STRENGTHENING STEM

FEMALE FACULTY ARE PAVING A PATH FOR WOMEN IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS
Jim Hendler, Tetherless World Senior Constellation Professor, carries the Rensselaer mace during Commencement 2015. The mace is carried by the chief marshal at the head of all academic processions and is prominently displayed during academic ceremonies. Recalling our founder’s Dutch ancestry, the tulip-shaped top of the mace is made of silver with the Rensselaer seal in the middle of the tulip bloom.
New findings reveal that the Milky Way is contoured into several concentric ripples. See page 8.

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Astronomy and Art Intersect

For the month of March, the Curtis R. Priem Experimental Media and Performing Arts Center (EMPAC) was turned into an outdoor cinema that showcased a collaboration between Italian artist Rosa Barba and several members of the Rensselaer community. At the same time, a concurrent 70 mm film installation at the Rensselaer Hirsch Observatory was projected out of the planetarium’s dome into the sky.

The Color Out of Space was an EMPAC-commissioned project by Barba, developed in collaboration with the Hirsch Observatory; Heidi Newberg, professor of physics, applied physics, and astronomy; and astronomy students Nicholas Palmieri and Jake Weiss. Exploring “the speculative intersection of astronomy and art,” the two-part installation was constructed to visually connect the two buildings across campus, highlighting the common ways in which artists and physicists start with facts before “speculating” into the unknown.

Prior to the show’s opening, Barba and Newberg presented a talk to describe the similarities between their respective fields. Newberg described astronomy as a fundamentally observational (as opposed to experimental) science, in the sense that astronomers concern themselves always with discovering what already exists but is not yet known. It’s this form of scientific speculation—from established facts into the uncharted—that runs parallel to that of Barba’s artwork. And, like artists, astronomers must make aesthetic decisions about how to present their findings.

For both the artist and the astronomer, the exhibit presented a unique way of seeing the universe.
In May of 2013, we announced an exciting new partnership between Rensselaer Polytechnic Institute and the Icahn School of Medicine at Mount Sinai in research, education, and technology transfer. Dr. Kenneth Davis, the president and chief executive officer of Mount Sinai Health System, has credited this alliance as a reason the medical school received a grant from the New York City Economic Development Corporation (NYCEDC) to establish the Mount Sinai Institute of Technology—emphasizing that the NYCEDC approached Mount Sinai to ask what it could do to forward the relationship with Rensselaer.

This is a tribute to our strengths in biotechnology, computation, data science, immersive technologies, materials science, and the entire range of engineering disciplines—and to the increasing awareness that these disciplines are required, if we are to make progress in improving human health and mitigating disease. Another new Rensselaer partnership with Optum Labs—a research collaborative founded by the Mayo Clinic and the health care management and technology company Optum—advances the same goals.

With our partners, we hope to realize the promise of regenerative medicine, to design new classes of therapeutics based on an understanding of disease that begins at the molecular level, to develop more advanced medical devices, and, ultimately, to find better means of preventing and treating disease across the board.

It is important to note that many of these investigations and discoveries require sophisticated digital tools and are contributing to an explosion of medical data begging for interpretation. The genomics revolution alone is generating a staggering amount of data. So, just as 10 years ago, we invested in our Center for Biotechnology and Interdisciplinary Studies to address the great challenges in medicine—today, our focus on improving human health is one significant reason we are investing in the Rensselaer Institute for Data Exploration and Applications, or the Rensselaer IDEA.

The Rensselaer IDEA brings together our strengths in Web science, high-performance computing, data science and predictive analytics, and immersive technologies—and links them to applications at the interface of engineering, and the physical, life, and social sciences. The tools at its disposal include AMOS, the most powerful supercomputer at an American private university, and Watson, the IBM cognitive computing technology capable of absorbing large amounts of natural language information, including articles in medical and scientific journals.

The Rensselaer IDEA is helping biomedical researchers and physicians to find important insights within the enormous data sets we have access to through our partnerships, including those generated by the 2.6 million outpatient visits, 500,000 emergency department visits, and 170,000 patient visits, 500,000 emergency department visits, and 170,000

Inpatient admissions each year in the Mount Sinai Health System—as well as the claims data from 150 million de-identified patients provided by Optum Labs. This enormous amount of data gives Rensselaer and its collaborators the scope to consider even uncommon phenomena and rare diseases, and to realize the promise of personalized medicine. The FDA approval process for small-molecule drugs currently takes on average 14 years, and costs over $2 billion per successful drug. Big data—as well as the tools and expertise to help us analyze and understand that data—can accelerate dramatically our ability to get targeted new treatments to patients at much lower costs, using compounds that already are approved.

For example, for one of our first joint research projects with Mount Sinai, Dr. Deborah McGuinness, Rensselaer professor of computer and cognitive science and Tetherless World Senior Constellation Chair, is developing tools for drug repurposing. She is using the results in the published literature to find possible causal relations that suggest which drugs, already proven safe, may be applicable to diseases other than the ones for which they originally were developed. We will marry this work with patient data.

Our endeavors in the field of human health are a prime example of The New Polytechnic: a vision for the future of Rensselaer, in which the Institute serves as a great crossroads for collaborations animated by new technologies and tools, and extending across disciplines, sectors, and global regions, in order to address complex global challenges.

As we bring together engineers, and researchers in the life, physical, and computational sciences, with physicians, we have the opportunity to understand health and disease from the nanoscale on up—from the level of the molecule, to the cell, to the tissue, to the organ, to the patients, in all their remarkable complexity.

The connections we make, among people and among ideas, will transform medicine.
Grand Marshal Memories

I read with interest the article titled “Union Strong” in the Winter 2014-15 issue of the alumni magazine and would like to share a missing point of historical interest concerning the Grand Marshal. According to the “History of GM Week,” (gmweek.union.rpi.edu/history. php), “[t]he election customs were well established by 1882, when Independence Grove, a strangely named junior, of Chi Phi, was elected Grand Marshal. In 1883 occurred a characteristic Grand Marshal’s election night on May 2 in Harmony Hall, used for many years for the purpose, and the retiring marshal was presented with a suitably inscribed gold-headed cane.”

In fact, during or about 2009, I located on eBay the 1887 Grand Marshal gold-headed cane, or walking stick, as they were commonly called, formerly presented to H.B. Pomeroy, and dated May 27, 1887, in recognition of his service as GM during the past year. This intricately cased cane now resides in the Institute Archives and Special Collections of the Folsom Library.

WILLIAM SHIRLEY ’75
Belleville, Illinois

Rensselaer Union Building Opening

G reatly enjoyed the “Union Strong” article and the many memories it returned to me (Winter 2014-15). One small correction, however: The “new” Union building did not open in 1969. It was dedicated in October 1967. I had the honor of being the PU for 1967-1968 and ran on a platform of taxing ourselves with a Student Activities fee large enough to support the new facility and other student clubs and sports.

I am looking forward to this coming October and the Reunion & Homecoming weekend activities that will recognize the immediate and long-lasting difference for the better the Union building made to campus life, way back then. I will be bringing with me a bunch of photos and memorabilia from that era. Included will be a copy of the Union Dedication Booklet.

BILL CRIRE ’68
Woodbridge, Virginia

Light Pollution

I always enjoy getting a new issue of the Rensselaer magazine. The Winter 2014-15 issue had several articles that I found interesting.

On page 6 is a short article, “Sustaining Roadway Lighting Standards,” about the Lighting Research Center (LRC) and how it is involved with improving highway lighting. As an amateur astronomer, however, I was disappointed that there was no mention of light pollution of the night sky as one of the issues the center was addressing.

Light pollution of the night sky has made it virtually impossible to see many celestial objects in most of the United States, especially in its highly populated urban areas, either with the naked eye or even with moderately powerful telescopes. This robs many people of the awe and wonder that our ancestors saw when they looked up at the night sky.

I respectfully suggest that the Lighting Research Center tap into resources available at the International Dark-Sky Association (www.darksky.org), which promotes lighting standards intended to reduce light pollution of the night sky around the world. Any photos of Earth at night from space make it clearly apparent that a great deal of light energy is going in a direction where it is not needed.

I hope that the center, working with the state of New York, will help promote newer technology highway lighting that will not only improve performance and efficiency, but also direct the light produced by these technologies to those areas where it is needed, thereby reducing light pollution of the night sky.

RICHARD KOGLER ’67
Enon, Ohio

On Course With Supply Chain Management

I am happy to see Rensselaer is now offering courses in supply chain management (“Big Data Analytics,” Winter 2014-15). I have spent 30-plus years working in supply chain management as a buyer for imported specialty products. I owe a great deal of my success to my education. My more technical MBA at RPI complemented my liberal arts undergraduate education at Rutgers University and prepared me for a career traveling to over 30 countries sourcing new products.

JANIS HERZT GROVER, MBA ’79
Stockton, New Jersey

We’d love to hear from you! Send correspondence to: Rensselaer Magazine, Strategic Communications and External Relations, Rensselaer Polytechnic Institute, Troy, NY 12180; email to alum.mag@rpi.edu; or call (518) 276-6531.
IN MEMORIAM

Burt Swersey Remembered

Burt Swersey, who served as a lecturer in the Department of Mechanical, Aerospace, and Nuclear Engineering for more than 25 years, died on March 8.

Swersey taught the Inventor’s Studio course, of which he was principal architect, for the past 15 years. More recently, he had introduced a popular new course, How To Change the World, which pushes students to identify and design ways in which they can use technology to economically better the lives of many around the world.

“Throughout his career at Rensselaer, he taught the ideals and methods of innovation and served as a role model to students,” said President Shirley Ann Jackson in a memo to campus. “Many of these students have made significant impacts, either as entrepreneurs or as product designers for well-established companies, accumulating patents and business plan competition awards.”

Recognized by Inc.com in 2009 as among the best entrepreneurship courses in America, the Inventor’s Studio course, a semester-long capstone design experience for engineering seniors, helps students learn to identify, understand, and solve open-ended problems. Student work in the course has resulted in five patents, with several more pending. One notable project, by former students Eben Bayer ’07 and Gavin McIntyre ’07, became Ecovative Design, which makes biodegradable packing products for companies including Dell and Steelcase.

