

# UNION COLLEGE



ANNUAL REPORT OF EXTERNAL FUNDING

MARCH 2015 | MARCH 2016

**COLLEGE RELATIONS**  
OFFICE OF CORPORATE, GOVERNMENT  
& FOUNDATION RELATIONS

*Proposals and Awards: A Year in Review*

ON THE COVER:

(TOP) Students Rebecca Babiak '16, Karyn DeFranco '16, and Professor Holli Frey descend through the Valley of Desolation toward Boiling Lake in Dominica, Lesser Antilles. The group is sampling streams and springs to determine the effects of magma degassing and to establish a baseline for water monitoring. Funding provided by National Geographic. Image courtesy of Associate Professor of Geology Holli Frey.

(BOTTOM) A female adult *Schistocerca americana* (known as the American locust) and a first instar (at top of the branch), shown to illustrate the amazing size difference that occurs in about six weeks, from a 10 mg hatchling to a 2.8 gram adult -- the equivalent of a normal human baby going from 7 lbs to almost 2,000 lbs in six weeks. Union's micro-CT, recently acquired through a grant from the National Science Foundation, will be used to understand how structural and functional differences vary in the respiratory system of the grasshopper during this developmental period. Image courtesy of Associate Professor of Biology Scott Kirkton.

**COLLEGE RELATIONS**  
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*Proposals and Awards: A Year in Review*

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## NEW AWARDS

*Alphabetical, by project title*

### Brazil Faculty and Staff Development Trip

(CO-)SPONSORED BY THE NEW YORK SIX LIBERAL ARTS CONSORTIUM, FROM AN AWARD BY THE ANDREW W. MELLON FOUNDATION

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PROJECT PERSONNEL:

Principal Organizers **Lara Atkins** (International Programs) and **Dr. William Garcia** (Modern Languages & Literatures)

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ABSTRACT:

This project supports the New York Six (NY6) consortium's mission to share expertise and resources while enhancing options for students, faculty, and staff. The goal of the project was to engage faculty and international programs staff from the NY6 colleges with Fundação Armando Álvares Penteado (FAAP) University in Sao Paulo – the Brazil program site. The Brazil program has consistently been named as one of the top three study abroad opportunities of interest for undergraduates at each of the NY6 schools. The development trip enabled faculty and staff to learn more about the program, gain a better understanding of the Brazilian culture, and develop valuable contacts and connections with FAAP to facilitate the program's educational experiences and enrichment activities. This project leverages the partnership and collaboration of our six peer institutions, linking faculty and staff from across the consortium to promote collaboration and partnership, and ultimately to enhance the Brazil program recruitment activities.

### Care and Support in Aging Communities

(CO-)SPONSORED BY THE NEW YORK SIX LIBERAL ARTS CONSORTIUM, FROM AN AWARD BY THE ANDREW W. MELLON FOUNDATION

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PROJECT PERSONNEL:

Principal Organizer **Dr. Carol Weisse** (Psychology); Research Mentors **Dr. Cay Anderson-Hanley** (Psychology) and **Dr. David Cotter** (Sociology)

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ABSTRACT:

Activities designed as part of this project will focus on access to end-of-life housing, support, and palliative and hospice care. As more individuals live into older ages, the ways in which modern society either integrates aged individuals and addresses their particular experiences and needs, or fails to, represents an important human rights issue. This work aims to investigate the challenges presented by an aging society in order to enrich their teaching and research, with a broader goal to understand the factors that make communities more 'livable' and contribute to integrated aging. Planned activities for this project will investigate end-of-life care more specifically and aging more broadly through site visits to hospice programs (domestic and international), expert speakers and discussion, and service learning student projects. The goals of these activities are two-fold: to make connections that will promote future teaching and research, and to learn more about the challenges faced by individuals aging today and those who support them.

### Chinese Language Teaching Assistant, Academic Year 2016-17

THE ALLEX FOUNDATION

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PROJECT PERSONNEL:

Project Directors **Dr. Megan Ferry** and **Dr. Zhen Zhang** (Modern Languages & Literatures)

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ABSTRACT:

The ALLEX Teaching Fellow Program provides a means for an institution to augment and enrich its language course offerings in Chinese, Japanese or Korean. For the upcoming 2016-17 academic year, Union will welcome an ALLEX Teaching Fellow who will serve as a crucial participant in Union's Chinese foreign language program, offering additional language practice for students, as well as sustaining the core values of the American Council on the Teaching of Foreign Languages (ACTFL) Standards by seamlessly linking the classroom with the community, especially the Chinese-speaking community on campus. The teaching assistant will increase Union students' access to Chinese cultural habits, products, and beliefs, as well as assist students in making connections across the various academic disciplines (e.g., environmental sustainability for Environmental Science students and China's global relations with Latin America or Africa for Economics or Political Science students).

### Conference Travel Funding: Alpine Conference on Algebraic and Applied Topology

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. Brenda Johnson** (Mathematics)

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ABSTRACT:

Saas-Almagell, Switzerland will serve as the location for the Alpine Conference on Algebraic and Applied Topology to take place August 15<sup>th</sup> through August 21<sup>st</sup>, 2016. The conference will bring together experts in both the theoretical aspects of algebraic topology and the growing range of scientific applications of topology. The conference program will consist of lectures by the invited plenary speakers, together with contributed talks from other conference participants. The plenary speakers will inform participants about recent advances in their fields, and provide insight into possible directions for future work. All participants will have the opportunity to discuss their work and receive feedback from other experts in the field, to continue existing and form new collaborations, and to learn more about potentially useful tools and techniques outside their areas of expertise. This award will ensure that the U.S. algebraic topology community is well-represented at this important conference, and, in particular, that early-career topologists from the U.S. have the opportunity to participate.

## NEW AWARDS

*Continued*

### Educating Girls for Engineering

GENERAL ELECTRIC, GLOBALFOUNDRIES, AND  
THE AMERICAN SOCIETY OF CIVIL ENGINEERS

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PROJECT PERSONNEL:

Project Director **Dr. Cherrice Traver** (Electrical & Computer Engineering)

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ABSTRACT:

**E**DGE is an intensive, two-week summer residential program with the mission to inspire high school girls' interest in engineering. The program combines real-life college learning and living experiences with activities intended to spark interest in participants to study science, health and engineering in college and undertake a career in one of those disciplines. EDGE's unifying theme of "Toys and Tools for Disabled Children" illustrates the humanitarian aspects of engineering and focuses on developing technologies to enhance the learning activities and communication skills of children with special needs. The theme also immerses participants in all aspects of engineering, from theory and academic learning to field trips and activities where real-life examples of engineering are studied. This provides the opportunity to learn about different career opportunities, engineers' educational and work experiences, and mentoring for girls interested in a particular field.

### Encounters with Circus and Its Others

SOCIAL SCIENCES AND HUMANITIES RESEARCH COUNCIL OF CANADA

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PROJECT PERSONNEL:

Principal Organizer **Dr. Charles Batson** (Modern Languages & Literatures)

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ABSTRACT:

**F**rom Pink and Britney Spears' stage shows to *American Horror Story* to Cirque du Soleil's status as the world's most successful live performing arts company, circus in the early 21<sup>st</sup> century has undeniably gone mainstream. This positive news for circus companies, artists, and audiences with a taste for thrilling entertainment raises questions about circus's historic status as a site for celebration and exploitation of differences, from stagings of exceptional performing bodies to the display of "freakery." This project addresses these questions, focusing on what and whom have been targeted as different, as Other, in contemporary circus practice. We include questions of gender, sexuality, embodiment, ability/disability, ethnicity, class, and species. Encounters with Circus and Its Others proposes extended and multi-faceted engagement with these concerns via exchanges between scholars, circus artists and workers, and the public. The three-part series of "Encounters" will be held in connection with the July 2016 iteration of Montréal Complètement Cirque (MCC) festival, whose collaboration, along with Cirque du Soleil and the National Circus School, will bring these conversations to a broad public.

### Engineering Ambassadors Network

GENERAL ELECTRIC

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PROJECT PERSONNEL:

Project Director **Dr. Shane Cotter** (Electrical & Computer Engineering)

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ABSTRACT:

**T**his grant from General Electric supports outreach events to middle and high school students as part of the Engineering Ambassadors Network (EAN). Originally funded by the National Science Foundation, EAN is a collaboration of engineering students across universities dedicated to changing the conversation middle and high school students are having about engineering. The EAN serves the need for strong future leaders in engineering and supports recruitment of a diverse future generation of engineers. Union's EAN students will attend an intensive 2-1/2 day workshop of hands-on training to learn the fundamentals of building outreach presentations using messages from the National Academy of Engineering's Changing the Conversation to develop a 10-15 minute presentation. The program will expand to include a social/professional event, and will coordinate efforts by partnering with Rensselaer Polytechnic Institute's EAN. Additionally, the program will involve Union's SUCCESS scholars, a cohort of academically talented students majoring in STEM disciplines.

