternal grandparents both graduated from Temple, agrees: “Temple offers a strong foundation in technology—things like networking, basic programming capabilities, how various core technologies work—and those fundamentals have helped me understand what I work on at Google every day.”

—Bruce E. Beans
Jay Novik (BA ’67, Math) named to Temple’s Gallery of Success

Jay Novik, a national leader in both life and property/casualty reinsurance, has been named to the Gallery of Success, a collaboration of Temple’s Office of Alumni Relations and Career Center that highlights the success of inspiring Temple alumni.

Novik is currently a principal of Black Diamond Capital Partners, a specialty private-equity firm focused on insurance-sector investments with significant value-creation potential. During his career, Novik has held many leadership positions in the insurance industry. He was CEO of Atrium Corp., European International Reinsurance and Swiss Re Financial Services. He was also vice chairman of Swiss Re New Markets, Swiss Re America and other Swiss Re companies. He has served on the board of Talbot Holdings, AmeriLife Group, Shenandoah Life Insurance and Savings Bank Life Insurance, all portfolio investments.

Novik is a fellow of the Society of Actuaries and a member of the American Academy of Actuaries. He is also a director of AmeriLife Group, LLC and chairman of the Board of Shenandoah Life Insurance Company. He currently serves on the CST Board of Visitors.

Wei Chang (PhD ’16, CIS): Securing the mobile frontier

Wei Chang has always been interested in social networks and security issues, but since getting his first iPhone he has become especially fascinated by security and privacy risks associated with mobile social networks, peer-to-peer video streaming and the mobile cloud.

“Back in 2009, I downloaded many apps and made a lot of new friends through interactions on my phone,” Chang says. “In the same year, I read an article about bad guys who used the design defects in certain apps to stalk others. It was the first time that I realized there were some privacy and security issues in the cyberworld, and that they were so close to our daily life.”

Chang’s research revolves around developing solutions that can mitigate these growing risks.

“Temple is famous as a research institution, and I was also drawn here to work with Professor Jie Wu, who is well known in the field,” says Chang, who earned an undergraduate degree from Beijing University of Posts and Telecommunications.

At Temple, Chang homed in on social information-assisted distributed system design, developing defense mechanisms for attacks and combatting privacy leakage. His own publications focused on allocating cooperative work in mobile social networks, location privacy and crowdsensing.

In 2016, Chang began a tenure-track teaching position in the computer science department at Saint Joseph’s University in Philadelphia, where he directs a new master’s track in cybersecurity. “For most users, we give our trust to apps by simply downloading and using them, but the fact is that these apps may intentionally or unintentionally leak our sensitive information,” Chang explains. “As computer scientists, we should understand the mechanisms or the techniques behind the apps we all use.”

Chang found his time at Temple served him well for the current challenges of his job. “As a PhD student, there are a lot of pressures and conflicting priorities, but as an international student, Temple was an ideal place, with classmates that provided mutual support,” says Chang. “I developed critical thinking, learned how to identify limitations of existing works, and gained knowledge and skills to improve them.”

— Bruce E. Beans

CST’s Paul Curcillo Elected TUAA President

Paul G. Curcillo II (BA ’84, Bio), a current member of the CST Board of Visitors and a past president of the CST Alumni Board, has been elected president of the Temple University Alumni Association (TUAA) and, by virtue of that position, will serve a three-year term on Temple’s Board of Trustees.

As president of TUAA, Curcillo will help guide the TUAA Parliament, which advocates for Temple’s more than 320,000 living alumni worldwide and fosters closer relationships between alumni and the university. He succeeds Past President Scott Cooper, LAW ’92.

Curcillo is chief of Fox Chase’s Division of Minimally Invasive Surgery; director of minimally invasive surgical initiatives and development; and serves in the Department of Surgical Oncology. He is also president, co-founder and principal of SPAce Inc., an international medical and surgical education and consulting firm.

During his tenure as president of the CST Alumni Association, Curcillo was instrumental in launching the college’s successful Owl to Owl Mentor Program, where CST alumni meet with CST students to offer career guidance.
OWL TO OWL MENTORS ENTERS SIXTH SUCCESSFUL YEAR

Launched during the 2011-2012 academic year, CST’s Owl to Owl Mentor Program was established by the college’s Alumni Board to connect undergraduate students with successful, experienced alumni in similar fields.