Swersey holds 14 U.S. patents and was the founder of Brookline Instrument Company in 1962 and American Scale Corporation in 1973. He is the recipient of several recognitions, including the 2007 Olympus Lifetime of Educational Innovation Award; the 2012 David M. Darrin ’40 Counseling Award from Phalanx, the Rensselaer student leadership honor society, which recognizes a faculty member who has made an unusual contribution in the counseling of undergraduate students; and the 2014 Sustainable Practice Impact Award from the Lemelson Foundation and the National Collegiate Inventors and Innovators Alliance (NCIIA).

“Professor Swersey pushed students to exceed their dreams, both in the classroom and in their business ventures,” said President Jackson. “His ability to motivate and engage students, and his dedication to student advising, counseling, and mentoring, was unequaled.”
President Shirley Ann Jackson shared her vision for The New Polytechnic—and its unprecedented potential to harness the power of science and technology—at the inaugural Pauline Newman ’47 Distinguished Lecture in Science, Technology, and Society.

Held in April at Newman’s alma mater, Vassar College, the lecture acknowledges her contributions in the field of intellectual property law, and in the application of science and technology for government, business, and academic use. Since 1984, Newman has served as a judge for the U.S. Court of Appeals for the Federal Circuit, which has nationwide jurisdiction over international trade legal issues, government contracts, patents, and other subjects.

“Hers has been an extraordinary career,” Jackson said, “but one with which we are familiar at Rensselaer, where a number of our alumni and alumnae have moved from science and engineering to become prominent figures in intellectual property law.”

As an example, Jackson cited Arthur Gajarsa ’62, chairman of the Rensselaer Board of Trustees, and former U.S. circuit judge. In fact, Gajarsa served alongside Newman for 15 years on the U.S. Court of Appeals for the Federal Circuit.

She devoted most of her remarks to The New Polytechnic, defined as a collaborative endeavor merging across a multiplicity of disciplines, sectors, and global regions.

“We are re-envisioning the meaning of polytechnic, within the context of modern challenges and opportunities,” Jackson said. “The New Polytechnic is predicated on the absolute necessity of educating our students in multidisciplinary and collaborative thinking, and linking our researchers—in the arts, architecture, the humanities, the sciences, and the social sciences—as well as in engineering and the applied sciences. Engaged in by a broad spectrum of participants, guided by societal concerns and ethics, The New Polytechnic ultimately facilitates novel and effective approaches to global challenges.”

Jackson pointed to global threats such as geopolitical tensions, climate change, pandemics, competition for natural resources, and growing income inequality in developed and developing economies.

“Collaborations on a grand scale are required, and colleges and universities, as we educate future leaders and convene brilliant scholars, have an obligation to seed, and to support, new approaches to teaching, learning, and problem-solving,” she said.

“Collaborations on a grand scale are required, and colleges and universities, as we educate future leaders and convene brilliant scholars, have an obligation to seed, and to support, new approaches to teaching, learning, and problem-solving,” Jackson said. “It is when we join forces that we truly cancel out our weaknesses and compound our strengths.

“To solve great problems,” she added, “we must connect.”

Century, who is also a pianist, accordionist, and composer, says that this year’s event brought together several world-class musical and intellectual talents in a two-part program. “Susie Ibarra and David Rothenberg are unique musicians that I have known for years, with strong commitments in their art to the environment and sustainability matters,” he says.

The Earth Trio includes Century, Rothenberg, and Ibarra. Ibarra is a percussionist, composer, teacher, and practitioner of world music. She is also noted as a humanitarian working with indigenous peoples through music, a TED fellow, and a collaborator working with artists in other media. Her composition Circadian Rhythms, for 77 percussionists and surround soundscape, was premiered at the 2013 Earth Week Festival on campus.

Musically at home in classical, contem- porary, and improvisational settings, Century joined the Rensselaer Arts Department in 2002 after a varied career as university teacher, new media researcher, inter-arts producer, and arts policy maker. His works for live and electronically processed instruments have been performed and broadcast in concerts and festivals internationally.
PHYSICS, APPLIED PHYSICS, AND ASTRONOMY

The Corrugated Galaxy

The Milky Way galaxy is at least 150 percent larger than is commonly estimated, according to new findings that reveal that the galactic disk is contoured into several concentric ripples. The research, conducted by an international team led by Professor Heidi Jo Newberg, revisits astronomical data from the Sloan Digital Sky Survey (SDSS) which, in 2002, established the presence of a bulging ring of stars beyond the known plane of the Milky Way.

“In essence, what we found is that the disk of the Milky Way isn’t just a disk of stars in a flat plane—it’s corrugated,” says Newberg, professor of physics, applied physics, and astronomy. “As it radiates outward from the sun, we see at least four ripples in the disk of the Milky Way. While we can only look at part of the galaxy with this data, we assume that this pattern is going to be found throughout the disk.”

Importantly, the findings show that the features previously identified as rings are actually part of the galactic disk, extending the known width of the Milky Way from 100,000 light years across to 150,000 light years, says Yan Xu, a scientist at the National Astronomical Observatories of China, former visiting scientist at Rensselaer, and lead author of the paper.

“Going into the research, astronomers had observed that the number of Milky Way stars diminishes rapidly about 50,000 light years from the center of the galaxy, and then a ring of stars appears at about 60,000 light years from the center,” said Xu. “What we see now is that this apparent ring is actually a ripple in the disk. And it may well be that there are more ripples further out which we have not yet seen.”

Newberg, Xu, and their collaborators used data from the SDSS to show an oscillating asymmetry in the main sequence star counts on either side of the galactic plane, starting from the sun and looking outward from the galactic center. In other words, when we look outward from the sun, the mid-plane of the disk is perturbed up, then down, then up, and then down again.

The new research builds upon a 2002 finding in which Newberg established the existence of the “Monoceros Ring,” an “over-density” of stars at the outer edges of the galaxy that bulges above the galactic plane. At the time, Newberg noticed evidence of another over-density of stars, between the Monoceros Ring and the sun, but was unable to investigate further. With more data available from the SDSS, researchers recently returned to the mystery.

“It’s very similar to what would happen if you throw a pebble into still water—the waves will radiate out from the point of impact,” Newberg says.

BUSINESS

Lally Hosts Fourth Annual Business Model Competition

To transform a good idea into a great product, service, or solution requires many factors, including the right environment to foster that growth. To support this endeavor, the Lally School of Management hosted its fourth annual business model competition for undergraduate and graduate students in February.

Nine student teams pitched their product or software ideas as they competed for more than $15,000 in prizes and in-kind services. The panel of judges included community members and alumni and alumnae with varying backgrounds in entrepreneurship and business.

“The Lally School is a pivotal destination for many students at Rensselaer who excel at entrepreneurial skills, innovation, and leadership and are interested in starting a journey to create a business,” says Thomas Begley, dean of the Lally School. “This annual competition helps them bring their ideas to the next level. The highly experienced group of entrepreneurs who serve as coaches and judges encourage these students to believe that starting a business is within their reach.”

The winners were: BASE-Lock, which won first place ($8,000) for a smart firearm safety technology that serves as a quick-access safe for handguns intended for home safety; Re-sumazing, which won second place ($5,000) for an automated web service that uses machine learning to bundle resume building and headhunting into one powerful and synergistic platform; and Illium VR, which won third place ($2,000) for a highly immersive virtual reality experience for first-person shooters, for both consumer and military applications. Illium VR was also awarded the intellectual property (in-kind) award ($2,000).

BASE-Lock (L to R): Timothy Oh ’16, mechanical engineering; Bob Godgart ’82, serial entrepreneur.

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EMPAC

EMPAC-Produced Albums Top Year-End Lists

Good news started rolling in at year’s end as music magazines, radio stations, blogs, and awards organizations selected a number of albums produced at the Curtis R. Priem Experimental Media and Performing Arts Center (EMPAC) for their lists of 2014’s best. Ben Frost’s A U R O R A, Vicky Chow and Tristan Perich’s Surface Image, David Brynjar Fransson’s The Negotiation of Context, and Michael Gordon’s Rushes were all developed through the EMPAC artist-in-residence program, and recorded either in full or in part at EMPAC.

The highest honor was given to Frost, whose record was chosen as the No. 1 avant-garde album of the year by Rolling Stone. Chow and Perich’s album followed closely behind at No. 4. Spin placed Frost at No. 48 in a list that took no account of genre, while Pitchfork notched the project in at No. 50.

Meanwhile, Chow and Perich’s album received much acclaim on classical/new music lists. Rhapsody put the album at No. 17, Fringe or Possibly Extinct at No. 6, while WNYC’s New Sounds selected it for their top-10 year-end radio show. Music Is Good chose Chow and Perich at No. 8 and Michael Gordon at No. 9. And, finally, Fransson’s album, which was recorded at EMPAC by the ensemble Yarn/Wire, registered at No. 5 on The Wire’s list of “best modern composition.” The album was also nominated for an Icelandic Music Award in Fransson’s native country.

These selections highlight EMPAC’s rising profile within the international arts community as an incubator for boundary-pushing work that cannot be technically achieved elsewhere. During his residency, Frost used the EMPAC Concert Hall as a giant echo chamber, processing source material he had recorded in Iceland and the Congo, while recording and mixing in Studio 1. Chow and Perich developed their entire album in residence at EMPAC, with music curator Argeo Ascani producing. Pianist Chow worked in the Concert Hall, while Perich programmed 1-bit electronics in Studio 2, mixing and mastering everything in-house.

In each of these cases, the artists also debuted their work in an EMPAC performance. But the artist-in-residence program as often conceives work behind closed doors that then takes life elsewhere. In Frost’s case, the residency was used in part to develop the live show he then toured the world with throughout the year. When Yarn/Wire performed at EMPAC this fall, two of the selected pieces were drawn from this prior recording project with Fransson.

CIVIL AND ENVIRONMENTAL ENGINEERING

Flood Systems Explored Virtually

The National Science Foundation (NSF) has awarded a three-year $650,000 grant to two Rensselaer professors to develop Geo Explorer, a game that will allow engineering students to inspect, design, and test flood protection systems virtually.