### III: Small: RUI: Collaborative Research: ANTE – A Four-Tier Framework to Boost Visual Literacy for High Dimensional Data

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. Kristina Striegnitz** (Computer Science)

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ABSTRACT:

**W**ith the massive availability of data, the need to understand and be comfortable with data has gained increasing importance. There is now a great demand for individuals with the skills to extract meaning from data. Visualizations, such as bar charts, line plots, maps, etc. that most people are familiar with, are helpful in explaining data. However, today's data sets often combine many different kinds of information and are, therefore, too complex to be represented with these basic visualizations. This project aims to develop a visualization system that can represent data in such a way that a user can make sense of complex data without extensive training. This will involve advances in visualization techniques and novel approaches to presenting visualizations in an engaging way. The ANTE (Appeal, Narrate, Transform, Engage) system developed in this project has good potential to help increase the ability of citizens to become more knowledgeable participants in an increasingly data-centric society. The visualization tools and games will make an excellent environment for teaching both data and visual literacy, at all education levels.

## NEW AWARDS

Continued

### MRI: Acquisition of a High-Resolution Micro-Computed Tomography System for Multidisciplinary STEM Research and Undergraduate Training

THE NATIONAL SCIENCE FOUNDATION

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#### PROJECT PERSONNEL:

Principal Investigator **Dr. Scott Kirkton** (Biology); Co-PIs **Dr. Jennifer Currey** (Bioengineering), **Dr. Leo Fleishman** (Biology), **Dr. Robert Olberg** (Biology), and **Dr. John Rieffel** (Computer Science); Senior Personnel **Dr. David Hodgson** (Mechanical Engineering), **Dr. Steven Rice** (Biology), and **Dr. Nicole Theodosiou** (Biology)

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#### ABSTRACT:

**M**icro-CT ( $\mu$ CT) provides a nondestructive method to visualize complex internal structures of a sample ranging from micro to macro scales. Analysis of  $\mu$ CT images can address fundamental structure-function questions in science, technology, engineering, and mathematics (STEM). This project will have broad impacts on STEM fields. First, it will enhance both multidisciplinary and interdisciplinary STEM research at Union College that will influence external researchers and build future collaborations. Second, the project will provide 18 undergraduate research opportunities across STEM fields each year. Access to research training will increase student interest in pursuing graduate STEM study and improve the scientific and technical research infrastructure of our country. Third, each year approximately 260 Union College students will interact with cutting-edge  $\mu$ CT technology and its capabilities through a wide variety of STEM classes. Finally, Union College has established K-12 outreach programs aimed at encouraging students from traditionally underrepresented groups to enter STEM fields including a program that provides scholarships and intensive cohort mentoring with educational enrichment activities to increase undergraduate retention and achievement in STEM disciplines. This project will enhance the work of these groups by leading students through exciting, hands-on  $\mu$ CT imaging with associated 3D printing modules. The goal of these outreach activities is to help students see themselves as future scientists and engineers.



With the capabilities offered by the new micro-CT, Union faculty and student researchers are able to examine and analyze complex internal structures, such as this 10-week skate embryo, *Leucoraja erinacea*, transverse section. Image courtesy of Associate Professor of Biology Nicole Theodosiou

### Optical Components to Construct a Surface Plasmon Resonance Apparatus and a Self-Standing Microscope

THE JONATHAN F. REICHERT FOUNDATION

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#### PROJECT PERSONNEL:

Principal Investigator **Dr. Seyfollah Maleki** (Physics & Astronomy)

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#### ABSTRACT:

**U**nion's ALPhA Immersion Equipment grant is notably part of the Foundation's inaugural program to support faculty who have participated in the Advanced Laboratory Physics Association (ALPhA) Immersions program. The Surface Plasmon Resonance Apparatus and self-standing microscope will enable students to conduct new experiments on nano-plasmonics and Surface Enhanced Raman Spectroscopy (SERS), as part of the required advanced physics lab (Physics 300, Methods of Modern Physics). This new experimentation connects research with Raman Spectroscopy applications as well as the study of physics of nano structures.

### Our Shared Humanities

THE ANDREW W. MELLON FOUNDATION

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#### PROJECT PERSONNEL:

Program Director **Dean Wendy Sternberg** (Academic Affairs); Steering Committee members **Dr. Andrew Burkett** (English), **Dr. Daniel Burns** (Psychology), **Dr. Deidre Hill Butler** (Sociology), **Dr. William Finlay** (Theatre & Dance), **Frances Maloy** (Schaffer Library), **Dr. Fernando Orellano** (Visual Arts), **Dr. John Rieffel** (Computer Science), and **Denise Snyder** (Information Technology Services)

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#### ABSTRACT:

**T**he *Our Shared Humanities* initiative promotes the integration of the arts and humanities across academic disciplines through faculty development and a series of distinctive hands-on experiences for students and faculty. This three-year project allows the College to build on its traditional strength of crossing disciplinary boundaries to prepare students for an increasingly diverse, global and technologically complex society. This will be done by providing faculty with a broad range of opportunities to explore and develop collaborations. These include workshops, discussion groups and participation in conferences that bring artistic and humanistic perspectives to bear across disciplinary boundaries. The grant will support workshops and initiatives related to instructional design and student-centered learning including a series of events that educate faculty on state-of-the-art research about how students learn, the expansion of Union's Faculty Development Institutes (FDI), promotion of Union's Maker Community, and acquisition of library holdings that will expand our collections of materials that integrate the arts and humanities across the disciplines.

## NEW AWARDS

*Continued*

### Postdoctoral Teaching Fellow in Japanese Literature and Film

THE ASIANETWORK – LUCE FOUNDATION

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PROJECT PERSONNEL:

Project Directors **Dr. Megan Ferry** and **Dr. Junko Ueno** (Modern Languages & Literatures)

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ABSTRACT:

This grant will support a postdoctoral teaching fellow, a position which will have a tremendous impact on Union's Asian Studies Program and the Japanese program in the Modern Languages and Literature department. The fellow will teach Japanese literature and Japanese film courses during the 2016-2017 academic year. These classes will not only provide an excellent opportunity for the Japanese language students to deepen their cultural knowledge and to complement and enhance their language course experiences, but will also provide an opportunity for non-Japanese language students to learn about the Japanese culture. The fellow will help to reinforce the bridge between Union's Asian Studies Program and the local community through a partnership with the Albany Japanese Language School to extend student learning outside the classroom and foster lifelong language and cultural learning. In addition to teaching, the fellow will create a community-based culture learning module, facilitate an extra-curricular film series, and participate in the weekly lunchtime "Japanese Table" in the college dining hall.

### Science Technology Entry Program at the Kenney Community Center

THE NEW YORK STATE EDUCATION DEPARTMENT

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PROJECT PERSONNEL:

Program Director **Angela Tatem** (The Ralph and Marjorie Kenney Center)

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ABSTRACT:

STEP was established in 1985 by the NYS Legislature to increase the number of historically underrepresented and economically disadvantaged students prepared to enter college, and improve their participation rate in mathematics, science, technology, health related fields and the licensed professions. STEP provides academic enrichment in science and mathematics content areas. Since 1994, Union College has been awarded the STEP grant by the NYS Education Department to establish collaborative relationships with public schools in the City of Schenectady. Public school students partner with Union faculty and students to receive high-quality instruction in math, science and technology through academic tutoring, college-level enrichment courses, and opportunities to work on research projects. The Kenney Center hosts sessions comprised of academic workshops and local field trips during the academic year, and a three-week intensive research-based program in the summer.

### Supplement: Collaborative Research: RUI: Deep Drilling of Lake Junin, Peru: Continuous Tropical Records of Glaciation, Climate Change and Magnetic Field Variations Spanning the Late Quaternary

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. Donald Rodbell**; Co-PI **Dr. David Gillikin**; Senior Personnel **Dr. Matthew Manon** and **Dr. Anouk Verheyden-Gillikin** (Geology)

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ABSTRACT:

Public outreach is the primary focus, aiming to substantively engage stakeholders including lake area residents, teachers, government officials, and the Peruvian environmental community. A variety of activities are designed to communicate the purpose and benefits of the drilling project (especially to eliminate concerns regarding resource exploration or extraction), and to initiate a program of community sampling of natural waters for heavy metal and nutrient contaminants. Outreach efforts will have broad impacts by working with teachers in the villages around the lake to bring science into the classroom, supporting public science engagement and literacy, developing content for an interpretive center on the shores of Lago Junin, and engaging stakeholders in discussions to draw out their questions about the past and future environment of the region.

