



July 2016

Message from Dean Breneman



It's difficult to believe that summer is already more than half over! The weather is still warm, Lake George is beautiful, and the skies are occasionally decorated with cumulonimbus thunderclouds that provide us with some great displays of nature's fireworks—even though the Fourth of July holiday has passed. As I write this, we've just emerged from a mini-drought followed by a multi-day rain, making the crystal blue sky outside of my office seem even more beautiful! The local flora

seems pretty happy about the added moisture—we've seen some dry days recently and some brown grass in places—even on the Frear Park golf course. Now things have changed—time to fire up the mower again!

We couldn't be more proud of our summer undergraduate researchers (SURP)! Five SURP students (Jennifer Freedberg, Zachary Harris, Sherese Morgan, Stephen Notley, and Jackie Pelham) worked with School of Science faculty (Ethan Brown, Esther Wertz, Rick Relyea, Cathy Royer, and Jennifer Hurley, respectively) this summer, and I was very impressed by their efforts. It was also great that three of the five worked with Assistant Professors who were hired within the last year or two (Brown, Wertz, and Hurley). Great work, students and faculty!

Our Bridge Scholars program is running successfully again this summer, adding to the Science background of incoming freshman students even before they officially arrive at Rensselaer. How much Science is enough? (In the words of Mick Jagger, "Too much is never enough!")

The DATUM project continued to thrive this summer, and continues to expand into our "Data Dexterity" thrust that will soon ramp up within the new Data INCITE Laboratory. Go Data Science!

I'm also very proud of the accomplishments of our School of Science faculty. Professor Fran Berman (Computer Science) was sworn in this month as a member of the National Council on the Humanities in

a Washington, D.C., ceremony. Now that Fran is a Senate-confirmed Presidential appointee, she is officially known as “The Honorable Fran Berman”. Cool. She’s still “Fran” to everyone here, though...

Congratulations to Professor Boleslaw (Bolek) Szymanski for leading the RPI SCNARC/NeST team to a new level of funding and international prominence! Bolek received \$2.15M to fund this social/information/communication network study for the next two years, making Rensselaer the highest funded institution in the collaboration. On top of this, he also received another individual Army grant related to “Forecasting Emergent Phenomena with Human Computer Collaboration” and this sounds pretty important in a fast-changing world.

Esther Wertz (Assistant Professor of Physics) just received word that her first NSF grant has been funded! Esther just joined us last fall, and we’re looking forward to great things. Congratulations, Esther!

Don’t miss the story about Earth & Environmental Science Professor Steve Roecker’s work in earthquake prediction. Steve just got another grant to study geological data analytics in the Sierra Nevadas. Stay tuned!

Great things are always happening in the Rensselaer School of Science!

Come to Rensselaer and Change the World!

Curt Breneman, Dean of Science

Jefferson Project – An Exploration of the Hudson Led to Rensselaer



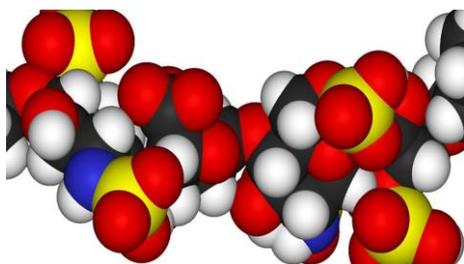
Sherese Morgan, an enthusiastic undergraduate from Yonkers, N.Y., with interests in the field of environmental science, contributed this guest post on her summer research with the Jefferson Project at Lake George. In her junior year, Sherese started working in the laboratory of Rensselaer professor and Jefferson Project director **Rick Relyea**. Recently, she was awarded a School of Science Summer Undergraduate Research Program grant. As a recipient of the grant, she will be conducting an independent project to study how humans influence and disturb freshwater ecosystems.

As a child, my parents encouraged me to engage with the environment of my community. I am a true city kid, fortunate enough to have the Hudson River as my backyard. Every Saturday morning, I visited my local library and walked a short distance to explore the Hudson River along the waterfront walkway. The Hudson River has a rich historical context for my city; for centuries, the river has been a means of transportation and recreational use. My interest in environmental science stems from childhood explorations of the Hudson River, in which I learned how humans influence and affect ecological communities. I am happy to have this experience and hope to mentor other city youth in their own exploration of the Hudson River.