In total, more than 450 students and more than 120 mentors have participated in the program, now a model for similar initiatives at Temple’s other schools and colleges. “CST mentors provide information, opportunities and support,” says Steven Szczepanski (BA ’79, PhD ’85, Chem) Alumni Board vice president and chair of its mentor committee. “Mentees learn what it takes to succeed in their field.”

In late summer, prospective mentors and mentees apply to the program via CST’s website. Committee members then review applications and match students with appropriate alumni. For example, students with an interest in drug discovery are matched with alumni working in big pharma. Students and mentors meet at an orientation session and, over the course of the academic year, get together to review career goals; strategize how to enter a particular industry; and discuss specific companies, graduate programs or hiring trends.

“Our success rests squarely on the shoulders of the alumni who built Owl to Owl,” says Szczepanski, who notes the committee is exploring how alumni from beyond the Philadelphia region can participate. “We want to reach more students, provide additional resources for their success and offer alumni another way to give back to Temple.” Learn more about being a mentor at cst.temple.edu/owl2owl.

FLANK GIFT SUPPORTS FACULTY ENDOWMENT

A gift from William (BA ’58, Chem) and Sandra (BA ’56, Chem) Flank will be used to support the Dean’s Endowed Term Professorship Fund, which helps attract top researchers to the college.

The Flanks returned to CST for the dedication of faculty space named for them within the Institute for Genomics and Evolutionary Medicine, which is housed in CST’s Science Education and Research Center.

Dean Michael L. Klein, FRS, with Sandra (BA ’56, Chem) and William (BA ’58, Chem) Flank
OWLCROWD CAMPAIGN SHATTERS GOAL

This year, CST supporters contributed $5,210—more than $1,500 above goal—to help send six computer science students to the 2017 Grace Hopper Celebration of Women in Computing Conference, the world’s largest gathering of women technologists.

CST’s supporters used OwlCrowd, Temple University’s online fundraising tool that offers an easy-to-use way to support student-led and educational activities at the College of Science and Technology. More than 30 alumni, friends, faculty and staff contributed to the effort. Corporate partners Elsevier, Fast Enterprise, PrintMail Solutions and Vanguard provided additional funding for students, and two CST students were awarded scholarships from the Grace Hopper conference. In total, 11 CST students attended this year’s conference, held in Orlando.

Highlighting the research and careers of women in technology, the Grace Hopper conference brings together the best minds in computing and encourages collaborative proposals, networking and mentoring for attendees. Female CST students regularly present their groundbreaking research, which gives them exposure to graduate programs, job prospects and international publications.

Over the past five years, the college has hosted seven OwlCrowd campaigns, raising more than $25,000—mostly through modest individual donations—to support educational opportunities for CST students. Learn more about how to support Temple at giving.temple.edu/OwlCrowd.

SUPPORTING FIELD CAMP EXPERIENCES

Victoria Boyt (BA ’66, Sc), a successful marketing and sales consultant and executive with a strong commitment to environmental issues, is supporting CST through a gift to endow the Gene C. Ulmer Undergraduate Support Fund. The fund helps geology and other Earth & Environmental Science students attend a summer field camp experience, which is critical to their professional development.

Boyt was president of V. Kaufman Enterprises, a marketing firm specializing in entrepreneurial ventures, and a national sales manager at PlayCable Company, a telecommunications joint venture of General Instrument and Mattel.

Boyt, founder and chair of the Environmental Commission of the City of Englewood, N.J., and board member of the Association of New Jersey Environmental Commissions and Flat Rock Brook Nature Association, returned to the college to lecture on career, business and environmental commitment.

To make a gift to the Gene Ulmer Fund and support field camp experiences for geology students, go to giving.temple.edu/givetoCST.
INVESTING IN THE COLLEGE OF SCIENCE AND TECHNOLOGY

Temple alumni share their commitment to CST students and faculty

LEARN WHAT INSPIRED THEIR GIVING AND HOW YOU CAN MAKE YOUR OWN IMPACT
HOW YOU CAN IMPACT THE WORK
OF EXTRAORDINARY RESEARCHERS
AND TALENTED STUDENTS

SUPPORT THE UNDERGRADUATE RESEARCH PROGRAM
Real-world research is an essential part of CST’s curriculum. The college’s Undergraduate Research Program (URP) is designed to get motivated students into the lab with world-class Temple researchers. More than 850 students have participated in URP, working on projects such as an intelligent reasoning system or studying topics like the effects of ocean acidification on coral.