The education grant was awarded to Tarek Abdoun, the Thomas Iovino chaired professor in civil and environmental engineering, and Victoria Bennett, assistant professor of civil and environmental engineering.

Abdoun and Bennett are developing Geo Explorer, a mixed-reality and mobile game, to “bring” students into the field virtually to conduct geotechnical site investigations and evaluations. Playing Geo Explorer will enable students to participate in field testing, inspect levees during and after extreme storms, assess stability, and make decisions about future actions related to flood control infrastructure. Geo Explorer also includes a bridge to the actual laboratory. Players will not only use mobile devices, but they also will test actual soil samples in the lab and can upload results to the game.

Abdoun and Bennett note that natural disasters such as Hurricane Katrina illustrate the serious consequences of a deteriorating infrastructure and a public ill-equipped to respond to weather extremes. Such challenges cannot be adequately met in the traditional classroom. Games like Geo Explorer can address the gaps in geotechnical engineering education by providing realistic virtual experience with the unfamiliar, allowing participants to weigh choices and experience their consequences.

“Geo Explorer has a tremendous potential to teach students about the deadly consequences of deteriorating infrastructure,” says Bennett. “Games enable people to experience the unknown and unfamiliar in a virtual world, and they have the power to engage their users.”
Breneman’s research is in the field of computational chemistry and predictive cheminformatics, with emphasis on both computational drug discovery methodology and materials informatics methods. His materials informatics work led to his appointment as an adviser to the White House Office of Science and Technology Policy/National Institute of Standards in Technology Materials Genome Initiative program.

Breneman has led the Rensselaer Exploratory Center for Cheminformatics Research during the past nine years. He is the author of more than 100 journal articles, 16 book chapters, and numerous refereed conference proceedings, and holds a patent on his molecular property descriptor technology (“PEST”), which has been licensed by several major pharmaceutical companies.

**ROBOTICS**

**Team TROOPER Faces Final DARPA Challenge**

Team TROOPER spent the spring preparing to take on contenders from around the globe—and tackle some of the most daunting disaster response tests—during the Defense Advanced Research Projects Agency (DARPA) Robotics Challenge finals in June. The team is a partnership of Rensselaer, Lockheed Martin, and the University of Pennsylvania.

One of the world’s most difficult robotics competitions, the challenge requires humanoid robots to drive to a simulated disaster zone, exit the vehicle without assistance, and complete a circuit of complicated physical tasks. The goal is to improve disaster response by developing semi-autonomous robots that could be dispatched to areas too dangerous for humans.

Team TROOPER is one of 11 to qualify for the finals by placing among the top finishers in previous contests. Another 14 teams qualified by submitting videos of their robots in action.

The finals feature some challenges that contestants have seen before. However, for the first time, robots will be untethered. With no power cords, fall arrestors, or wires, robots will operate on battery packs and have to recover from falls unassisted. Teams will rely on wireless communications.

Also, tasks will have to be completed in order, in an hour or less—and will include a surprise that teams have not been able to prepare for in advance. Lastly, communications will be degraded and intermittent, forcing robots to make some decisions without their human teammates.

“The DARPA Robotics Challenge was designed to push the teams and their robots to perform beyond what was thought to be nearly impossible just a few years ago,” says Jeff Trinkle, professor of computer science and director of the Rensselaer Computer Science Department Robotics Lab. “The challenge has accelerated progress, and the finals competition will set performance standards for future robots to exceed.”

Most of the teams have designed their own robots and software. Seven, including TROOPER, are writing software for the Atlas humanoid, which was developed for DARPA by Boston Dynamics. The upgraded, cordless Atlas is 6 feet 2 inches tall and weighs 345 pounds. Arms have been repositioned so Atlas can better sense what its hands are doing. Redesigned wrists enable Atlas to turn door handles simply by rotating its wrist, instead of its entire arm.

Lockheed Martin plays the lead role on team TROOPER and is responsible for the overall software structure and communication. Rensselaer team members—doctoral student Jun Dong and postdoctoral researcher Daniel Montrallo Flickinger—focus on upper body planning and manipulation. University of Pennsylvania team members work on perception and lower and communication. Rensselaer team members—doctoral student Jun Dong and postdoctoral researcher Daniel Montrallo Flickinger—focus on upper body planning and manipulation. University of Pennsylvania team members work on perception and lower and whole body control for walking and balancing tasks. “Together, we form an amazing team,” Dong says.

For the finals, Dong is developing software to help the robot execute pre-set trajectories for specific tasks and objects in an unknown environment.
Biomedical Engineering

New Innovator Award Honors Pioneering Research in Embryonic Development

Leo Q. Wan, assistant professor of biomedical engineering, has won a five-year, $2.4 million New Innovator Award from the National Institutes of Health (NIH) to support his pioneering research in left-right asymmetry of the cell in embryonic development.

This prestigious award is reserved for early-stage investigators who propose highly innovative approaches to major challenges in biomedical and behavioral research. Nationwide, only 50 scientists received the award in 2014.

The New Innovator Award is the latest honor for Wan, who also has been named a Pew Scholar in the Biomedical Sciences and has won a Faculty Early Career Development Award from the National Science Foundation.

“Dr. Wan is among the most promising, talented young researchers in the field of biotechnology and biomedical engineering, and we congratulate him on this latest, much-deserved recognition,” says Deepak Vashisht, director of the Center for Biotechnology and Interdisciplinary Studies (CBIS). “His research and its potential clinical implications exemplify the trailblazing work underway at CBIS.”

Wan’s research focuses on chirality—also known as handedness or left-right asymmetry—an important feature in the development of multicellular organisms. In humans, for example, asymmetry is evident in the positioning of organs in the body.

Defects in chirality occur in more than one in 8,000 live births. Wan’s goal is to uncover the rules that govern left-right asymmetry in tissues and organs during development and, ultimately, to better understand genetic diseases and birth defects. He uses embryonic stem cell culture to mimic the cells at various stages of embryonic tissue development. He also employs microfabrication, live cell imaging, molecular assay, traction force measurement, and high-throughput screening, to illustrate the biophysical and biochemical mechanisms involved in the formation of chiral structures.

The NIH New Innovator Award was established in 2007 to stimulate highly innovative research and support promising new investigators. The award is part of the NIH High-Risk High-Reward Research Program “to encourage creative, outside-the-box thinkers to pursue exciting and innovative ideas about biomedical research.”

“This is the NIH’s most prestigious award for early investigators,” says Juergen Hahn, professor and head of biomedical engineering. “It is an extraordinary honor for Dr. Wan, the department, the School of Engineering—and for Rensselaer.”

In addition to his NIH, NSF, and Pew awards, he has been recognized with an American Heart Association Scientist Development Grant, March of Dimes Basil O’Connor Starter Scholar Research Award, the Cellular and Molecular Bioengineering Conference Rising Star from the Biomedical Engineering Society, and Young Investigator Award from the Frontiers in Bioengineering Workshop.

Athletics

Ring of Honor for John Carter ’86

Former student-athlete John Carter ’86 is the eighth inductee into the prestigious Rensselaer Hockey Ring of Honor. A two-time national All-American and the second leading point producer in school history, Carter, a forward who wore number 15, was recognized in February prior to the Engineers’ Big Red Freakout game against Yale University.

It was 30 years ago that Carter helped Rensselaer to the 1985 NCAA Championship. In 131 games at Rensselaer from 1982-83 to 1985-86, Carter scored 117 goals with 108 assists for 225 points. He is second in school history in goals and points, third in hat tricks (13), and sixth in assists. He had six 5-point games and also compiled 207 career penalty minutes, which is 22nd. He was a national All-America First Team honoree in 1983-84 and Second Team the following season. Carter was an All-ECAC choice the same two years, including First Team as a junior in 1984-85 when he helped the Engineers to a 35-2-1 (.934) record, an ECAC Championship, and the NCAA title.

“We are thrilled to be recognizing the great contributions of John Carter by inducting him into the Ring of Honor,” says head coach Seth Appert. “He is one of the best to ever wear the cherry and white while also helping deliver an NCAA title to RPI.”

Carter went on to play 10 professional seasons, including 244 games in the National Hockey League (NHL). He scored 40 goals with 50 assists for 90 points during eight NHL regular seasons, while also scoring seven times with five assists in 31 playoff games. He played six seasons with the Boston Bruins and two with the San Jose Sharks. He also represented the United States, playing on the 1986 national team.

A management major, Carter joins Adam Oates ’85, Joe Juneau ’91, Coach Ned Harkness, Frank Chiarelli ’55, Bob Brinkworth ’64, Garry Kearns ’58, and Jerry Knightley ’65 in the Ring of Honor, which is displayed in the Houston Field House rafters.
THE PLASTIC MONKEY IN A BARREL OF Monkeys game today is nearly identical to the grinning little figure Milton Dinhofer ’45 created in the basement of his Long Island home in 1963. The swinging arms form a perfect S and the legs kick up slightly, as though the teeny primate is doing a jig.

“At first I had them standing straight,” says Dinhofer, a 1945 Rensselaer graduate who majored in electrical engineering. “But making them kick up at an angle balanced the piece. And the legs are what make them look so great.”

At 91, Dinhofer lays claim to a bona fide slice of Americana, “a quirky little thing to make someone happy,” as his granddaughter, Tracy Leshay, puts it. Not only has the linking game he invented been in circulation nonstop since Lakeside Toys put the first barrel on store shelves in 1965, and not only have the monkeys changed but a tiny fraction (they sprouted body hair!), but also Barrel of Monkeys keeps coming up with new ways to assert its relevance.

The shiny chimps, for instance, appear in all three Toy Story movies, sharing scenes with the likes of Buzz Lightyear and Mr. Potato Head. Dinhofer collects royalties from this product placement, as he has from every $8 to $10 game sold, every Pixar action figure and McDonald’s Happy Meal toy. The game even saves lives in Iron Man 3, when the superhero gets 13 passengers who have jumped from a burning plane to link arms “like a Barrel of Monkeys,” he instructs, as he whisks them to safety.

“They just put out a video game of that and I’m getting royalties on it, too,” says Dinhofer, who lives outside Los Angeles, near his family.