[See more](#)

Drug Safety: How a Crisis Propelled Change



Robert Linhardt, the Ann and John H. Broadbent Jr. '59 Senior Constellation Professor of Biocatalysis and Metabolic Engineering at Rensselaer, answers questions about a Perspective he co-authored in the June edition of *Nature Biotechnology* with a team including Janet Woodcock, the Director of the U.S. Food and Drug Administration Center for Drug Evaluation (CEDAR), and Roger Williams, the former head of the United States Pharmacopeial Convention (USP). The

Perspective— titled “The US regulatory and pharmacopeia response to the global heparin contamination crisis” —discusses how the FDA, the USP, and international stakeholders have responded

to a 2007 crisis in which contaminated heparin – a critical anticoagulant obtained from pig intestines – killed several patients in the United States and caused hundreds of adverse reactions worldwide.

Q: Briefly, what happened in 2007 that drew attention to this issue?

There was a contamination crisis that led to severe reactions among dialysis patients. People stopped breathing after they were administered heparin, and some of them died. Our immediate concern was to remove the bad drug from the market. The first thing we did was to develop a quick assay to judge whether the drug contained this particular contaminant (which we were able to identify through signature peaks in our analysis) and get it out of circulation. It was an emergency response to minimize the damage. We helped develop two methods, one involving capillary electrophoresis, and one involving NMR, and with that we cleaned up the drug supply. In the subsequent months, we went on to figure out what made the drug bad, and we discovered that an adulterant, abbreviated as OSCS, had been added to the drug. Once we had identified it, it was even easier to detect. And that was the immediate solution.

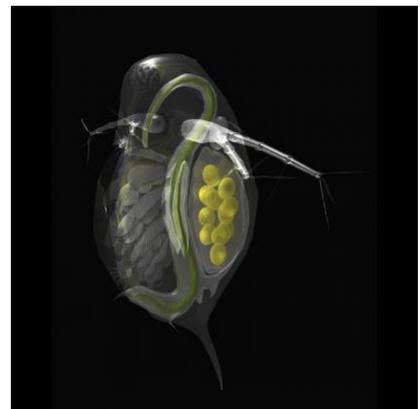
But then working with the Food and Drug Administration (FDA), and the United States Pharmacopeial Convention (USP), we devised a response that went further, to protect us not just against this single contaminant, but against all contaminants in the future. And that's more complicated.

[See more](#)

Arts Collaboration “World of Plankton” Featured in ACM SIGGRAPH “Science of the Unseen” Exhibit

"World of Plankton," a collaborative project involving students and faculty of the School of Humanities, Arts, and Social Sciences (HASS) and the School of Science, is featured in the ACM SIGGRAPH exhibit “Science of the Unseen: Digital Art Perspectives.” The exhibit may be viewed online at <http://science-unseen.siggraph.org>.

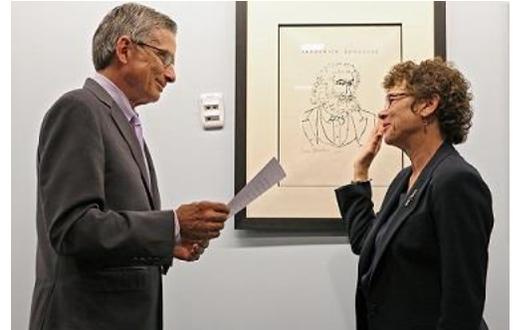
The work involved intensive study of freshwater ecology in the lab and in the field, including microscopic and underwater explorations of the visual, audio, material and behavioral aspects of zooplankton and phytoplankton and their environments and a lake model based on bathymetric data. The project was programmed in C# in Unity 3-D with AI, behaviors, underwater lighting and physics. 3-D models were created and rigged in Maya, and the soundtrack was composed by Electronic Arts senior Evan Gonzalez.



[See more](#)