### Undergraduate Summer Research Fellow

GLOBALFOUNDRIES

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PROJECT PERSONNEL:

Program Director **Dr. Rebecca Cortez** (Mechanical Engineering & the Office of Undergraduate Research)

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ABSTRACT:

Through a competitive selection process, the GLOBALFOUNDRIES Undergraduate Summer Research Fellow will conduct original research for eight weeks during the summer with a faculty member. Undergraduate research provides opportunities for students to develop a critical understanding of their field through learning the current state of knowledge, gain experience and confidence in knowing when and how to ask the right questions to solve difficult problems, and students often have the satisfying experience of coauthoring publications and delivering papers at conferences. Union students have participated in the National Conference on Undergraduate Research (NCUR) every year since its inception in 1987. Over the years, Union has sent more than 700 students to NCUR, among the largest delegation of undergraduates to this conference. Our students present their work at annual meetings of professional societies including The American Chemical Society, ASME International Mechanical Engineering Congress & Exposition, American Physical Society, and the Materials Research Society.

## NEW AWARDS

*Continued*

### Union College: Host Institution for a Russian FLTA, Academic Year 2015-16

THE INSTITUTE OF INTERNATIONAL EDUCATION

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#### PROJECT PERSONNEL:

Program Director **Dr. Kristin Bidoshi** (Modern Languages & Literatures)

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#### ABSTRACT:

The Institute of International Education (IIE) administers the U.S. Government's flagship international exchange program – the Fulbright Program. The Fulbright Foreign Language Teaching Assistant (FLTA) program provides welcome and exciting resources for Union's Russian language program. The FLTA assists in teaching first and second year language courses. In conjunction with that work, the FLTA leads practice or drill sessions, offers guided conversational activity, and provides tutoring as appropriate. The FLTA attends and actively participates in Language Table and Language Club meetings, while fully engaging in campus life by residing in residences associated with our language programs, offering to our students further informal practice in every-day conversational language. The FLTA is a valuable asset to Union, offering the college community an increased international presence and diversity in language programming.

### Union College Space Grant 2015-18

NASA – NEW YORK SPACE GRANT AT CORNELL UNIVERSITY

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#### PROJECT PERSONNEL:

Principal Investigator **Dr. Rebecca Koopmann** (Physics & Astronomy)

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#### ABSTRACT:

Union has been a member of the NASA – New York Space Grant since 2007. The research objectives for students who participate in the summer research program are threefold: 1. to participate in a STEM research project; 2. to engage in the summer seminar program at Union College; and 3. to present their findings at a local, regional or national conference. On-campus presentations and summer seminars provide a natural forum for these projects, and help students gain exposure to the variety of other science and engineering projects on campus. Participants are involved in Union's summer student seminar program. They present their findings at campus research seminars and are strongly encouraged to present their results at regional or national meetings. Outreach activities include partnering with the Kenney Center and local secondary schools for the Physical Constants Workshop for high school physics teachers and students. Teachers and students work in teams with Union faculty and advanced undergraduates to perform experiments, gaining experience with modern instrumentation and laboratory techniques such as high-resolution video analysis, scattering experiments with a particle accelerator and scanning electron microscopy.

## ACTIVE & COMPLETED GRANTS

*Alphabetical, by project title*

### A Physicochemical Exploration of the Diffusion of Small Molecules in Glassy and Highly-Viscous Materials

THE AMERICAN CHEMICAL SOCIETY – PETROLEUM RESEARCH FUND

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#### PROJECT PERSONNEL:

Principal Investigator **Dr. Andrew Huisman** (Chemistry)

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#### ABSTRACT:

Diffusion is a process fundamental to molecular motion that is of interest when molecules reach an interface or penetrate a viscous or vitreous material. This study explores the molecular diffusivity of a small tracer molecule in highly viscous systems. A basic relationship between the observed diffusivity and the physicochemical properties of the system is sought. In addition to water, the diffusive behavior of small organics such as methanol and ethanol (used in chemical synthesis and many industrial processes) in viscous and glassy media are being explored. The project involves several Mechanical Engineering and Chemistry students in the design and fabrication of the temperature and humidity-controlled sample cell for the Raman microscope, construction and improvement of Union's electrodynamic balance (EDB), the performance of proposed experiments, and the acquisition and analysis of data taken on the EDB in consultation with the principal investigator.

### Aquatic Biogeochemistry: Tracking Pollution in Fluvial Systems

THE KECK GEOLOGY CONSORTIUM

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#### PROJECT PERSONNEL:

Principal Investigator **Dr. Anouk Verheyden-Gillikin** (Geology)

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#### ABSTRACT:

This Keck Sophomore Project was designed for students from groups underrepresented in the Earth Sciences who might be considering majoring in Geology or Environmental Science. Students were exposed to a challenging topic with wide application potential (isotopes), collecting samples in the field and working with state of the art equipment in the lab, including a stable isotope ratio mass spectrometer (IRMS). Students engaged in research on the distribution of stable carbon and nitrogen isotopic composition of fluvial systems in the Catskill and Schoharie regions of New York to pinpoint polluted areas. In the field, various types of samples were collected from sites along different streams, then cleaned and prepared for the students to do the analysis using the IRMS. Results will be used to develop a distribution map of stable carbon and nitrogen isotopic composition of several streams in the Catskills. The isotope map or 'isoscape' will be used to pinpoint areas of increased waste water discharge.

## ACTIVE & COMPLETED GRANTS

*Continued*

### Artifact-Free Reconstruction of Medical Imaging Information

THE NATIONAL INSTITUTES OF HEALTH

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PROJECT PERSONNEL:

Principal Investigator **Dr. Jue Wang** (Mathematics); Senior Personnel **Dr. Ronald Bucinell** (Mechanical Engineering), **Dr. Shane Cotter** (Electrical & Computer Engineering), and **Dr. Scott LaBrake** (Physics & Astronomy)

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ABSTRACT:

**P**rostate cancer is the most common cancer after skin cancer and the second leading cause of cancer death in men in the United States. The options for radiotherapy treatment planning of prostate cancer are limited by CT's low soft tissue contrast, MRI's distortion of prostate shape, and ultrasound's speckle noise and attenuation-induced imaging artifacts. This grant supports the design and development of a novel technique for reconstruction of medical imaging information. This project exploits a greater potential of trans-abdominal ultrasound imaging in prostate cancer treatment planning than is currently being realized in daily verification. If successful, the proposed method will improve attenuation artifact correction, reveal hidden/additional clinic-important information, automatically delineate anatomic structures, increase cancer treatment accuracy, and reduce normal tissue toxicity.

### Cognitive Benefits of Interactive Mental and Physical Exercise for MCI

THE NATIONAL INSTITUTES OF HEALTH

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PROJECT PERSONNEL:

Principal Investigator **Dr. Cay Anderson-Hanley** (Psychology); Senior Personnel **Dr. Kristina Striegnitz** (Computer Science)

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ABSTRACT:

**T**he primary goal of this research project is to replicate and extend the recently concluded randomized clinical trial (RCT) investigating interactive physical and mental exercise, "Cybercycling for Cognitive Health" (Anderson-Hanley et al., 2012a). Investigators found significant cognitive benefit after three months of simultaneously combined physical and mental exercise (i.e., exergaming), when contrasted with physical exercise alone. Results suggest that for the same effort, interactive physical and mental exercise on a cybercycle can yield greater cognitive benefit than physical exercise alone on a stationary bike. This project extends the research to persons with mild cognitive impairment (MCI), to examine the generalizability of the above finding to those already experiencing cognitive decline, with the hypothesis that cybercycling can slow decline more than either physical or mental exercise alone.



Kathryn Kurchena '16 and Katherine Christopher '16 engage in lab work to learn about the ecology of ticks carrying lyme disease. Image courtesy of Professor of Biology Kathleen LoGiudice.

### Collaborative Research: Elucidating the Interactive Effects of Sensory Response and Signal Function on the Evolution of Signal Diversity

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. Leo Fleishman** (Biology)

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ABSTRACT:

**A** fundamental challenge of modern Zoology is to understand why, in some cases, large numbers of similar-appearing animal species have formed, and continue to coexist, in relatively limited geographical areas. This study examines the role of communication in facilitating species boundaries in communities of Anolis lizards, focusing on lizard communities on the islands of Jamaica, Hispaniola and Puerto Rico. This project includes a strong outreach component, involving high school, undergraduate and graduate students with a special effort to include groups underrepresented in the sciences. By explaining the role of effective communication in the maintenance of reproductive boundaries between species, the project will provide information that is critical for conservation efforts aimed at preserving biological diversity through habitat preservation and reconstruction.