But as the game, now made by Milton Bradley, turns 50 this year, what Dinhofer is not getting is credit for its concept and design. An early partner in the venture squeezed him out, a matter later settled in court. Now, his granddaughter vows to set the record straight where it counts: on Wikipedia, which does not include Dinhofer in its Barrel of Monkeys entry.

“I promised him this for his 90th birthday,” says Leshay, who is building her case by writing meticulously researched articles on the game for trade journals. “If he’s not listed in Wikipedia, no one will know that the monkey and the idea were his.”

Brooklyn-born, Dinhofer studied at Rensselaer, pre-computer and, he jokes, even before the ballpoint pen. He combined a grounding in manufacturing with stints as a cartoonist for campus publications, including the 1945 yearbook. He emerged confident that he could move concepts to reality. Equal parts artist, engineer, and inventor, Dinhofer had whimsical creations to his credit before Barrel of Monkeys, often concocted after-hours and in his basement. In his 20s, while working in novelty imports, he designed a popular, and lucrative, headband women could secure with a plastic clip, using a new technology impossible...
for competitors to copy. There was also Dinhofer’s kid’s space helmet, see-through spherical headgear that landed nostalgic illustrations on the covers of Collier’s and The Saturday Evening Post.

And after seeing children playing with glass tubes, Dinhofer came up with the first-ever plastic straw, the twisting Sip-N-See, billed as a surefire way to get kids to drink their milk.

“The buyer put in an order for six dozen in six stores on a Friday night and on Monday the six stores reordered anywhere from 60 to 120 dozen and I knew we were in,” Dinhofer recalls.

Those were clever responses to what the market craved. But Barrel of Monkeys is his signature piece for the ages. “I've had grandmothers who had the game when they were little give it to their grandchildren. They ask me to sign it,” he says. “It’s quite an achievement.”

The game was born when Leonard Marks, a salesman, began snapping together some chain links while waiting for a client. Marks saw the potential for a linking game and contacted Dinhofer, an old high school classmate, to discuss the potential.

“I said, ‘first you have to make them out of plastic,’” Dinhofer recalls. “A week later he came to me with plastic S-shaped pieces and I saw monkeys right away.”

He spent months drawing the smiling faces, perfecting the swirling arms and the kicking legs and getting them to link easily. Then, he paid to have a mold created.

But when Marks struck a deal with Lakeside Toys, he did not inform Dinhofer and, Dinhofer says, never told the company about him. Instead of earning full royalties, Marks paid him a modest share of his own proceeds from the hugely successful game. The matter was later rectified in court.

Now, Dinhofer says he’d be glad if people knew that the monkeys were his from a source other than himself. When he contacted his Brooklyn high school to tell them he had invented the game and wished to be included on its Honor Roll of successful graduates, they declined because he wasn’t listed anywhere.

“I feel good because I never expected the game to last this long,” he says. “I just wish people knew what I did.”
MAKING A DIFFERENCE

A Lifelong Legacy of Support

Diane Ozovek Howard ’82 was just 6 years old when she first stepped onto the Rensselaer campus, and the Institute has been an important part of her life since. Howard’s family has a strong legacy at Rensselaer, as her two older brothers attended the Institute, as well as her twin sister.

Howard makes it a priority to travel back to campus several times a year, an experience which still has an effect on her after all these years.

“There are two things I love about coming back to campus more than 30 years after graduating,” Howard says. “First, I am able to see the overwhelming advancements made, both brick-and-mortar and programmatic. The changes have accelerated beyond the times and it gives me a sense of pride to see the campus and the student experience transformed, and to know that I may have played a small part in this. Second, the chance to connect with the students and to experience the holistic education they are receiving in addition to the technological base is inspiring.”

For nearly 20 years, she has been inspired to consistently give back to the Institute by donating to the Rensselaer Annual Fund. She also serves in an important volunteer leadership role, as chair of the Annual Giving Leadership Council, a position she has held since 2009. In this position, Howard helps to lead the many alumni volunteers who inspire others to give back to Rensselaer, a critical component of the Annual Fund. Her efforts are paying off, with the Annual Fund growing during her tenure, from $3.8 million her first year, to $4.8 million last year.

In recognition of her service to Rensselaer, she was awarded the Alumni Key Award in 2006.

“I look at both my volunteer work and gifts to Rensselaer, particularly to the Rensselaer Annual Fund, as a way to give back and help students,” Howard says. “I would not have been able to attend RPI without financial assistance. Getting my Rensselaer degree was a watershed moment in my life, and I am extremely appreciative of all that the degree and the Rensselaer experience has made possible for me. I gain personal satisfaction in helping the students achieve an RPI education, which will pay dividends in their lives, and empower them to change the world.”

At the onset of her career, she was actively involved as a young alumna through her position with IBM Corporation, which allowed her to visit campus frequently to recruit and connect with students. After various positions of increasing responsibilities with Lockheed Martin and Thales Communications, Howard is currently vice president of operations for the cyber division for Northrop Grumman Information Systems.

Highly Efficient Neutron Detector

A Rensselaer team has created a highly efficient and robust solid-state neutron detector based on a patent-pending new material system. Neutron detectors are typically used to track neutrons for the purposes of protecting materials and the control of neutron transmutation. This new detector could reach 100 percent efficiency and operate in high temperature and high neutron flux environments without significant device performance degradation. Because the fabrication of the detector is based on standard semiconductor processing, a very low-cost system could be massively produced.

Reliable, Adaptive Vibration Controller

Led by Michael Symans, associate professor of civil engineering, a reliable, cost-effective, adaptive-passive mechanical control system targeted for protecting buildings, bridges, and other structures from seismic activity has been invented that could also be used to dampen other vibrations. Most earthquake protection systems require electric power. These systems, while effective, are not considered reliable due to potential power failure during an earthquake. On the other hand, passive vibration controllers systems lack adaptability. This new invention overcomes the shortcomings of a conventional passive system by incorporating an adaptive technology that reacts to seismic activity in real time, yet preserves the robustness of the passive system without the need for electricity.

“Chiral” Filtration Membranes

A new type of filtration membrane has been created that is more resistant to fouling than commercially available products. Membrane fouling that occurs due to the adhesion of proteins inhibits filtration performance in dialysis, desalination, microbial fuel cells, and other applications. This technology uses a set of chiral membranes that allows for selective protein separation. Chiral proteins, giving rise to “left-handed” and “right-handed” versions of the molecule, add a powerful new dimension to exploit when trying to separate out fouling proteins.

To learn more, go to www.rpitechnology.com or email otc@rpi.edu.
Lamps designed by Lightexture, a company co-founded by Yael Erel ’13, a graduate and current adjunct professor of the School of Architecture, have earned more than $82,000 in a Kickstarter campaign. Four Lightexture lamps and objects that project “light drawings” were part of a group exhibition titled “Lit” at the Albany International Airport this spring.

The lamp series is an outgrowth of “Subliminal Transcriptions,” Erel’s graduate research in architecture and light. Hand-made by the Troy-based company, the “Iris” lamp has two apertures of overlapping metal leaves that can be adjusted to control the amount of light and reflections it casts. The patented design draws inspiration from a stainless steel vegetable steamer, according to Lightexture co-founder Avner Ben Natan.

As one aperture on the Iris lamp opens, the other closes. When the lower aperture is fully open, light shines directly down, casting textured golden light onto the surface below. When the upper aperture is open, patterned light shines upward and bounces off the ceiling to fill the space with a warm, indirect light. The transition between these two provides a variety of reflections and light atmospheres. The Iris lamps give the user the ability to change the light and create the atmosphere in the room.

Ben Natan and Erel have developed prototypes of four Iris lamp styles. The couple launched the Kickstarter campaign to expand production capacity and were pleased to meet their initial goal in less than two days. Under the terms of Kickstarter campaigns, fund seekers are required to set a financial goal and deadline and can collect pledges only if the campaign reaches the goal before the deadline. The Kickstarter campaign was so successful it was selected as a “Kickstarter Staff Pick.”

“We were very moved by the support this project has been getting,” says Erel. “We never imagined we would reach our goal in only 31 hours.”

Erel is a licensed architect in New York and registered architect in Israel. She graduated with honors from the Cooper Union School of Architecture, and earned a master’s degree in architecture with an emphasis on lighting from Rensselaer. Erel is currently teaching at Rensselaer with support from the 2015 Brown Travel Fellowship for her research project “Constructing Reflections.”

The Lightexture lamp series is an outgrowth of “Subliminal Transcriptions,” Yael Erel’s graduate research in architecture and light.
Ph.D. Student Honored for Contemporary Arts

Doctoral student Zach Layton has received one of the most prestigious awards in the contemporary arts—a 2015 Grant to Artists from the Foundation for Contemporary Arts in recognition of his groundbreaking work and potential.

The award carries extraordinary weight, in part, because recipients are nominated and chosen by distinguished fellow artists, via a confidential selection process. Applications are not accepted. As a result, in addition to receiving financial support, honorees typically benefit from a boost in confidence at a pivotal point in their careers. There are no restrictions on how the grant funds may be used.


“When you look at the list of past recipients, it’s humbling and inspiring to be in such company,” Layton says. “Being an artist can be very difficult, and an award like this can make an enormous difference in your financial and emotional well-being and your faith in yourself.”

Layton is the founder and artistic director of Darmstadt: Classics of the Avant-Garde, a new-music/media series held annually in Brooklyn. He has taught at New York University and has been a guest lecturer at Brooklyn College, Parsons School of Design, and the Columbia University Sound Arts Program. Layton also has performed at the Solomon R. Guggenheim Museum and has served as curator for ISSUE Project Room, an internationally renowned Brooklyn-based performance venue.

The Foundation for Contemporary Arts was founded in 1963 by artists—including Jasper Johns and John Cage—to benefit artists. Since then, the foundation has awarded more than 2,300 grants totaling over $11 million.
FRANCINE BERMAN, GE WANG, and SHEKAR GARDE have been named fellows of the American Association for the Advancement of Science (AAAS), the world’s largest general scientific society. They were among the 401 newly selected AAAS fellows recognized for their “scientifically or socially distinguished efforts to advance science or its applications.”

Berman, the Edward P. Hamilton Distinguished Professor in Computer Science and chair of the Research Data Alliance/U.S., was cited for her “distinguished contributions to the field of computer science and community leadership in data cyberinfrastructure, digital data preservation, and high performance computing.”