Faculty News and Notes

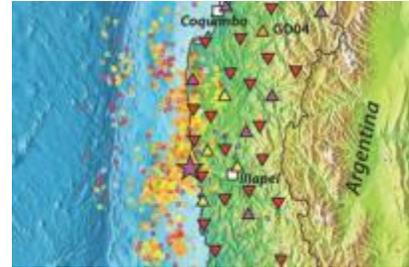
- **Fran Berman**, Edward P. Hamilton Distinguished Professor in Computer Science, was sworn in as a member of the National Council on the Humanities (NCH), a board of 26 distinguished individuals who advise the chairman of the National Endowment of the Humanities (NEH), and are appointed by President Obama and confirmed by the U.S. Senate. See the full story at:
<http://news.rpi.edu/content/2016/01/11/francine-berman-appointed-president-obama-national-council-humanities>
 - She also attended Board/Council Meetings for Sloan Foundation, Anita Borg Institute, Research Data Alliance, National Endowment for the Humanities, and Monterey Bay Aquarium Research Institute.
- **Richard Gross**, constellation chair and professor of chemistry and chemical biology:
 - Keynote Speaker at the 9th International Conference on Fiber and Polymer Biotechnology in Osaka, Japan, September 7-9. The title of his talk will be “Engineered Cutinases for Textile Polymer Modification and Recycling.” See more at: <http://ifpb2016.wixsite.com/ifpb2016>
 - Organizer and keynote speaker at the 3rd International Conference and Exhibition on Biopolymers and Bioplastics in San Antonio, Texas, September 12-14. See more at: <http://biopolymers-bioplastics.conferenceseries.com/>
- **Steve Roecker**, professor of earth and environmental sciences, is being funded by NSF Geophysics to image the lower crust and upper mantle of the southern part of the Sierra Nevada.
- **Boleslaw Szymanski**, director of the Network Science and Technology Center (NeST) and professor of computer science, SCNARC/NeST, has received over \$2,150,000 (October 2016-September 2018) in funding from the Army. “We have moved from the second highest funded university to the highest funded institution,” he said. “We have surpassed the industrial lead BBN. Overall, we have seven projects funded, three with focus on social networks (**Sibel Adali**, **Gyorgy Korniss**, and **Boleslaw Szymanski**), two on information networks (**Heng Ji** and **Al Wallace**), one for communications networks (**Jim Hendler**), and the last, evolving networks (**Malik Magdon-Ismail**).
- **Esther Wertz**, is co-principal investigator for a grant funded by NSF (Jian Shi from MSE is PI). This is a three-year grant for approximately \$380,000.
- **Michael Zuker**, mathematical sciences professor, delivered an invited lecture at the 28th European Conference, titled “Algorithms for Predicting RNA Secondary Structure: Making the most of an Ill-Conditioned Problem.” The conference took place in Poznan, Poland, on July 4.



Research News

After the Quake – Data Can Help Predict Consequences of the Next Event

Later this year, seismology geophysicist [Steve Roecker](#) will travel to Illapel, Chile, to remove instruments that have been tracking the struggle between two tectonic plates that caused a magnitude 8.3 earthquake on September 16, 2015. While areas to the north and south of Illapel – where the Nazca plate dives beneath the South American plate – have been studied, until now the complexity of the boundary in the area of Illapel has deterred research.



“Researchers have studiously avoided this part of the boundary because the Nazca plate changes dip – curving from 45 degrees in one area to about 10 degrees in another – which makes it hard to interpret results,” said Roecker, a professor of earth and environmental sciences in the School of Science at [Rensselaer](#). “But with the 2015 earthquake we knew we had an opportunity to collect a really good dataset that we can use to learn more about the dynamics in this environment.”

Researchers will use the open-source data to determine how much energy the 8.3 magnitude earthquake released, where it was released, and how much may yet remain to be released. Using tomography techniques, researchers can also create images of the subsurface which, when analyzed, may reveal subsurface temperatures or geologic composition. This information will help predict where future earthquakes may strike, and what their strength may be.

Like many other areas in the Pacific Ocean “Ring of Fire,” Illapel is a subduction zone, an area where one plate pushes beneath another, producing some of the world’s biggest and most destructive earthquakes. Subduction of the Nazca plate has generated high magnitude megathrust earthquakes more frequently than any other subduction zone in the past 100 years, including the largest magnitude earthquake yet recorded – a magnitude 9.5 earthquake in 1960 near Valdivia, Chile.

[See more](#)

Student News and Notes

Data INCITE Lab

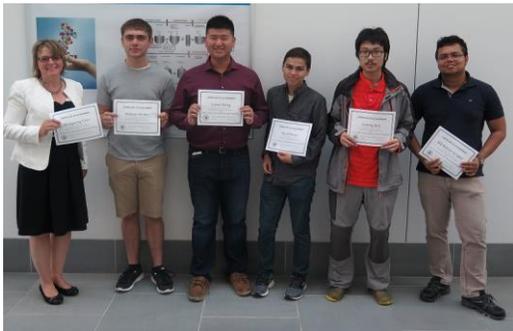
This summer, 16 undergraduate mathematics majors are doing applied data analytics research for six weeks in Rensselaer's new Data INCITE Laboratory supported by the NSF grant "EXTREEMS-QED: Data Analytics Throughout Undergraduate Mathematics." Teams of students are contributing to open data-driven research problems including detecting and diagnosing failures during computer chip fabrication, understanding the circadian rhythms, and determining microbial communities in the RPI plant wall.



K. Bennett, M. Su, C. Ye, R. Chen, A. Vargas,
Z. Haung, J. Liu



K. Bennett, H. Fede, T. Glushkova, A. Rosengrant,
M. Su, A. New, C. Collins, J. Ravichandar



K. Bennett, W. Pfeiffer, L. Zhang, D. Brooks, L. Ren,
R. Al Iqbal, (missing: Z. Chen)



J. Hurley, K. Bennett, Q. Tang, H. De los Santos,
H. Li, S. Luo

Students Present Their Summer Research Projects

Students in the Science Summer Undergraduate Research Program gave progress reports on their research on June 28.