## ACTIVE & COMPLETED GRANTS

*Continued*

### Collaborative Research: RUI: Deep Drilling of Lake Junin, Peru: Continuous Tropical Records of Glaciation, Climate Change and Magnetic Field Variations Spanning the Late Quaternary

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. Donald Rodbell** (Geology)

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ABSTRACT:

Our ability to understand the full complexity of climate change and forecast future regional trends requires that we extend the available instrumental records into the geologic past. Over the past several decades paleoclimatologists have developed myriad proxy indicators of past regional climate that are recorded in natural archives such as ice cores, cave deposits, and lake sediment, among many other archives. Proxy paleoclimate records from the tropics are particularly important because this region is the “heat engine” of Earth. Understanding the role of changes to ocean-atmosphere circulation and other causes of climatic events is critical because these phenomena can have a profound impact on regional water balance that directly affects potable water supplies, hydroelectricity generation, and agricultural productivity. Lake Junin is exceptional in the length of record that it contains, but also in the climate signals that it records. This research will develop these and other proxy climate records for the full length of recovered core; the records generated will comprise one of the longest continuous records of climate and environmental change from the inner tropics.

### Collaborative Research: Measuring and Modeling Collective Intelligence

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. Christopher Chabris** (Psychology)

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ABSTRACT:

The “holy grail” of artificial intelligence research for decades has been to design computers with robust, integrated, human-like intelligence. This goal has proven elusive, in spite of a massive amount of research. But another goal is just now becoming feasible, and so has been the subject of much less research: using vast computer networks to create new kinds of intelligent entities that combine the best of both human and machine intelligence. One key to designing such human-centered computing systems is better ways of measuring the collective intelligence they exhibit. That is the focus of this research, which represents a collaborative effort among researchers at the Massachusetts Institute of Technology (lead institution), Carnegie Mellon University, and Union College.

### Collaborative Research: Provenance and Thermal Evolution of the Chugach Prince William Terrane in Southern Alaska

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. John Garver** (Geology)

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ABSTRACT:

Research on the Chugach-Prince William terrane directly addresses several key problems in North America tectonics related to terrane formation, translation, accretion, and basin formation, and is helping advance geochronologic methods used for tracking the origin and thermal evolution of sedimentary rocks. The results of this work are providing a better tectonic framework for understanding the timing and nature of basin formation (including hydrocarbon-rich strata), and the timing and extent of precious metals deposits (gold) associated with intrusive rocks. This project also has a strong educational component aimed at increasing the number of students in the geoscience pipeline and ultimately the workforce, and this effort is partly aimed at recruiting students underrepresented in the geosciences. The faculty researchers are involved in the direct training, mentoring, and assessment of undergraduate students through the Keck Geology Consortium framework. The Keck Geology Consortium plays a leading role in the research training of promising students, and supplies the geoscience pipeline with bright, talented, well-trained students, many of whom become leaders in the field.

### Educating Girls for Engineering

GENERAL ELECTRIC

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PROJECT PERSONNEL:

Program Director **Dr. Cherrice Traver** (Electrical & Computer Engineering)

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ABSTRACT:

EDGE is a pre-college educational enrichment program designed to address the serious and continuing under-representation of women in engineering. The program is designed to give participants academic learning experiences not available in the standard high school curriculum, as well as encourage humanistic approaches to group activities. The program's theme of “Toys and Tools for Disabled Children” focuses on developing technologies to enhance the learning activities and communication skills of children with special needs. Through intensive course modules and team projects, the program aims to instill in participants a compassionate, civic-minded approach to addressing societal issues. Participants will develop the theoretical and technical knowledge to not only build tools and toys for the disabled, but also to make educated, informed decisions about their career paths.

## ACTIVE & COMPLETED GRANTS

*Continued*

### Grass Roots Activism and the American Wilderness: Pioneers in the Twentieth Century Adirondack Park Conservation Movement

THE COUNCIL ON LIBRARY AND INFORMATION RESOURCES

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PROJECT PERSONNEL:

Project Directors **Annette LeClair** and **India Spartz** (Schaffer Library)

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ABSTRACT:

The papers of John S. Apperson and Paul Schaefer held at the Kelly Adirondack Center collectively cover nearly 100 years of political activism to conserve the Adirondack Forest Preserve and to expand the Adirondack Park, the largest protected parkland in the contiguous United States. Apperson's and Schaefer's papers, which span the years 1899 to 1996, remain pertinent to 21<sup>st</sup> century conservation issues, wherein social, economic, and environmental concerns so often clash. Their grass roots efforts and extensive correspondence with both local and national figures provide a wide variety of examples of how such issues were negotiated. The Apperson and Schaefer papers also reveal the deep connections between activists working on Adirondack preservation and their colleagues moving on the national stage. Ideas and practices forged in the Adirondacks helped shape the political efforts that culminated in the Wilderness Act of 1964, one of the defining moments of modern American environmentalism. More broadly, the collections document a range of dynamics that helped fuel the transformation of Americans' attitudes toward the environment. Access to the collections will further the research options for scholars already utilizing collections on the subjects of environmental history and the national conservation movement in institutions including the Library of Congress, the Denver Public Library (which houses the Wilderness Society papers and the Howard Zahniser papers), the Bancroft Library at UC Berkeley, the New York State Archives, and the Adirondack Museum at Blue Mountain Lake.



One of the hidden treasures found in the processing of the John S. Apperson papers is this c. 1901 candid photograph of Theodore Roosevelt and his youngest daughter Ethel Roosevelt stopping for a meal while hiking in the Adirondacks.

### Holocene Climatic Change and Active Tectonics in the Peruvian Andes: Impacts on Glaciers and Lakes

THE KECK GEOLOGY CONSORTIUM

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PROJECT PERSONNEL:

Principal Investigator **Dr. Donald Rodbell**; co-PI **Dr. David Gillikin** (Geology)

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ABSTRACT:

This Keck project tied to an existing National Science Foundation (NSF) grant designed to generate continuous, centennial to millennial-scale records of mountain glaciation in Peru spanning the Holocene (~12 ka to present) that will enable testing of hypotheses concerning the causes of abrupt climate change in the tropics. For this project, researchers aimed to broaden the scope to include biogeochemistry of alpine lakes and active tectonics. This research had three key goals: (1) Produce centennial-scale records of glacial flour flux using geochemical analyses of proglacial lake sediment cores from sites that span the steep precipitation gradient in the central Peruvian Andes; (2) Determine the age of moraines using cosmogenic radionuclide (CRN) dating methods to provide information about both the timing and extent of major Holocene ice advances; (3) Test the scale and climatic forcing of Holocene glacier variability by using inverse modeling of valley-specific paleoglaciers and comparing results from this with available regional paleoclimate proxy data.

### Hurricane Camille: Race, Rights and Disaster Relief

THE NATIONAL ENDOWMENT FOR THE HUMANITIES

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PROJECT PERSONNEL:

Project Director **Dr. Andrew Morris** (History)

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ABSTRACT:

Hurricane Camille devastated the Mississippi Gulf Coast in 1969 and brought the failures of disaster relief in the U.S. into sharp focus. The author illustrates how disasters punctuate American history, and yet we lack a clear history of the shifting assumptions of where responsibility for disaster relief should lie, and the personal and political circumstances that shaped those assumptions, arguing that Hurricane Camille decisively shifted the locus of responsibility for disaster relief to the national level. The expectations and controversy surrounding the relief effort in Mississippi – though peculiar in some ways to that state's politics and demographics – nonetheless opened up disaster relief to the same forces that had pushed other areas of social policy toward a broader federal role. The book will be based on oral history interviews to shed light on the challenges faced by the victims of Hurricane Camille, and how disaster policy expanded to meet these needs.

## ACTIVE & COMPLETED GRANTS

*Continued*

### IgniteCS

THE TIDES FOUNDATION

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PROJECT PERSONNEL:

Faculty Advisor **Dr. Nick Webb** (Computer Science); Student team members from the **Association for Computing Machinery Committee on Women in Computing (ACM-W)**

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ABSTRACT:

Union's ACM-W will advance several key initiatives through the Tides Foundation – Google Education grant, including IgniteCS, an after-school program for middle school students, offered through the Kenney Community Center. ACM-W will also continue the NCWIT Social Robotics Workshop that is already in place between Union College and SUNY Albany. The ACM-W members will teach the students how to build and program a NXT EV3 Lego Robot. These robots have motor control, UV sensors, audio output, and touch sensors. The goal is to have the students develop a personality for their robots over the course of the program, the last step being robot speech. Success will be measured by having a robot challenge during the last session of the program. For example, building a Rube Goldberg machine using their programming skills they have learned, the robots themselves, and Legos from the NXT robot kits.