Wang, the John A. Clark and Edward T. Crossan Professor of Engineering and director of the Biomedical Imaging Center, was cited for his “distinguished contributions to the field of biomedical imaging particularly for X-ray computed tomography, optical molecular tomography, interior tomography, and multi-modality fusion.”

Garde, dean of engineering and the Elaine S. and Jack S. Parker Chaired Professor, was cited for his “distinguished contributions to molecular-level understanding of water and hydrophobicity using modern theory and simulations, and for communicating science to children through the Molecularium Project.”

BULENT YENER, professor of computer science and founding director of the Data Science Research Center, has been named a fellow of the Institute of Electrical and Electronics Engineers (IEEE). In elevating him to a fellow, the IEEE cited Yener for “contributions to network design optimization and security.”

GEORGES BELFORT, Institute Professor, has been named an adviser to the Chinese Academy of Sciences and a member of the Academic Steering Committee of the Alexander Grass Center for Bioengineering at the Hebrew University of Jerusalem. He also has been selected to chair the Society for Biological Engineering, a technological community within the American Institute of Chemical Engineers.

HEIDI NEWBERG, professor of physics, applied physics, and astronomy and a founding member of the Supernova Cosmology Project, will share the 2015 Breakthrough Prize in Fundamental Physics with members of two competing teams that discovered dark energy. The 51 collaborators from the two teams will split the $3 million prize. The project was cited for “the most unexpected discovery that the expansion of the universe is accelerating, rather than slowing as had been long assumed,” according to a news release from the Breakthrough Prize.

ROBERT LINHARDT, the Ann and John H. Broadbent Jr. ’59 Senior Constellation Professor of Biocatalysis and Metabolic Engineering, and Jonathan Dordick, vice president for research, have been named fellows of the National Academy of Inventors (NAI). The recognition is reserved for academic inventors “who have demonstrated a prolific spirit of innovation in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development, and the welfare of society,” according to the NAI.

EVAN DOUGLIS, dean of architecture, was among four individuals to be honored by the Cooper Union Alumni Association at their Founder’s Day Celebration in April. Dougliss received the John Q. Hejduk Award, given to a graduate of the Irwin S. Chanin School of Architecture who has made an outstanding contribution to the theory, teaching and/or practice of architecture. The award has been presented since 2003 to a recipient who reflects the passion and commitment that John Hejduk, Cooper Union faculty member from 1964 to 2000 and dean of the School of Architecture from 1975 to 2000, had for architecture.

JAMES HENDLER, WAYNE GRAY, and HENG JI were selected to receive 2014 Faculty Awards from IBM. IBM said the competitive program recognizes the quality of a faculty member’s research program with IBM and the importance of that research to industry. Hendler is the Tetherless World Senior Constellation Professor and director of the Rensselaer Institute for Data Exploration and Applications (IDEA). Gray is a professor in the Department of Cognitive Science and an expert in integrated cognitive systems and cognitive modeling. Ji is the Edward P. Hamilton Development Chair and associate professor in the Department of Computer Science.

FRANCINE BERMAN and JAMES HENDLER are among a group of high-profile computer scientists who will help guide a new open access computer science journal, PeerJ Computer Science. Berman is the Edward P. Hamilton Distinguished Professor in Computer Science and chair of the U.S. branch of the Research Data Alliance, and Hendler is the Tetherless World Senior Constellation Professor and director of the Rensselaer Institute for Data Exploration and Applications (IDEA).

JAMES CRIVELLO, professor of chemistry and chemical biology, died Feb. 25. He joined Rensselaer in 1988 after completing a successful industrial career of 22 years at the General Electric Research and Development Center, where he was elected a Coolidge Fellow. Crivello’s contributions to the field of additive manufacturing and 3-D printing are seminal: His invention of a new class of photoinitiators, also known as “Crivello Salts,” designed for inducing cationic polymerization of epoxy resins, opened the door for the first wave of additive manufacturing systems. Most of the current 3-D imaging and 3-D printing technology in use today employs epoxy resin technology and cure chemistry based on work done in his lab. He had more than 330 publications, 144 patents, three books, and 15 book chapters to his credit, and was widely recognized for his work.
Kim Michelle Lewis is one of the 85 female tenured/tenure-track faculty at Rensselaer who blasted past the negative messages that young girls hear about them having lesser math and science abilities than boys.
Kim Michelle Lewis’ interest in science began in elementary school. Interest turned to passion when an African-American female high school physics teacher urged her to take part in a class demonstration involving the diffraction of light. “After that, I was hooked,” recalls Lewis, associate professor of physics, applied physics, and astronomy at Rensselaer.

In those early years, science seemed a natural path for Lewis, who drew inspiration from her physics teacher and three generations of strong female role models. After graduating from a predominantly African-American high school and earning a bachelor’s in physics from Dillard University, a historically black college in her hometown of New Orleans, La., Lewis knew nothing of the perceptions swirling “out there” about women—particularly those who are also racial minorities—being anomalies in the field of physics.

Her wake-up call came when she began studying for a master’s degree in electrical engineering and Ph.D. in applied physics at the University of Michigan at Ann Arbor, an institution with a predominantly white population.

“That’s when I recognized I wasn’t home any more. In elementary, high school, and even college, none of what I was doing was odd to me—you know, being a female African-American in science,” Lewis says. “But at the University of Michigan, I remember feeling a strong sense of isolation.”

Committed to a future as a physicist, she developed a solid support system, tapping into the network of mentors that encouraged her through high school and college. Lewis also credits two of the school’s student organizations—the Society of Minority Engineering Students Graduate Component and the Movement of Underrepresented Sisters in Engineering and Science—for connecting her with students on the same career track.

“In both of those I found my place,” says...
Lewis, who went on to earn a Ph.D. in applied physics from the University of Michigan. A professor at Rensselaer since 2006, Lewis is among the 20 percent of physics Ph.D.s and 14 percent of physics professors in this country who are women.

Lewis is one of the 85 female tenured/tenure-track faculty at Rensselaer who blasted past the negative messages that young girls hear about them having lesser math and science abilities than boys. These distinguished professors and others like them rose above the challenges that can accompany a woman’s decision to pursue careers in the testosterone-driven world of STEM (science, technology, engineering, and math).

Their stories of beating the odds are especially important as demand for these skilled jobs is on track to grow faster than other occupations: 17 percent between 2008 and 2018 compared to 9.8 percent for other jobs, according to the U.S. Bureau of Labor Statistics. Women are expected to fill less than a quarter of these jobs, in spite of making up 47 percent of the workforce.

With widespread job opportunities in these high-paying careers, the number of women working in STEM has been stagnant since 2000. Retention is an even bigger issue. A recent study by the Center for Talent Innovation found that women leave these jobs, in spite of making up 47 percent of the workforce.

The effects of these messages, which depict women as “less-than,” support the many U.S. studies that point to culture rather than gender as the reason there are so few women in math and science. With these cultural biases in mind, Yazici pays particular attention to her female students.

“When I回首看看我自己的学习历程，我越来越觉得女性可以在STEM领域取得成功。我认识的女性都在学校和工作场所取得了成功，但比例仍然很低。我担心这些文化偏见会阻碍我们。”Yazici回忆道。

STEM jobs are on track for 17% growth between 2008 and 2018, compared to 9.8% for other jobs. Women are expected to fill less than a quarter of these jobs, in spite of making up 47% of the workforce.

**U.S. BUREAU OF LABOR STATISTICS**

**BLASTING PAST ROADBLOCKS**

“Every woman has experienced different barriers,” says Heidi Jo Newberg ’87. The professor of physics, applied physics, and astronomy at Rensselaer spent her high school years without a boyfriend.

“I was smart—scary smart—and boys were afraid of me,” Newberg recalls. Undaunted by the stigma, Newberg enrolled in Rensselaer’s mechanical engineering program when her father suggested she could find a good job as an engineer.

Fellow students at Rensselaer responded much differently to Newberg’s brainpower. “It’s funny. In college, I was popular,” she recalls.

A self-described problem-solver who was looking for a different kind of challenge, Newberg switched her major to physics in her sophomore year. She went on to earn a Ph.D. in physics from the University of California-Berkeley, where she was a founding member of the Supernova Cosmology Project.

The astrophysicist’s current work looks at the structure of the Milky Way galaxy. In 2014, Newberg received the Thomson Reuters Highly Cited Researcher award.

Birsen Yazici heard very different messages as a child in Istanbul, Turkey, a society she says does not segregate gender like the United States does. Growing up in a single-parent home with two siblings and an educated mother who valued learning, Yazici saw herself as smart and capable. As a young girl, she learned four languages and earned admission to a highly competitive school.

She was also a math whiz, a skill her mother encouraged. “It was a core part of who I was, so I naturally pursued that direction,” says Yazici, professor of electrical, computer, and systems engineering at Rensselaer.

Yazici first noticed gender differences when she came to the U.S. in 1988 to pursue a Ph.D. in electrical engineering at Purdue University in Lafayette, Ind. It was here, in America, that she saw the ads promoting hair, skin, and other improvement products for women.

“It was a surprise to me. In Turkey, we were not bombarded with commercials that made women feel bad about themselves,” Yazici recalls.

**SUBTLE MESSAGES**

The issues surrounding women and STEM are complex, says Barbara Ruel, director of the Rensselaer Women in Engineering program. Research shows that men and women alike hold implicit assumptions about the opposite gender, including an ongoing bias about women in the sciences.

“These gender schemas manifest themselves in our homes, schools, universities, and workplaces, with the scales tipped toward overrating men and underrating women,” Ruel says.

Many of these messages take on the perception of truth. In elementary school, for example, American girls score better in science and math than boys do. But, as these students move through the upper grades and girls start internalizing cultural signals, the gap narrows until boys begin registering higher grades.

Cynthia Collins was oblivious to any gender bias in the science disciplines until she started pursuing a Ph.D. in chemistry and biochemistry at the California Institute of Technology in Pasadena.