S. Notley, S. Morgan, J. Pelham, Z. Harris, J. Freedberg

Name	Department	Project Title	Advisor
Jennifer Freedberg	Physics	Characterization & Optimization of thin films	Ethan Brown
Zachary Harris	Physics	Light-Matter Interactions with J-aggregates	Esther Wertz
Sherese Morgan	Environmental Sciences	Stirring it up: Understanding how the nutrient contamination interacts with the biological diversity of ecosystems	Rick Relyea
Stephen Notley	Computer Science	Image Analysis Software for two-photon scanning fluctuation microscopy	Catherine Royer
Jackie Pelham	Biology	Analysis of FRQ Structure Over the Circadian Day	Jennifer Hurley

The goal of the School of Science is to have 100 percent participation by undergraduates in research during the academic year and/or the summer. To this end, three endowed research scholarships have been established to allow students to undertake research during the summer. They are:

- **Miriam and Milton Prince '34 Fellowship** - Milton A. Prince earned his bachelor's in electrical engineering in 1934. He purchased a private company, the Republic Electronics Corporation, and served as the company owner, president, and chairman of the board for 44 years. The company specialized in ceramic electronic capacitors and ceramic research and development. Mr. Prince died in 1995. The Miriam and Milton Prince '34 Undergraduate Research Scholars Fund for the School of Science was established in 1997.
- **Jack Marsh '58 Fellowship** - John L. Marsh Jr. received three degrees from Rensselaer, a B.S. in electrical engineering, and an M.S. and Ph.D. in physics. Dr. Marsh was the co-founder and president of Quantum Solutions, a manufacturer of electronics for the oil and gas industry. He is

retired. The John L. Marsh '58 Undergraduate Research Scholars Fund for the School of Science was established in 1992.

- **Carol D. and Samuel C. Wait Jr. '53 Fellowship** - Samuel C. Wait Jr. received three degrees from Rensselaer, a B.S., M.S., and Ph.D. in Chemistry. He joined the Rensselaer faculty in 1961 and became associate dean of science, a position he held until his retirement in 2009. The Carol D. and Samuel C. Wait Jr. '53 Undergraduate Research Scholars fund was established in 2005.

Students Recently Attended the Bridge Scholars Program



The Bridge Scholars Program is an opportunity for enrolling students to attend a summer program designed to provide a rigorous academic instruction in either calculus or physics introduction. This year 39 students attended the 6 week summer program which encompasses a two week residential program to develop early academic and social success skills through academic mentoring, career development, access to academic support resources, and enrichment seminars that focus on excelling in the uniquely demanding Rensselaer environment. The two week residential program is followed by a rigorous four week continuation of students' academic study in either calculus or physics. The summer culminates in students moving back on to campus early to start their semester off by participating in the Navigating Rensselaer and Beyond Overnight Experiences and Day trips.

Student Briefs

Kaylyn Bell and **Amy Loya** (adviser, Doug Swank, professor of biology and biological sciences), both won best poster awards for their respective poster sessions at the biennial Myofilament Meeting “Local and Global Regulatory Networks in Muscle” in Madison Wisconsin. Six awards were given out of 95 posters presented at the meeting.

- The title of Kaylyn’s poster was “The Muscle Mechanical Basis of Freeman-Sheldon Syndrome.” One of her co-authors was Alice Huang, who is in the RPI/AMC Physician-Scientist medical program.
- The title of Amy’s poster was “Troponin C Isoforms Set Isometric and Stretch Activated Force Levels in Drosophila Jump and Indirect Flight Muscles.” Her co-author on the poster was Devan Puhl, who is in the School of Science accelerated B.S./Ph.D. program.

Mark Durniak (graduate student advised by Christian Wetzels, associate head of research and graduate programs, professor of physics, applied physics and astronomy), co-chair of the upcoming Gordon Research Seminar (GRS) on “[Defects in Semiconductors](#)”, August 13-14 at Colby-Sawyer College.

Alumni News

- [John Landers '90](#), (biological sciences), was part of an international team of scientists funded by the [Ice Bucket Challenge](#) donations has isolated a gene variation present in many ALS patients. See more at: <http://www.umassmed.edu/news/news-archives/2016/07/umms-led-discovery-of-als-gene-funded-by-ice-bucket-challenge-gets-global-attention/>
- Reunion and Homecoming – October 6-9.

Upcoming Events

- First-Year Convocation – Class of 2020: Sunday, August 28, 5:30-6:30 p.m.
- Classes begin: Monday, August 29

Catch more School of Science updates on social media!