### Kaehler Geometry

THE SIMONS FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. Christina Tonnesen-Friedman** (Mathematics)

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ABSTRACT:

The Collaboration Grant for Mathematicians supports intensive collaboration and travel to promote collaborative activities. The goal of the program is to support the 'mathematical marketplace,' to substantially increase collaborative contacts in the community of mathematicians working in the U.S. by enhancing the research atmosphere within the department. Through the grant, Union has hosted numerous visits to campus, advanced faculty research, and supported departmental activities, particularly enabling a greater number of participants at the annual mathematics conference held each fall. More specifically, the grant funding has supported collaborative research at a much more intensive level, allowing for in-person work that has proven far more fruitful than virtual connections. Also, the mathematics department has enjoyed a much larger than usual number of invited speakers to the benefit of its faculty, students, and the broader campus community. Notably as a result of welcoming speakers to campus, they have returned the favor of inviting our faculty to speak at their home institutions. This demonstrates the broader impact of such valuable resources to help cultivate collaborations.

### MRI: Acquisition of a Multi-Material 3D Printer to Enable Novel Multi-disciplinary Research and Research Training

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. John Rieffel** (Computer Science); co-PIs **Dr. Ann Anderson** (Mechanical Engineering) and **Dr. Steven Rice** (Biology); Senior Personnel **Dr. Takashi Buma** (Electrical & Computer Engineering), **Dr. Michael Hagerman** (Chemistry), and **Dr. Robert Olberg** (Biology)

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ABSTRACT:

Three-dimensional printing technology is the centerpiece of Union's Collaborative Design Studio (UCDS), and serves as the foundation of an inherently cross-disciplinary and highly collaborative research program. Providing a common space in which community members can design solutions and solve problems together helps foster and spark spontaneous interdisciplinary collaborations. Students using the space are emboldened as craftspersons and enabled as entrepreneurs. Not only does this acquisition help set the standard for the integration of rapid prototyping techniques into undergraduate research and teaching, it provides tools, methods, and environments around which tomorrow's designers will coalesce and thrive.

### MRI: Acquisition of an Inverted Optical Microscope to Enable Interdisciplinary Research that Unites Five Departments within the Union College Nanoscience Program

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. Samuel Amanuel** (Physics & Astronomy); co-PIs **Dr. Palmyra Catravas** (Electrical & Computer Engineering), **Dr. Brian Cohen** (Biology), **Dr. Rebecca Cortez** (Mechanical Engineering), and **Dr. Michael Hagerman** (Chemistry); Senior Personnel **Dr. Joanne Kehlbeck** (Chemistry) and **Dr. Seyfollah Maleki** (Physics & Astronomy)

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ABSTRACT:

An integrated optical/AFM system supports Union's long-standing commitment to incorporate undergraduate research experience as an integral part of the curriculum and develop innovative, multidisciplinary research and teaching opportunities through active learning that includes hands-on experience in instrumentation. Enhanced student expertise with key materials characterization techniques promote professional development and opens up career opportunities in science and technology. The instrument is an integral part of the dynamic outreach programs that use frontiers of science and technology to engage the general public through applications such as the arts and food science, designed for high school students and teachers.

## ACTIVE & COMPLETED GRANTS

*Continued*

### MRI: Acquisition of a Stable Isotope Ratio Mass Spectrometer for Interdisciplinary Research and Undergraduate Research Training

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. David Gillikin** (Geology); co-PI **Dr. Donald Rodbell** (Geology); Senior Personnel **Dr. Jeffrey Corbin** (Biology), **Dr. Kathleen LoGiudice** (Biology), and **Dr. Anouk Verheyden-Gillikin** (Geology)

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ABSTRACT:

This grant supported the acquisition of a stable isotope ratio mass spectrometer (SIRMS), an instrument that supports a range of research and research training in paleoclimatology and paleoceanography that requires analysis of stable isotope ratios recorded in marine and freshwater bivalves and in marine and lacustrine sediments. The instrument also supports isotopic investigations of natural waters, glacial ice and plant materials for paleoenvironmental and paleoecological studies of climate dynamics and the global carbon cycle. The PIs incorporated use of the instrumentation into K-12 outreach activities aimed to engage at-risk and underrepresented youth in topical regional investigations of immediate societal relevance.

### MRI: Development of an Instrument for Testing Catalytic Aerogel

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. Bradford Bruno** (Mechanical Engineering); co-PIs **Dr. Ann Anderson** (Mechanical Engineering) and **Dr. Mary Carroll** (Chemistry)

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ABSTRACT:

This grant enabled an interdisciplinary team of researchers to develop an advanced modular engineering testbed. The Union Catalytic Testbed (UCaT) provides researchers with the capability to undertake experiments in catalytic aerogel material (CAM) performance that were previously not possible, because there are no commercially available instruments or systems that have the required capabilities for the application and are economically feasible for an undergraduate institution. The unique physical properties of aerogel materials, including high surface area, low density and good thermal stability, offer significant advantages for use as automotive catalysts. The PIs have developed a novel rapid supercritical extraction (RSCE) process for fabricating aerogels. By constructing the UCaT, the group is now enabled to significantly extend its research, by having the capability to test the catalytic ability of CAMs under realistic end-use conditions, in order to facilitate the development of CAMs and support parallel fundamental work.

### Privacy in Practice: The Role of EHRs in Pediatric Interactions with Patients

THE NATIONAL INSTITUTES OF HEALTH

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PROJECT PERSONNEL:

Principal Investigator **Dr. Timothy Stablein** (Sociology)

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ABSTRACT:

This Agency for Healthcare Research and Quality (AHRQ) grant supported a study exploring the ways adolescents and providers think about the privacy and use of health information, and whether they think privacy concerns, and/or the use of electronic health records (EHRs), affect doctor-patient communication or interaction. Researchers explored how perceptions of privacy and the use of EHRs affect the way pediatricians communicate with other clinicians and patients and how they use health information technology (HIT) to record and disseminate patient information. Working with medical staff at Children's Hospital at Dartmouth (CHaD) Hitchcock Medical Center, this exploratory, qualitative research design offered an opportunity to understand how expectations, perceptions, and interactions occurring among doctors and patients, shape communication and information flows and exchanges.

### Reconstructing the Biogeochemistry in Tropical Aquatic Ecosystems Using Elemental and Stable Isotope Tracers in Freshwater Bivalve Shells

THE FLEMISH SCIENCE FOUNDATION OF BELGIUM

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PROJECT PERSONNEL:

Principal Investigator **Dr. David Gillikin** (Geology)

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ABSTRACT:

Aquatic ecosystems are vulnerable to changes in land use, climate, and nutrient inputs, as the material they transport is directly influenced by a range of catchment characteristics. This is particularly true for tropical systems which are under increasing stress and are sensitive early indicators of catchment modifications. Long-term datasets on aquatic biogeochemistry are virtually non-existent. An elegant method to circumvent this absence is to use well-dated biological archives to reconstruct environmental conditions. Freshwater bivalves have demonstrated the potential to store such information in their shell. The geochemical composition along the growth axis provides a history of aquatic biogeochemical and environmental conditions during the lifetime of the bivalve. The researchers have initiated detailed monitoring of a wide range of parameters on several African rivers at unprecedented temporal resolution. The research will provide excellent case studies of how freshwater bivalves record known (and unknown) changes in climate and/or land-use in understudied tropical catchments.

## ACTIVE & COMPLETED GRANTS

*Continued*

### Renewable and Compostable Fungus Based Plastics - Establishing the Structure/Property/Processing Relationships to Facilitate Commercialization

THE NATIONAL SCIENCE FOUNDATION

#### PROJECT PERSONNEL:

Principal Investigator **Dr. Ronald Bucinell** (Mechanical Engineering)

#### ABSTRACT:

**R**enewable and biodegradable materials are a key element to a sustainable planet. Ecovative Design, LLC has created new compostable mycelium-based (fungus) bioplastic/biocomposite materials. These new biodegradable and renewable materials are being sold commercially as replacements for expanded polystyrene and polyethylene foams that are petroleum-based and difficult to recycle or reuse. These fungus-based biopolymers have the potential to be used in additional markets such as transportation and recreation that currently use petroleum-based plastics but first the structure/property/processing relationships need to be understood. This award supports fundamental research to provide needed knowledge on how to optimize and tailor the properties of these new materials to expand the range of applications where highly renewable, compostable, and inexpensive materials can replace petroleum-derived products.