Growing up, Collins was always very competitive. “I was naturally that way. I wanted to be better, smarter, and faster than everyone else,” recalls Collins, associate professor of chemical and biological engineering and biological sciences at Rensselaer.
We need to change these ubiquitous images of what a physicist looks like.”

HEIDI NEWBERG
At her high school in Winnipeg, Canada, where Collins excelled in chemistry, teachers pushed her to challenge herself. It wasn’t until she began her Ph.D. studies that Collins first noticed the difference in how she and her male peers were treated, and how they treated each other. As an undergrad, the students, regardless of gender, were on equal footing, measured by grades or how well they performed in the classroom.

At the graduate level, where students are measured by the value of their ideas and how well they carry out research, assessing value and success is much more subjective. More than once, Collins’ ideas fell on deaf ears—until a male colleague pitched the same idea a few days later.

“It was subtle, which is pretty much how it’s been throughout my career,” Collins recalls. “Often, our ideas aren’t valued as much as those of our male peers.”

Men aren’t the only ones who unfairly value women. A study released earlier this year by researchers at Princeton University and the University of Illinois suggests that the sciences and the humanities—fields that favor men—share a cultural bias in that they value perceived innate brilliance, a trait typically associated with white men, over hard work.

The study surveyed 1,820 academics from 30 disciplines at public and private universities, and found that “an innate gift or talent” was a better predictor of success than was “motivation and sustained effort.” Both men and women were queried for the study. Rather than perpetuate this notion, the authors suggest that professors share honestly about how hard they’ve had to work to advance their careers.

“Seeing people being successful who are two steps ahead of you really helps,” says Collins, whose research accompanied two NASA space missions. In 2010 and 2011, after sending her experiments about bacterial behavior aboard the space shuttle Atlantis, Collins discovered that bacterial biofilms grown in space behave in ways never before observed on Earth. Her experiments with bacteria may provide insights that can be used in the fight against bacterial infections both on Earth and during long-term space missions.

**FEEDING THE PIPELINE**

Rensselaer has employed outreach, recruitment, and mentoring efforts aimed at supporting the STEM pipeline since the 1990s, says Ruel. These initiatives not only assist women at the university, but also introduce girls at an early age to the growing number of careers in STEM.

For instance, the Women’s Mentorship Program matches first-year undergraduate females with upper-class female students in the same or a related field. The Society of Women Engineers at
Rensselaer reaches out to a next generation of female engineers through such organizations as the Girl Scouts of America, the Children’s Museum of Science and Technology in the Rensselaer Technology Park, and others.

Faculty at Rensselaer are also working individually to boost interest from women and minorities.

Lewis established the New Orleans Louisiana Minority Opportunities via Educational Research in Science, or NOLA MOVERS. Each year, as part of an effort to bring minority scientists into the fold, Lewis selects one college student from her hometown to spend between six and eight weeks working in her research group.

“It’s an excellent way to promote students’ continued interest in science, and encourage them to pursue advanced degrees,” says Lewis. She is one of the first people in the Rensselaer Department of Physics, Applied Physics, and Astronomy to receive the National Science Foundation's prestigious Faculty Early Career Development (CAREER) Award. Her research, which studies how molecules are transported through advanced electronic systems, is expected to lead to smaller, more efficient devices.

These initiatives—combined with increased national awareness—are likely among the reasons that Rensselaer has increased the percentage of first-year women students in the last 15 years, from 295 (22 percent) in 1999, to 426 (32 percent) in 2014.

Women attending Rensselaer also graduate at a higher rate and with a higher grade point average than the men, says Linda Schadler, Russell Sage Professor in Materials Science and Engineering and vice provost and dean for undergraduate education.

“Our campus is a place where young women thrive,” Schadler says.

RENSSLEAER ROLE MODELS

Examples of this are plentiful. Take Tahira Reid ’00, who as a senior at Rensselaer received a patent for a motorized double-dutch jump rope system that she and her classmates developed in an introductory engineering design class. The invention attracted national attention on various media outlets, including National Public Radio and NBC’s Today Show.

The innovative jump rope system began as a drawing for which Reid was first recognized in 1985, while she was a third-grader growing up in the Bronx.

“I think from a very early age, STEM needs to be seen as normal as everyday activities like taking a bath,” says Reid. She went on to earn a master’s in electrical engineering from Rensselaer, and a Ph.D. in design science from the University of Michigan at Ann Arbor, and is now an assistant professor of mechanical engineering at Purdue.

Reid sees firsthand the influence she has had on her 7-year-old goddaughter, with whom she has been conducting simple science experiments since the youngster was 2.

“She obtains very high grades in her science classes, and her mother strongly believes that it’s those times that we spend together that are making the difference,” says Reid.

Newberg says simple actions can make a difference. One of
Women have to have the confidence to ask questions. And we have to foster an environment for that.”

SHAYLA SAWYER, PH.D. ’06
the first things she did when she moved into her first-floor office in the Jonsson-Rowland Science Center was take down a large wall poster of famed physicist Albert Einstein. “We need to change these ubiquitous images of what a physicist looks like,” Newberg says.

The female role models are out there: women such as Rensselaer President Shirley Ann Jackson, the first African-American woman to earn a doctorate from the Massachusetts Institute of Technology, and Rosalind Franklin, who discovered the structure of DNA. Mathematician and physicist Emilie du Chatelet was the first to predict the existence of infrared radiation. Mae Jamison was the first black woman in space, and Lise Meitner helped discover nuclear fission.

The shortage of women in STEM speaks to an even bigger issue: the “quiet crisis” that President Jackson identifies as the gap between the nation’s growing need for scientists, engineers, and other technically skilled workers, and its production of them. As baby boomers retire, U.S. colleges and universities are not graduating enough talent to fill needed jobs in research labs, software centers, defense installations, science policy offices, manufacturing shop floors, and high-tech startups.

Through 2018, the number of STEM jobs in the U.S. will grow to 8 million, from 6.8 million in 2008, according to a Georgetown University study. The study looked at the impact of STEM occupations on the country’s economic growth. This dearth will impact every corner of life, President Jackson has noted. She suggests closing the gap with women, minorities, and persons with disabilities, who currently make up only a small part of the STEM workforce.

**BRIDGING THROUGH RELATIONSHIPS**

Retaining women in STEM careers is also a challenge. With women leaving STEM fields at a 45 percent higher rate than men, it’s critical to expose young girls to science projects that align with their unique interests. That way, from the beginning, they are pursuing something that intrigues them.

“Many young girls experiment with makeup. However, the majority never think about how it is made,” says Tequila Harris ’03, who counts President Jackson among her early role models. “A chemistry lab that illustrates how to make cosmetic goods, versus how to model an erupting volcano, could have a very significant impact on attracting women into STEM.”

Harris earned her master’s degree (2003) and her Ph.D. (2006) in mechanical engineering at Rensselaer, and is now an associate professor at the Georgia Institute of Technology’s School of Mechanical Engineering in Atlanta.

Looking back, Harris regrets that she did not build a solid network before she launched her career. But she’s grateful for the support that Rensselaer provided, even after she was gone.

Two months into a new position, Harris turned to a former Rensselaer professor after she failed to make the right funding connections.

“He said, ‘Meet me in Washington, D.C.,’ which I did. He walked me through several buildings to meet several program managers. By the end of that day, I was invited to serve on panels. It helped me to better understand the review process as well as network,” Harris says.

Harris’ work, which investigates the science associated with polymer thin films, earned her the National Science Foundation’s CAREER award in 2010. Her research is designed to make thin films better, cheaper, and faster for a variety of areas including energy, environmental, electronics, and pharmaceuticals.

Shayla Sawyer, Ph.D. ’06, is another success story. Sawyer, who earned a Ph.D. in electrical engineering from Rensselaer in 2006, is associate professor of engineering in the Department of Electrical, Computer, and Systems Engineering.

As a young girl, Sawyer had two equal goals: earn an engineering degree (her father was an electrical engineer) and play Division I basketball. She enrolled at Hampton University. Hampton, a historically black, private college in Virginia, provided her the outlet for both.

Growing up in the predominantly white community of Erie, Pa., Sawyer did not encounter many people like her. “But I definitely did not grow up in a negative environment. I never heard that I couldn’t play academically, or on the court,” Sawyer says. What she knew intuitively was that she had to perform well to succeed.

“You have to have a certain mentality. When I perform and bring my skills, any question to the contrary goes away,” says Sawyer, among the 17 percent of women professors in Rensselaer’s School of Engineering. She was the fifth woman in her department to receive tenure; two have followed since.

“I’m proud of our department for making steps in that direction,” notes Sawyer, who studies nanocomposite-based devices and their ability to sense things including light, chemicals, and biohazards.

Lately, Sawyer notices more women students coming to her office for help. This is encouraging, she says, because it builds familiarity and trust.

“Women have to have the confidence to ask questions. And we have to foster an environment for that,” Sawyer says. “Increasing the number of women and minority faculty helps.”
The Jefferson Project at Lake George seeks to create the most advanced environmental monitoring and prediction system ever built to provide insights into lakes around the world.

BY JODI ACKERMAN FRANK

ON AN OCTOBER DAY IN 2013, a small boat equipped with sonar-based gear traversed Lake George, incorporating sound waves to create a three-dimensional map of the contours of the lakebed.

The undertaking, which included many sonar-equipped boat trips over several months, marked the starting point of the Jefferson Project, a historic initiative to understand, manage, and protect one of the world’s most pristine and natural lakes.

The sonar data, produced from an advanced technology called hydrographic bathymetry, was paired with other data collected through aircraft outfitted with LiDAR (light detection and ranging) equipment to build the most sophisticated topographical survey of a freshwater lake of this size. The high-resolution, 3-D map details the bottom of the 32-mile-long body of water and its shoreline, as well as the entire watershed that includes the mountains, which frame the lake’s crystalline beauty.

Launched in June 2013, the Jefferson Project is a collaboration among Rensselaer, IBM, and The FUND for Lake George, a nonprofit environmental advocacy group. The goal is to create the most advanced environmental monitoring...
and prediction systems ever built to provide scientists and the community with a continuous, real-time view of the health of the lake.

The three project partners offer expertise in fields as varied as biology, freshwater ecology, computer science, physics, engineering, cyber-physical systems, environmental advocacy, and remote sensing. Working together, they are developing novel ways of collecting, modeling, analyzing, and sharing data to gain a more complete understanding of the complex systems that operate within and around Lake George.