Today, students must have lab experience, especially if they plan on going to medical school or to top graduate programs. In such a competitive market, advanced research experience provides URP students with a distinct edge. Gifts to URP translate into more students getting this invaluable experience.

CONTRIBUTE TO THE DEAN’S ENDOWED TERM PROFESSORSHIP FUND
CST’s extraordinary professors conduct innovative research and invent advanced technology. They attract research dollars and inspire students to excel. Today, many universities are competing fiercely for a small cadre of scientific superstars. To continue attracting remarkable talent, CST needs donor support to establish two term professorships within the college.

Gifts toward endowed term professorships help attract top researchers and top teachers, and the income the funds generate supports leading-edge research in the lab and in the field.

ESTABLISH A ‘TOP-UP’ GRADUATE FELLOWSHIP
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The College of Science and Technology extends its deep appreciation to the alumni, friends, faculty, staff, parents, students, corporations and foundations that made generous contributions between July 1, 2016 and June 30, 2017. Their generosity means CST can continue to set new standards in research, teaching and engagement with the world.

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28 College of Science and Technology
In the seventies, computer science was a course requirement many business school students dreaded, but for Steve Petchon, once he got his feet wet, he never looked back. Although he received his degree in accounting, he pursued a career in computer technology. His first job was working part-time as a student computer services consultant for Temple University. Shortly thereafter he launched his 28-year career with Accenture, ultimately becoming a partner and senior executive responsible for technology competency. Having retired in 2008, Steve credits his experiences in the Department of Computer & Information Sciences for shaping his career and inspiring his philanthropy.

“The faculty in the CIS department taught classes extremely well, giving students plenty of freedom to experiment with computers and learn in their own way. The professors took the time to mentor me and encourage my involvement in computing technology and in Temple’s local Association for Computing Machinery chapter where I was part of team of four that went on to compete at the national level—a pivotal point in determining what I wanted to spend my life doing.”

The Petchon Family Computer and Information Science Endowed Scholarship is awarded to an undergraduate who has demonstrated academic excellence in Computer & Information Sciences. “Temple paved the way for me,” explains Steve. “I support student scholarships because a CS degree is a wonderful degree to have—it will open doors.” In addition, the Steven Petchon ACM Endowment provides funding for activities of the Association for Computing Machinery chapter at Temple. “Investing in students is my way of giving back in an area where I think others can benefit tremendously and to say thanks to the faculty for what they have done for me. College is very expensive today compared to what it cost when I attended, and supporting education is a great way to help CST grow in a positive direction.”

“Investing in students is my way of giving back in an area where I think others can benefit tremendously.”

Steven Petchon, FOX ’80
Faculty inspired investment in students
“The role of a scientist is knowing what questions to ask,” explains Stanley Lefkowitz, a notion he learned and put into practice during his years at Temple as an undergraduate chemistry major. Stanley credits the remarkable faculty, and memorable interactions with them and his peers, with making his Temple experience great. Professors like Hazel Tomlinson, George Harrington and Bob Salomon left lasting impressions that have guided him as a person and as a scientist.

Stanley is executive vice president and chief financial officer of The Falconwood Corporation, an investment banking company. In addition to a bachelor’s degree from Temple, he holds a PhD in chemistry from Princeton University. A scholarship recipient himself, Stanley and his wife Debbie have made it a priority over the past 45 years to give of their time and resources to Temple University. They contribute to four different areas at Temple (CST, CLA, Medicine and Athletics), the most prominent being CST, where Stanley currently serves on the Board of Visitors. “It goes back to asking the right questions, understanding the most prevalent needs, and then choosing to fund the areas we believe are important to us and to making Temple and the world an incrementally better place,” says Stanley.