### RUI: Catalytic Aerogel Materials

THE NATIONAL SCIENCE FOUNDATION

#### PROJECT PERSONNEL:

Principal Investigator **Dr. Ann Anderson** (Mechanical Engineering); co-PIs **Dr. Bradford Bruno** (Mechanical Engineering) and **Dr. Mary Carroll** (Chemistry)

#### ABSTRACT:

**E**xisting catalytic converter systems use rare precious metals to catalyze exhaust gas. Decreasing the use of these metals has the potential to transform automotive pollution clean-up methods. This has important economic implications for the nation because a typical automobile catalytic converter contains about \$100 of precious metals, adding about 700 million dollars per year to the total cost of cars sold in the US. Aerogels are lightweight, nano-porous materials with lots of surface area and good thermal properties. Catalytic aerogel materials have the potential to replace the precious metals while being both cost-effective and environmentally friendlier than current automotive catalysts. This project funds an interdisciplinary team of faculty and undergraduate students in Mechanical Engineering and Chemistry at Union College who are undertaking fundamental studies of catalytic aerogel materials and demonstrating the utility of these materials as catalysts to alleviate automotive pollution.



Union College students participate in advanced, hands-on research experiences in the laboratory and in the field. These students share the results of their scholarly endeavors at poster presentations and the annual Steinmetz Symposium

## ACTIVE & COMPLETED GRANTS

*Continued*

### STTR Phase I: Development of High Performance Windows using Monolithic Aerogels

THE NATIONAL SCIENCE FOUNDATION

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#### PROJECT PERSONNEL:

Principal Investigator Dr. Bahram Keramati (Sunthru, LLC); co-PI **Dr. Ann Anderson** (Mechanical Engineering and Sunthru, LLC); Senior Personnel **Dr. Mary Carroll** (Chemistry and Sunthru, LLC); Union College subaward Principal Investigator **Dr. Bradford Bruno** (Mechanical Engineering)

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#### ABSTRACT:

In aerogel-based window commercialization, a specific market opportunity exists in daylighting. The goal is to provide window systems that allow natural light to be used instead of electric lights. A key challenge in such applications is to also reduce the heating and cooling costs. Union researchers' rapid supercritical extraction (RSCE) method for fabricating aerogels has the following advantages: (a) it can be easily automated; (b) it is fast; (c) it is environmentally friendlier than other methods; (d) it minimizes the use of solvents; (e) it is potentially less expensive than other methods, and (f) the process can produce large intact aerogels. Work produced a range of window prototypes based on the RSCE approach and tailored for desirable properties. The resulting aerogel window products will offer end-use customers a higher value than current daylighting products.

### SUCCESS: Stimulating Undergraduates: Creating Contributors in Engineering & Science for Society

THE NATIONAL SCIENCE FOUNDATION

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#### PROJECT PERSONNEL:

Principal Investigator **Dr. Joanne Kehlbeck** (Chemistry); co-PIs **Dr. Samuel Amanuel** (Physics & Astronomy), **Dr. Palmyra Catravas** (Electrical & Computer Engineering), **Dr. Rebecca Cortez** (Mechanical Engineering), and **Dr. Scott Kirkton** (Biology); Senior Personnel **Dr. George Bizer** (Psychology)

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#### ABSTRACT:

The SUCCESS Scholars program further broadens Union's inclusive recruiting strategy by building relationships with small, rural under-resourced public high schools in order to attract and retain talented students to STEM fields. SUCCESS scholars are selected from all science and engineering disciplines, with four-year scholarship support for two cohorts of ten students. The project is helping participants achieve success by meeting the educational and financial needs unique to their situations and backgrounds. The SUCCESS Scholars program is designed to produce talented, energetic STEM professionals from diverse backgrounds and the approach will be transferable to educational institutions across the country. SUCCESS scholars trained as leaders and capable of propagating transformative mentoring skills will positively impact this nation's workforce.

### Supporting Scholars in Science and Engineering

THE NATIONAL SCIENCE FOUNDATION

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#### PROJECT PERSONNEL:

Principal Investigator **Dr. Bradford Bruno** (Mechanical Engineering); co-PIs **Dr. Joanne Kehlbeck** (Chemistry), **Dr. J. Douglass Klein** (Economics), and **Dr. Cherrice Traver** (Electrical & Computer Engineering); Senior Personnel **Dr. Suzanne Benack** (Psychology)

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#### ABSTRACT:

The integration of engineering and the liberal arts offers unique opportunities for students. This project aimed to: 1) improve recruitment and retention of academically-talented students in STEM fields; 2) increase the number of women in engineering, physics, and computer science, and underrepresented groups in all disciplines; 3) provide students with opportunities to further enhance their education through summer research, internships, study abroad, and leadership training; and 4) enable these students to make connections between their major and other disciplines through pursuit of a dual major, minor or interdisciplinary major. The impact of these efforts resulted in increased numbers of students with the education and skills necessary to enter the workforce or professional and graduate programs in emerging multidisciplinary fields. The proven results of the activities implemented through this project provided important preliminary data for the recently awarded SUCCESS Scholars grant.

### The Arthur O. Eve Higher Education Opportunity Program at Union College

THE NEW YORK STATE EDUCATION DEPARTMENT

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#### PROJECT PERSONNEL:

Program Director **Philip Poczik** (Academic Opportunity Program)

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#### ABSTRACT:

Union College has participated in The Arthur O. Eve Higher Education Opportunity Program (HEOP) since its inception 45 years ago. The program provides a broad range of services to New York State residents who, because of academic and economic circumstances, would otherwise be unable to attend a postsecondary educational institution. Union continues to pursue its goal of providing a viable option for higher education for the economically and educationally disadvantaged population of New York State. Through our cooperative ongoing partnership with the HEOP and the New York State Education Department, we will continue to provide the resources required to achieve this goal by providing academic support and mentoring, while also encouraging students to pursue studies leading to careers and professions in under-represented areas.

## ACTIVE & COMPLETED GRANTS

*Continued*

### The Schrödinger Sessions: Science for Science Fiction

THE AMERICAN PHYSICAL SOCIETY

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PROJECT PERSONNEL:

Program Director **Dr. Chad Orzel** (Physics & Astronomy)

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ABSTRACT:

Sponsored by the APS Public Outreach and Informing the Public Grant program, “The Schrödinger Sessions: Science for Science Fiction” workshop at the Joint Quantum Institute (a combined initiative of the University of Maryland, College Park and NIST in Gaithersburg) provided a three-day “crash course” in quantum physics for science fiction writers. The aim was to bring in science fiction writers, and show them some of the latest and greatest in quantum physics, with the goal of inspiring and informing new stories using quantum ideas and quantum technology. The grant supported a broad range of writers – those who create stories in any medium (e.g., television, or movies, or video games, or online media). With the ultimate goal of public outreach, the workshop organizing committee aimed to invite participants whose work will be able to reach as broad an audience as possible, including established and up-and-coming writers, and diversity in terms of audience, sub-genre, media, etc.

### The Undergraduate ALFALFA Team

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. Rebecca Koopmann** (Physics & Astronomy)

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ABSTRACT:

Undergraduate ALFALFA Team (UAT) is a consortium of 19 undergraduate-focused institutions from across the United States. UAT is conducting a multi-faceted program of student training, faculty development, and public outreach that is integrated into the Arecibo Legacy Fast ALFA (where ALFA refers to the Arecibo L-band Feed Array detector) collaboration. UAT students and faculty participate through several program components, including workshops and observing sessions, group work, and undergraduate research experiences. The collaborative nature of the program, supported by appropriate computer infrastructure and communication media, enables students and faculty to participate effectively in data analysis and remote observing. The program builds connections between staff at Arecibo Observatory and faculty and students at the participating U.S. institutions. The project develops publicly available materials that enhance the undergraduate astronomy curriculum for both science and non-science majors.