“The discoveries we’ll be making, the technology that is being developed, the approach that we are taking, and the insights we will gain as a result are applicable to freshwater lakes around the world,” says Rick Relyea, executive director of the Margaret A. and David M. Darrin ’40 Fresh Water Institute (DFWI) and director of the Jefferson Project. “At a time when drinking-water sources everywhere are dwindling, the project we are embarking on couldn’t be more crucial.”

A Global Model

SITUATED ON THE SHORE OF LAKE GEORGE in Bolton Landing, the DFWI is the home base for the Jefferson Project. The DFWI, which operates a state-of-the-art field station, is widely regarded for its research of freshwaters, integrating the latest research methods and technologies for nearly 50 years.

Housed at the DFWI is the Jefferson Project’s central operations center—the Helen-Jo and John E. Kelly III ’78 Data Visualization Laboratory. This is where data collected from a network of 40 sensors and other equipment in and around the lake will be transformed into graphic displays and simulations on a high-resolution screen, which will paint a detailed picture of all the elements that interact with the lake, including weather, runoff, circulation patterns, and aquatic life.

The 2,000-square-foot facility is named in recognition of John Kelly III ’78 and his wife, Helen-Jo, who provided a major gift last fall to create an endowed fund at Rensselaer to support lab research and equipment.

“RPI and Lake George have been important parts of my family’s life, and I am thrilled to be supporting such an important endeavor,” John Kelly says. Kelly, who serves as senior vice president and director of IBM Research, has been instrumental in forging strong corporate partnerships between IBM and Rensselaer over the years.

With the visualization lab in place, researchers will be able to zoom in as close as half a meter (about 20 inches) on high-resolution 3-D models of the lake and surrounding area, a degree of detail unprecedented for a lake of this size. The visualization lab is linked to several supercomputers, including the Advanced Multiprocessing Optimized System (AMOS) at Rensselaer. The most powerful supercomputer in the Northeast, AMOS has unparalleled abilities to run calculations and access data from other networks.

AMOS is a Blue Gene/Q supercomputer located in the university’s Center for Computational Innovations (CCI). It has a bandwidth of more than four terabytes per second—more than the combined bandwidth of two million home Internet subscribers. IBM’s Blue Gene computer series, developed in collaboration with the U.S. Department of Energy, was originally built to help biologists observe protein folding and gene development.

The visualization lab will also be connected to multiple computers at IBM’s research lab in Yorktown Heights, New York. Data from the sensors and other sources will be accessible to Jefferson Project researchers via a new system that is being developed. Several other IBM supercomputers around the country will also augment and analyze the sensor data, including Deep Thunder, a weather forecasting system that currently provides 48-hour forecasts every 12 hours.

“We are collectively working on an environmental monitoring and management system in a way that has never been done before, connecting together the best computing models available that will then be joined to the visualization lab at the DFWI,” says Harry Kolar, an IBM Distinguished Engineer who is heading the IBM team working on the Jefferson Project.

Queen of American Lakes—Preserving a World Treasure

The name chosen for the Jefferson Project pays homage to President Thomas Jefferson, who in a letter to his daughter in the late 1700s said that Lake George is “without comparison, the most beautiful water I ever saw.”

“Jefferson’s words provide us with both inspiration and destination for this history-making endeavor,” says FUND Executive Director Eric Sy.

Surrounded by thick forests and craggy mountains, the “Queen of American Lakes,” as it is fondly referred to by residents and visitors, is treasured for its beauty and clean water. Even more than 225 years after Jefferson wrote his letter, describing the lake as “limpid as crystal,” residents can still drink the water in parts of the lake unfiltered.

Fed by streams and underground springs, mountain snowmelt and rain, Lake George is part of a landscape that includes more than 170 islands and 110 miles of sandy beaches and rocky shoreline, wetlands,
The Darrin Fresh Water Institute on Lake George is home to the Jefferson Project. A bathymetric and topographic survey conducted by boat and plane has mapped the lakebed, shoreline, and watershed. Now, scientists will be able to study high-resolution 3-D models of the lake and surrounding area, with a degree of detail unprecedented for a lake of this size.
Invasive species are a threat to the lake’s ecosystem and pose a multibillion-dollar threat to Lake George’s tourist industry.

- Estimated annual costs of damages from invasive species in the United States exceed $120 billion.

- Invasive impacts on water quality could cause a property value drop up to 20%.

- Number of invasive and non-native species in neighboring bodies of water:
  - St. Lawrence River: 87
  - Lake Champlain: 49
  - Great Lakes: 184
  - Lake George: 91

- Invadives headed this way:
  - *Quagga mussels* (*Dreissena rostriformis bugensis*)
    - From the Great Lakes—called zebra mussels on steroids—where they are causing billions of dollars in damage every year.

- *Hydrilla* (*Hydrilla verticillata*)
  - In Cayuga Lake Inlet, Central NY, rhymes with godzilla, and has monstrous effects on invaded waters.

- Trailered boats are a primary vector for the introduction and spread of aquatic invasive species.
and meadows that provide habitat for a wide array of animals and plants. The Lake George watershed in total is nearly 233 square miles and includes several communities within three counties.

Yet, the Queen of American Lakes is in danger of losing its regal status. The water quality has steadily declined over the past several decades. Approximately 5 percent of the land around the lake is developed, with 95 percent of the watershed remaining as natural forestland as part of the Adirondack Park. But these small areas of development are causing a significant decline in the historically high water quality of Lake George.

Last summer, the DFWI and the FUND released a landmark report on the present state of the lake. The 72-page report, titled The State of the Lake: Thirty Years of Water Quality Monitoring on Lake George, represents one of the longest and most consistent sets of lake chemistry data in North America. The report, based on data analyses and a summary of findings from 1980 through 2009, provides a benchmark for long-term change in temperate lakes worldwide.

“The study serves as a springboard for the Jefferson Project,” says DFWI Director Sandra Nierzwicki-Bauer, who also will help lead project efforts. “To be able to look at trends that have occurred over 30 years is critical to providing a solid understanding of the systematic problems that are threatening to deteriorate the lake.”

The report’s findings are based largely on DFWI’s Offshore Chemical Monitoring Program, implemented in 1980 to address concerns related to nutrient loading—the total amount of nutrients entering the lake at a given time period.

According to the report, the greatest threats to the lake’s water quality indeed include increases in nutrient loading, due in large part to storm water runoff that contains fertilizers and wastewater from residential and industrial sources. The effects of salt and invasive species are also major concerns outlined in the report.

Although nutrients, such as nitrogen and phosphorus, occur naturally in the environment and are essential to the health of plants and animals, these chemical elements can wreak havoc in high doses, when the watershed can no longer absorb excess amounts. The growth of algae has increased by 33 percent in Lake George during the 30-year study. And salt levels have tripled over the past three decades, a serious concern that needs to be more fully addressed, according to the report.

Road de-icing is the chief cause of the lake’s increased salinity levels. Continued increases of salt loading in the watershed may affect the circulation of the lake as well as the biological makeup of microscopic plants and animals. About 9,000 tons of salt are applied every year to roadways throughout the Lake George watershed, which generally receives more than 70 inches of snow in winter.

Invasive species are another threat to the lake’s ecosystem and pose a multibillion-dollar threat to Lake George’s tourist industry. The Asian clam and Eurasian watermilfoil, both of which spread rapidly, crowd out native animals and plants. Another invasive species, the zebra mussel, fouls beaches with washed-up remains, clogs water intake pipes, and alters water quality.

The good news is that, despite these red flags, Lake George remains in “remarkably good condition environmentally” compared to many lakes across New York state and the country, according to the report.

“Even today, Lake George is one of the cleanest, clearest lakes of its size in the world,” Siy says. “We are in an enviable position of keeping it this way for future generations—and reversing some disturbing trends—through preventive measures, and that is unique.”

So, there is hope that the Queen will still be able to hold her own.

A Full-Color Portrait

Jefferson Project researchers will use the latest technologies and methods tailored specifically for Lake George to focus on more comprehensive areas of research.

“The 30-year report poses bigger scientific questions that the Jefferson Project is poised to answer,” Nierzwicki-Bauer says.

While providing an invaluable road map, the 30-year study only focused on the chemistry of the lake, looking at the health of the lake through a rather narrow lens.

“We’re now taking a wide-angle view,” Siy says. “We are going from a rough sketch to a full-color portrait. In doing so, we will understand the lake from ‘physics to fish.’ ”

A team of IBM Smarter Water experts from the United States, Ireland, and Brazil research laboratories is providing hardware and software to the Rensselaer researchers who will be studying the lake in groundbreaking ways. In partnership with Rensselaer and the FUND for Lake George, the IBM researchers are pairing their expertise with new technologies to help local leaders see a real-time picture of the current and future computer modeled conditions, water chemistry, and health of the natural systems.

Four types of sensor platforms will transmit data back to the visualization lab so scientists can monitor the interactions of four complex environmental systems: weather, hydrology (runoff and the contaminants it introduces into the lake), water circulation, and the food web.

“We will be studying how the regional weather, the runoff of water from the surrounding land, the circulation of the lake, and the food web of the lake work as individual systems and how they all interact,” Siy says. “We will be able to see the contaminants in the water and use our tools to determine, for example, what chemicals are entering the lake, how they are spreading throughout the lake, how long it takes for things to move around, and how the lake is changing. This is very new and very different.”

“We are in an enviable position of keeping it this way for future generations—and reversing some disturbing trends—through preventive measures, and that is unique.”
interact to affect the ecosystem,” Relyea says. “In addition, we will examine how human impacts are affecting Lake George. We’ll also predict the effects of human activities that may occur in the future. These are enormously complicated challenges, and we are ready to tackle them.”

Last fall, researchers towed by boat two one-ton buoy platforms across Lake George and anchored them in scientifically significant locations. The platforms are each equipped with a vertical profiler, which measures physical, biological, and chemical elements, such as water temperature, dissolved oxygen, and algae from the surface to the lake bottom. Acoustic Doppler current profilers (ADCPs) also have been deployed on the bottom of the lake to measure circulation at various levels of the water column.