Distinguished faculty fellowships, TUtEach, and the Debra and Stanley Lefkowitz Undergraduate Student Research Awards are a few areas that have greatly benefited from Debbie and Stanley’s support. “We’ve witnessed the impact that greater resources can give to faculty who are at the forefront of their field, especially in recruiting promising PhD candidates. Many times, all it takes is someone to start and good things happen from there.”
Higher education is an area where you can really help someone move forward in life, accessing opportunities they wouldn’t have otherwise.”
Theodore Largman (BA '48, Chem) was recognized for his 50 years of service on the Morris Township (NJ) environmental commission, during which the Theodore Largman Community Garden was dedicated and named in his honor.

Marilyn Anderson (BA ’66, Bio) released her film, *How to Beat a Bully*, now available on DVD at Walmart stores nationwide and on Amazon, iTunes and Google Play. The lighthearted film, which presents an anti-bullying theme, is being adapted into a novel by Anderson.

Amber Salzman (BA ’82, CIS) was appointed chief executive officer of Adverum Biotechnologies Inc. She is also president of Stop ALD Foundation, a patient-advocacy group.

David Tener (MA ’89, Chem) was included in *The Best Lawyers in America* 2017 for his work in patent law and trademark law with the firm of Caesar Rivise PC, now in its 90th year of business.

Stephen Murray (BS ’03, Phys; LAW ’06) was named to the board of directors of the Eastern Montgomery County Chamber of Commerce. Murray is an attorney at the Philadelphia intellectual property law firm of Panitch Schwarze Belisario & Nadel and a member of the EMCCC Technology Committee.

Kandis Gilliard (BS ’07, Chem) is the founder and CEO of Nardo Technology, which markets technology she developed that uses electrochemical sensors to detect chemical substances in food, water and the overall environment.

Brian Hughes (MS ’11, EES), who earned a law degree from the University of Tulsa College of Law in 2014, is now with the Washington, D.C., office of Pierce Atwood LLP in its energy law group.

Christopher Seminack (MS ’11, EES) earned a doctorate from George Mason University and is designing a geoscience program as an assistant professor of geology at the University of North Georgia.

Franklin Erkes (BS ’12, Chem) earned a doctor of physical therapy degree from New York University in 2015.

Andrew Bentley (MS ’13, EES) earned his PhD in geoscience education from Western Michigan University and has accepted a postdoctoral position at the University of Northern Colorado.

Steve Schnell (BA ’14, Bio) is nearing completion of his doctorate at CST, after a U.S. Army career and seven years as a study coordinator with Charles River Laboratories.

Morgan Taylor (BS ’14, CIS) is working for a national IT management consulting firm, CapTech Ventures Inc., as a consultant to a Fortune 50 telecommunications firm in Philadelphia. Taylor has been consulting project manager for more than two years with her telecommunications client. Prior to that, she worked for CapTech as a business analyst for a space and national-defense security client. “I’m always learning about how different businesses work and how technology can help them,” says Taylor. “I often go back to the CIS Department to engage with students, professors and alumni because the sense of community that CIS offers really helped build and develop me.”

Logan Wiest (MS ’14, EES) is completing his PhD at Baylor University and had an article about the mystery of the massive death of Waco mammoths published in *Palaios* and featured in *Scientific American*.

David Dukes (BS ’15, MS ’17, EES) was awarded a Graduate Student Summer Fellowship from the National Science Foundation-funded Long-Term Ecological Research (LTER) program.

Christopher Conwell (BS ’16, EES) received his third outstanding poster award at the 2016 regional Geological Society of America conference in Albany, New York.

Roselyne Laboso (MS ’16, EES) studied geothermal systems as a fellow at the Lawrence Berkeley National Lab last year. She presented a paper on her research at the Stanford Geothermal Workshop.

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**CLASS NOTES**

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Aron Cowen (BS ’17, Math/CIS)
DELOITTE CONSULTING

Aron Cowen dedicated himself to Temple and in return he realized just how far it would take him. Cowen got involved early in his academic career through organizations such as the Association for Computing Machinery, Model UN and tutoring. That’s when he realized he had a variety of passions.

“I come from a long line of scientific minds with both parents and three grandparents having multiple degrees in various science disciplines,” Cowen says. “Having those role models helped me decide on majoring in not only math but also computer science. And even a minor in physics.”