### The Volcanic History and Magmatic Degassing of Dominica: Implications for Future Eruptions

THE NATIONAL GEOGRAPHIC SOCIETY

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PROJECT PERSONNEL:

Principal Investigator **Dr. Holli Frey** (Geology)

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ABSTRACT:

Field work and lab analyses are central to this NGS Committee on Research and Exploration grant to examine the volcanic history of Dominica in two different ways on two different time scales: 1) dating zircons from ignimbrites and lava domes and 2) characterizing stream chemistry and stable isotopes from streams and hydrothermal areas. Investigators will test the hypothesis that 1) all of the ignimbrites are young (<50 ka) and emanate from a single magma chamber. If the ignimbrites derive from a single large magma chamber, there is an increased likelihood of a more catastrophic eruption that poses an island wide threat. The PI, along with undergraduate students, will also test whether 2) stream chemistry, particularly carbon isotopes, can be used to infer shallow magma degassing and potentially used for volcano monitoring. This is interesting not only from a scientific point of view, but has implications for hazard assessment and preparedness.

### Union College: Host Institution for Chinese and Russian FLTAs, Academic Year 2014-15

THE INSTITUTE OF INTERNATIONAL EDUCATION

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PROJECT PERSONNEL

Department Chair **Dr. Christine Henseler** (Modern Languages and Literatures); Supervisors **Dr. Kristin Bidoshi** (Russian), **Dr. Zhen Zhang** (Chinese), **Dr. Megan Ferry** (Chinese), and **Dr. Audrey Sartiaux** (Language Center)

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ABSTRACT:

The Fulbright Foreign Language Teaching Assistant (FLTA) program provides welcome and exciting resources for Union’s Chinese and Russian language programs. The FLTAs assist in teaching first and second year language courses. In conjunction with that work, the FLTAs lead practice or drill sessions, offer guided conversational activity, and provide tutoring as appropriate. The FLTAs attend and actively participate in Language Table and Language Club meetings, while fully engaging in campus life by residing in residences associated with our language programs, offering to our students further informal practice in every-day conversational language with our FLTA, or in Minerva residences, and increased international presence and programming for the campus community.

## ACTIVE & COMPLETED GRANTS

*Continued*

### Virtue and Vengeance in Aristotle

LOEB CLASSICAL LIBRARY FOUNDATION

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PROJECT PERSONNEL:

Project Director **Dr. Krisanna Scheiter** (Philosophy)

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ABSTRACT:

The author argues that for Aristotle revenge is virtuous when it restores the dignity and self-respect of the avenger. Some philosophers argue that revenge is a brand of retributive punishment (e.g. Kaufman 2013), but she contends that revenge does not have the same aim as retributive punishment. Rather revenge aims at restoring the worth and agency of the victim. She maintains that revenge and punishment are different (for many of the reasons Plato and Aristotle think they are different), but disputes that revenge is never moral (e.g. Nozick). Understanding how revenge and punishment differ can go a long way to helping us understand the morality of each. The author concludes that Aristotle is right that there is a type of moral revenge, which aims at restoring the self-worth of the individual. Many contemporary philosophers will disagree, but in certain circumstances, revenge, specifically non-violent retaliation, may be the best way to restore one's sense of self and send a message to the wrongdoer that he is mistaken in his original assessment of the victim's worth.

### VOSS: Collaborative Research: Is Larger Smarter? Investigating the Effect of Group Size on Collective Intelligence

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. Christopher Chabris** (Psychology)

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ABSTRACT:

From Wikipedia to Linux to scientific and business work-groups all over the world, both online and off-line groups are becoming a pervasive part of modern life. It is becoming increasingly important, therefore, to understand how to improve the performance of these groups. This work will use a new measure of generalized group effectiveness -- called "collective intelligence" -- to help do this. While there have been decades of research on factors that affect the performance of groups, almost all these studies have each focused on a single task. This work uses the perspective of collective intelligence to investigate, not just the ability of a group to perform a single task, but the group's general ability to perform a wide range of tasks. Since many real-world groups must cope with a wide range of problems, just such a perspective may be needed to systematically predict their performance. By making an online test of collective intelligence available to other researchers, the project will help advance scientific practice in this area. More generally, by providing a firmer scientific foundation for measuring and improving the performance of groups, the project may help our society address many of its most important problems more effectively.

### Waves of Futurity, Monstrous Attachments: American Literary Representations of Affect, Place, and Otherness (1797-1901)

THE THOREAU SOCIETY

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PROJECT PERSONNEL:

Project Director **Dr. Jillmarie Murphy** (English)

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ABSTRACT:

The 2015 Thoreau Society Fellowship supported research focused on advancing the author's book project which examines physical and abstract spaces as attachments. In its most obvious manifestation, place represents physical spaces -- homes, buildings, neighborhoods, islands -- but place can also be an area set aside for a specific purpose, a position or function one holds, or a situation in which one finds oneself. Moreover, place can be an abstract mental location, or it can refer to affect, one's moods, feelings, emotions -- love, hate, sadness, or anger, for instance. These two constructs of attachment -- interpersonal attachment and place attachment -- frame this three-part study of ten American literary works, including Henry David Thoreau's *Walden; or Life in the Woods* (1854).

### Wavelength Agile Photoacoustic Microscopy for Video-Rate Functional Imaging

THE NATIONAL SCIENCE FOUNDATION

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PROJECT PERSONNEL:

Principal Investigator **Dr. Takashi Buma** (Electrical & Computer Engineering)

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ABSTRACT:

Photoacoustic microscopy (PAM) is a promising technique that relies on pulsed optical excitation and ultrasonic detection. Exquisite in vivo images of tissue microvasculature, including individual capillaries, have been obtained with excellent contrast based on optical absorption rather than reflectance. Physiological changes can alter the wavelength dependence of optical absorption, making functional PAM (fPAM) possible with optical excitation at multiple wavelengths. fPAM has received considerable interest for oxygenation studies of tumor microvasculature and monitoring brain activity in small animal models. The fundamental hypothesis of this proposal is that wavelength agility can revolutionize the capabilities of fPAM. This grant enabled the PI to develop this compact source to switch wavelengths in less than 1 millisecond, representing a 1000-fold improvement in switching speed over conventional lasers. This wavelength agile source provides the breakthrough necessary to realize video-rate fPAM.

## SUBMITTED PROPOSALS

*Alphabetical, by project title*

### Adirondack Journal of Environmental Studies: The Geology Issue (Vol. 21)

FURTHERMORE GRANTS IN PUBLISHING: A PROGRAM OF THE J. M. KAPLAN FUND

Executive Editor **Caleb Northrop** (The Office of the President and the Kelly Adirondack Center)

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### Be Disruptive: Engaging Students in the Entrepreneurial Mindset through Disruptive Technologies

THE KERN FAMILY FOUNDATION

Principal Investigators **Dr. Harold Fried** (Economics) and **Dr. Richard Wilk** (Mechanical Engineering)

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### Collaborative Research: Empowering Research by the Undergraduate ALFALFA Team

THE NATIONAL SCIENCE FOUNDATION

Principal Investigator **Dr. Rebecca Koopmann** (Physics & Astronomy)

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### Contemporary Albanian Rites of Passage: Ritual Behavior and the Construction of Gender

THE NATIONAL ENDOWMENT FOR THE HUMANITIES

Project Director **Dr. Kristin Bidoshi** (Modern Languages & Literatures)

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### Development of Aerogel Based Window Systems

NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY

Principal Investigators **Dr. Bahram Keramati** (Sunthru, LLC), **Dr. Ann Anderson** (Mechanical Engineering and Sunthru, LLC), and **Dr. Mary Carroll** (Chemistry and Sunthru, LLC); Union College subaward Principal Investigator **Dr. Bradford Bruno** (Mechanical Engineering)

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### Dimensions: Collaborative Research: Genome Structure and Adaptive Evolution in Peat Mosses (Sphagnum): Ecosystem Engineers

THE NATIONAL SCIENCE FOUNDATION

Principal Investigator **Dr. Steven Rice** (Biology)

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### Electric City Wizards Collaboration

IEEE FOUNDATION

Principal Investigator **Dr. Palmyra Catravas** (Electrical & Computer Engineering); co-PIs **Dr. Luke Dosiak** and **Dr. Cherrice Traver** (Electrical & Computer Engineering)

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### Evaluating Subsurface Transport of PFOA and Associated Chemical Contaminants

THE NATIONAL SCIENCE FOUNDATION

Principal Investigator **Dr. Laura MacManus-Spencer** (Chemistry)

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### First Citizen Remembered: The Papers of John Bigelow and the Nation at Home and Abroad

THE COUNCIL ON LIBRARY AND INFORMATION RESOURCES

Project Directors **Annette LeClair** and **India Spartz** (Schaffer Library)

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### For the Common Good? Unlawful Governance in Democracy

AMERICAN POLITICAL SCIENCE ASSOCIATION

Project Director **Dr. Guillermina Seri** (Political Science)

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### Hurricane Camille: Race, Rights, and Disaster Relief

THE NATIONAL ENDOWMENT FOR THE HUMANITIES

THE AMERICAN COUNCIL OF LEARNED SOCIETIES

Project Director **Dr. Andrew Morris** (History)

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### Idyll and Abyss: The Late Works of Schubert

THE NATIONAL ENDOWMENT FOR THE ARTS

Artistic Director **Derek Delaney** (College Relations)

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## SUBMITTED PROPOSALS

*Continued*

### Inclusive Excellence: 2017 Undergraduate Science Education Grant

THE HOWARD HUGHES MEDICAL INSTITUTE

Program Director **Dr. Leo Fleishman** (Biology); Core Leadership Team Members **Dr. Samuel Amanuel** (Physics & Astronomy), **Dr. Paul Friedman** (Mathematics), **Dr. Joanne Kehlbeck** (Chemistry), **Dean Wendy Sternberg** (Academic Affairs), and **Shelly Shinebarger** (Student Support Services)

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### Memory Lane: A Neuro-Exergame to Mitigate Cognitive Decline in Later Life

THE NATIONAL INSTITUTES OF HEALTH

Principal Investigator **Dr. Cay Anderson-Hanley** (Psychology)

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### MRI: Acquisition of a 1.7-MV Pelletron Tandem Accelerator for Interdisciplinary Research and Undergraduate Education and Research Training

THE NATIONAL SCIENCE FOUNDATION

Principal Investigator **Dr. Michael Vineyard** (Physics & Astronomy); co-PIs **Dr. Samuel Amanuel** (Physics & Astronomy), **Dr. Scott LaBrake** (Physics & Astronomy), and **Dr. Donald Rodbell** (Geology); Senior Personnel **Dr. Michael Hagerman** (Chemistry), **Dr. Kurt Hollocher** (Geology), **Dr. Andrew Huisman** (Chemistry), and **Dr. Seyfollah Maleki** (Physics & Astronomy); Major Users **Dr. David Gillikin** (Geology) and **Dr. Heather Watson** (Physics & Astronomy)

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### MRI: Acquisition of a Confocal Microscope for Multi-Disciplinary Research and Undergraduate Research Training at Union College

THE NATIONAL SCIENCE FOUNDATION

Principal Investigator **Dr. Quynh Chu-LaGraff** (Biology); co-PIs **Dr. Brian Cohen**, **Dr. Robert Lauzon**, and **Dr. Robert Olberg** (Biology); Senior Personnel **Dr. Sudhir Khetan** (Bioengineering) and **Dr. Nicole Theodosiou** (Biology)

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### MRI: Development of an Automated Aerogel Fabricator

THE NATIONAL SCIENCE FOUNDATION

Principal Investigator **Dr. David Hodgson** (Mechanical Engineering); co-PIs **Dr. Ann Anderson** (Mechanical Engineering) and **Dr. Mary Carroll** (Chemistry)

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### NRI: RUI: Asking for Help: Selecting, Approaching and Engaging Unprimed People in High Traffic Public Spaces

THE NATIONAL SCIENCE FOUNDATION

Principal Investigator **Dr. Nick Webb** (Computer Science); co-PIs **Dr. Aaron Cass** and **Dr. Kristina Striegnitz** (Computer Science)

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### Preliminary Proposal: RUI: Deciphering the Phenotypic and Genomic Patterns of Divergence Across a Speciation Continuum in Young *Drosophila* Species Complex

THE NATIONAL SCIENCE FOUNDATION

Principal Investigator **Dr. Roman Yukilevich** (Biology)

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### Preventing or Ameliorating Alzheimer's and Related Dementias: An interactive Physical and Cognitive Exercise System (iPACES©) for Mild Cognitive Impairment (MCI)/Neurocognitive Disorder (mNCD)

THE NATIONAL INSTITUTES OF HEALTH

Principal Investigator **Dr. Cay Anderson-Hanley** (Psychology); Senior Personnel **Dr. Brian Cohen** (Biology) and **Dr. Kristina Striegnitz** (Computer Science)

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### Reconstructing Lake George Water Quality History and Monitoring Ecosystem Recovery

LAKE CHAMPLAIN SEA GRANT

Principal Investigator **Dr. David Gillikin** (Geology)

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## SUBMITTED PROPOSALS

*Continued*

### Rethinking Punishment

THE LAURANCE S. ROCKEFELLER VISITING FELLOWSHIP

Project Director **Dr. Leo Zaibert** (Philosophy)

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### RUI: Senior Research: An Ethnographic Study of Rights-Based Activism in Rural India

THE NATIONAL SCIENCE FOUNDATION

Principal Investigator **Dr. Jeffrey Witsoe** (Anthropology)

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### RUI: SusChEM: Tailored Catalytic Aerogel Materials

THE NATIONAL SCIENCE FOUNDATION

Principal Investigator **Dr. Mary Carroll** (Chemistry); co-PIs **Dr. Ann Anderson** and **Dr. Bradford Bruno** (Mechanical Engineering)

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### SBIR Phase II: High Performance Windows for Daylighting

THE NATIONAL SCIENCE FOUNDATION

Principal Investigators **Dr. Bahram Keramati** (Sunthru, LLC), **Dr. Ann Anderson** (Mechanical Engineering and Sunthru, LLC), and **Dr. Mary Carroll** (Chemistry and Sunthru, LLC); Union College subaward Principal Investigator **Dr. Bradford Bruno** (Mechanical Engineering)

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### Science, Medicine, Technology and National Socialism

AMERICAN ACADEMY IN BERLIN

Project Director **Dr. Mark Walker** (History)

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### Special Metrics in Kaehler and Sasaki Geometry

THE SIMONS FOUNDATION

Principal Investigator **Dr. Christina Tonnesen-Friedman** (Mathematics)

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### Teaching American & Latin American Studies: Core Fulbright U.S. Scholar

COUNCIL FOR INTERNATIONAL EXCHANGE OF SCHOLARS

Project Director **Dr. Teresa Meade** (History)

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### The 2016 Beckman Scholars Program

THE ARNOLD AND MABEL BECKMAN FOUNDATION

Project Director **Dean Wendy Sternberg** (Academic Affairs); Faculty Mentors **Dr. Mary Carroll**, **Dr. Kristin Fox**, **Dr. Michael Hagerman**, **Dr. Andrew Huisman**, **Dr. Joanne Kehlbeck**, **Dr. Laura MacManus-Spencer**, **Dr. Margot Paulick**, and **Dr. Laurie Tyler** (Chemistry); **Dr. Cay Anderson-Hanley**, **Dr. Christopher Chabris**, and **Dr. Stephen Romero** (Psychology); Undergraduate Research Director **Dr. Rebecca Cortez** (Mechanical Engineering)

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### Topological Methods in High-Dimensional Data Analysis

THE SIMONS FOUNDATION

Principal Investigator **Dr. Ellen Gasparovic** (Mathematics)

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### Union College Concert Series 2016-17

NEW YORK STATE COUNCIL ON THE ARTS

Artistic Director **Derek Delaney** (College Relations)

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### Union College: Host Institution for Russian Foreign Language Teaching Assistant, Academic Year 2016-17

THE INSTITUTE OF INTERNATIONAL EDUCATION

Primary Supervisor **Dr. Kristin Bidoshi**; Senior Personnel **Dr. Audrey Sartiaux** (Modern Languages & Literatures)

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### Waves of Futurity, Monstrous Attachments: American Literary Representations of Affect, Place and Otherness (1797-1901)

THE NATIONAL ENDOWMENT FOR THE HUMANITIES

AMERICAN ANTIQUITY SOCIETY

Project Director **Dr. Jillmarie Murphy** (English)

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### We Don't Become Refugees by Choice: The Politics of Flight, WWII to the Present

THE NATIONAL ENDOWMENT FOR THE HUMANITIES

SWEDISH COLLEGIUM OF ADVANCED STUDY

Project Director **Dr. Terese Meade** (History)

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## PROPOSALS AND AWARDS

### *A Year in Review*

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#### 17 NEW AWARDS

Involving 37 Union College Faculty & Staff  
From 18 Academic Departments and Programs  
Totaling \$2,214,518

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#### 37 PROPOSALS SUBMITTED

Involving 59 Union College Faculty & Staff  
From 22 Academic Departments and Programs  
Totaling \$6,991,208

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#### 33 ACTIVE AWARDS

Involving 53 Union College Faculty & Staff  
From 20 Academic Departments and Programs  
Totaling \$6,920,288

**COLLEGE RELATIONS**  
OFFICE OF CORPORATE, GOVERNMENT &  
FOUNDATION RELATIONS

*Location*

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At the corner of Lenox Road and Union Avenue

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