Cowen was elected president of Temple Student Government for the 2016-2017 academic year, after holding the position of director of government affairs. He pushed hard for several important changes, like increasing university counseling spaces by 50 percent.

One of his best CST memories is working with Professor Boris Datskovsky. “He is a legendary mathematician,” Cowen says. “I learned so much from him because he brings so much excitement to the classroom.”

Cowen is now working for Deloitte Consulting. As a business technology analyst in Deloitte’s office focused on the federal government, he is advising agencies on implementing large-scale technological change. An Owl through and through, Cowen says he will be active in the Temple Alumni Chapter of Washington, D.C.

Cowen, who participated in CST’s Owl to Owl Mentor Program as a student, is looking forward to giving back to Temple. “I hope to have the opportunity to also mentor CST students,” he says. “I’ll tell them to ‘be more than just your major. Get involved.’”

—Nadia Whiting

Nicholas Hestand (PhD ’17, Chem)
UNIVERSITY OF CHICAGO

Nicholas Hestand can’t imagine a better graduate experience than his time at CST. “Some of my success has been due to hard work and some of it has been just luck, joining a fruitful project with Dr. Frank Spano,” says Hestand, who was lead author or co-author of 12 published papers during his time at Temple. “I’ve had a great advisor and great lab mates, and I’ve learned a lot about research.

“Our research focuses on understanding the excited states of molecular aggregates and crystals, particularly in understanding what simple optical experiments, like absorption or photoluminescence, can tell us about a material’s properties,” says the recipient of both university and Francis H. Case fellowships. “For example, we’ve developed spectral signatures that allow us to predict whether a material would be good for transporting energy.”

While commercial applications are beyond the research in which Hestand was involved, the basic principles of organic electronics that he and Spano’s group explored ultimately could have applications for generating solar electricity as well as television and smartphone screens.

Hestand will next be investigating water as a two-year postdoctoral fellow at the University of Chicago’s Institute for Molecular Engineering.

“When I first came to Temple, my goal was to become a professor at a liberal arts institution where teaching would be my main focus,” Hestand says, “but during my time at Temple, I’ve fallen in love with research. Now my goal is to find a faculty position where I can do both.”

—Bruce E. Beans

Fiona Galzarano (BS ’17, Math)
DEPARTMENT OF DEFENSE

One of the top three undergraduate majors in mathematics at Temple, Philadelphia native Fiona Galzarano, a Presidential Scholar and winner of the 2015 Most Promising Mathematics Major Award, has engaged in extensive undergraduate research.

As part of the CST’s Undergraduate Research Program, the computer science and Spanish minor tested an intelligent reasoning system under Associate Professor Pei Wang of the Department of Computer & Information Sciences.

At the 2015 Cornell University Summer Program for Undergraduate Research, she analyzed Apollonian gaskets with Professor Robert Strichartz; presented their results at a March 2016 American Mathematical Society meeting; and is working with him on a related paper.

Finally, Galzarano’s summer work as an applied mathematics intern with the Department of Defense in Maryland has resulted in a full-time job assisting the government with cybersecurity.

“Beyond specific formal proofs, Temple has given me the intuition to be able to figure out stuff on my own,” says the former vice president of Temple’s Association for Women in Mathematics chapter. “The job’s mostly computer science, but it will be ‘mathy’ computer science.”

—Bruce E. Beans
CST hosted its second SeaPerch Challenge, an underwater robotics competition that tested the engineering skills of more than 600 Philadelphia-area middle-school students. Using the underwater remotely operated vehicles that they themselves designed and built, student teams competed in an underwater obstacle course and pipeline repair mission. CST also hosted its 10th ExxonMobil Bernard Harris Summer Science Camp, a two-week, all-expenses-paid program offering students real-world exposure to STEM and an opportunity to meet astronaut Bernard Harris.

Named for the noted 19th century mathematician, CST’s fifth Sonia Kovalevsky Day offered mathematics enrichment activities and competitions for young women in grades 5 through 8. In partnership with the Village, a social service agency working to strengthen Philadelphia families, members of the CST Alumni Board brought fun science activities to children at William C. Bryant Promise Academy and Joseph W. Catherine School.
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