About a dozen sensor platforms have been deployed so far, with the rest scheduled to be placed this year. This includes four weather stations and four tributary stations that have been installed around the lake. When all the instrumentation is in place, the amount of data collected each day will equal 10 times the amount collected over the entire 30-year study.

The IBM team also is building a series of embedded intelligent sensor devices (so new they haven’t been named yet). These processors, housed in small waterproof boxes, will be connected to clusters of sensors to form integrated systems that will communicate information back to the larger system and visualization lab, primarily through wireless networks.

The devices could eventually be used as a warning system to signal a problem, as well as the source of the problem, as it is happening. Researchers are testing these first embedded intelligence devices at three of the four weather stations and all four of the tributary monitoring stations. Several others will be rolled out later this year.

“The goal is to make these sensors intelligent, so that they know where they are in relation to the other sensors and their environment, and what the other sensors near them are doing, facilitating intelligent decisions to be made autonomously to change how they operate and when and how they send data or alerts to the system and specific users,” Kolar says.

**AN INSTITUTEWIDE, MULTIDISCIPLINARY EFFORT**

The core of the Jefferson Project team consists of 35 Rensselaer researchers, who include faculty, postdoctoral researchers, and graduate students in areas ranging from biological sciences, environmental earth sciences, and engineering to the arts. The project will also involve dozens of undergraduate students annually. The project team also includes 16 IBM computer scientists, physicists, and engineers. Relyea and Nierzwicki-Bauer are both faculty members in the Department of Biological Sciences.

“One of the most important aspects of this project is that it is an Institutewide endeavor. We are bringing in talent and expertise from all over campus,” says Relyea.
Computer scientists, such as Tetherless World Senior Constellation Professor Deborah McGuinness, will conduct leading-edge research in semantic technologies to develop a database of metadata. The metadata will interpret, integrate, and determine relationships among all the basic data generated from the lake research. A metadatabase website will allow users to share and reuse the data across applications, enterprises, and community boundaries.

The metadata will not only include the context of the sensor and equipment data, but also detailed descriptions of monitor check-ins and experiments, such as who is conducting the experiment, where it is taking place, and what the parameters are. “We need metadata about everything to capture the context under which the basic data was collected, so we understand when it makes sense to use that information,” says McGuinness, a leading expert in semantic web capabilities, knowledge representation, and reasoning environments.

“WE ARE EDUCATING THROUGH ART AND GAME SIMULATION ABOUT THE IMPORTANCE AND THE COMPLEXITY OF THE FRESHWATER ECOSYSTEM IN LAKE GEORGE.”

In one project, McGuinness is working with graduate student Laura Kinkead to create a mobile device to make it easy to capture some of this data. Much like a smartphone, the device will allow researchers to upload their locations as well as information about the sensors and other instruments they are using or investigating. Through an app, they can take a picture of the Quick Response (QR) code, a bar code that enables item identification and tracking. A URL can be encoded in the QR code to allow researchers to manage documents as well.

Once the metadatabase is established, smart query capabilities will be created for the website so users can generate relevant results of what they are searching for, much as Google works, but in a more sophisticated way in a single integrated system.

Adding to all the technological advances and data science to propel the Jefferson Project forward is an aquatic lab that Relyea will head. Central to the lab are 900 large outdoor water tanks that will form the basis of “mesocosms,” which simulate the natural aquatic environment.

The tanks, from 20 to 300 gallons in volume, will mimic real lakes, ponds, and wetlands, encompassing a wide range of aquatic plants, algae, insects, snails, amphibians, and fish. The tanks will be spread across a two-acre section of the Rensselaer Technology Park in North Greenbush, New York.

The experiments will answer questions about the impact of contaminants on aquatic ecosystems. Relyea also will investigate the impacts of aquatic diseases, predator-prey interactions, and invasive species. The mesocosm experiments will begin this spring.

“Relyea’s work, as well as endeavors of all our faculty and researchers involved in the Jefferson Project, underscores the power of basic research, which along with technological innovation, drives the Rensselaer research enterprise,” says Jonathan Dordick, vice president for research.

Arts faculty also are involved in the Jefferson Project. They will use EMPAC’s state-of-the-art technology and facilities for human-scale immersive experiences to develop several integrated art projects to help build awareness about the Jefferson Project and show just how detailed and delicate the Lake George ecosystem is.

Projects include “The World of Plankton,” a multimedia exhibition that will enable users to virtually snorkel with freshwater plankton. The exhibition will be designed to inform and engage middle and high school students as part of community outreach efforts, which will be a cornerstone of the Jefferson Project.

“We are educating through art and game simulation about the importance and the complexity of the freshwater ecosystem in Lake George,” says Kathleen Ruiz, associate professor of integrated arts.

“The World of Plankton” will tap into a specialized underwater camera, called CPICS (Continuous Plankton Imaging and Classification Sensor), which can capture more than 100,000 images per day of phytoplankton and zooplankton—microalgae and tiny animals that are each less than a millimeter in size but play a crucial role in lake food webs.

Jefferson Project researchers are using CPICS, dubbed the “Plankton Cam,” to identify the various plankton species that live in Lake George. CPICS was developed by Scott Gallagher, a marine biologist at the Woods Hole Oceanographic Institution in Massachusetts. Gallagher and Chuck Stewart, who heads the Rensselaer Department of Computer Science, work together on a number of other projects.

Stewart, along with graduate student Hendrik Weideman, is developing a new series of software algorithms that will have advanced pattern recognition capability to sort the CPICS images of plankton by species.

Stewart and Weideman will use the technology to collaborate with Relyea and Nierzwicki-Bauer to determine the prevalence of invasive species. They will also analyze the distribution patterns of the plankton, which form the base of the Lake George food web.

“The advanced CPICS imaging system and our new software will allow us to identify phytoplankton, zooplankton, and other microscopic species at a rate that is orders of magnitude faster than the traditional approach of manually studying them on slides through a microscope,” Stewart says. “Because it is so much faster, we will gather information that previously would have been impractical to collect. This will give us a much richer picture of what’s happening in the lake at the microscopic level.”

“The broad knowledge that the Jefferson Project brings together speaks volumes about how diverse this effort is,” Relyea says. “I am thrilled to bring all of these colleagues together to share the vision of the project with them and to see where we can take it.”
As the unmanned aerial vehicle—or drone—industry grows in the U.S., Rensselaer alumni are piloting the revolution.

BY ANDREW FAUGHT
When Amazon.com announced in July 2014 that it had plans to deliver parcels by drone, Dan Ganousis ’77 groaned.

“Wham, just like that our industry got a kick in the shins, because all it did was tell people there would be a helicopter circling your house while looking in your window,” says Ganousis, CEO of Iron Ridge UAS, a Longmont, Colo., company that has created a drone—or unmanned aerial system (UAS)—to be used by farmers to survey fields and better manage irrigation and the use of pesticides and fertilizers.

“There’s very much a public education problem,” Ganousis adds. “If you do not know what a drone is, and think of it only as a spy camera, you’re 110 percent against it. We’re trying to explain to people that this is not where the industry is going to go.”

The Federal Aviation Administration (FAA), which so far has prevented most uses of commercial drones, since has ruled that commercial flyers can’t leave their pilot’s field of vision or drop cargo. But few deny that drones—beyond their more common military applications—will soon be a fact of American life.

They’re being touted for use in search-and-rescue operations, environmental monitoring, newsgathering, and inspecting infrastructure, such as oil pipelines, bridges, and power lines, to name just some of the possibilities.

Rensselaer alumni have played and continue to play no small part in the drone revolution—not to mention the evolution of such devices, whose modern-day incarnations have their roots in work that was done three decades ago.

Ken Rosen, M.M.E. ’65, Ph.D. ’70, was among the pioneers. As vice president of research at Sikorsky Aircraft, he oversaw the development of the Cypher and Cypher II unmanned aerial vehicles (UAVs), whose saucer shape gave them the look of visiting extraterrestrial craft. The prototypes were powered by 40-kilowatt motorcycle engines (“we had very little funding,” Rosen says), because the most important objective was to prove a revolutionary concept.

The Cypher UAVs took off and landed vertically and were propelled by two enclosed counter-rotating rotors, which provided outstanding controllability. The first Cypher prototype was flown in 1993 and, like its successor, which could be fitted with removable wings, was designed for military reconnaissance. The Cypher achieved more than 400 successful flights and was eventually improved so that the winged version, Cypher II, had an endurance of three hours, a range of 125 kilometers, and could reach a top speed of 230 kmh, with a ceiling of 2,440 meters.

Sikorsky had a contract to provide the Marine Corps with two prototypes, with an option for four ground stations and 10 production versions of the extended-range UAVs, named Dragon Warrior, which could be equipped with non-lethal 45-pound payloads.

There was just one problem.

“It was ahead of its time, coming before the true business potential of autonomous UAVs was understood,” says Rosen, who retired from Sikorsky after 40 years but still consults for the Connecticut manufacturer. “Unfortunately, although
very successful technically, the product never got past the prototype stage.”

To Rosen’s disappointment, the program was canceled and the Cyphers would become an aviation footnote. Today, he says, Sikorsky is making huge strides in the science of “autonomy,” which should position it to again become a leader in the field.

FAA FRUSTRATION

From the quiet industrial park in Longmont, Colo., Ganousis’ voice bubbles with frustration on a late winter day. Only 24 hours earlier, the FAA announced that it needs to further study drone safety as it relates to commercial use. In the last 10 months of 2014, the FAA said there were 190 incidents in which drones flew too close to passenger airplanes.

Ganousis worries the delay means his “birds” could be grounded for three more years. This at a time when Japan has already become a world leader in using drones for agricultural purposes.

The rise of the drones appears to be a foregone conclusion—just not soon enough for Ganousis. The FAA says 7,000 commercial drones could be flying the friendly skies by 2018. A so-called drone economy could create more than 70,000 jobs and have an $82 billion impact on the U.S. economy by 2025, according to the Association for Unmanned Vehicle Systems International, a trade group.

The FAA claims to have its reasons for moving slowly, saying the United States “has the busiest, most complex airspace in the world.” Developing rules and standards “is a very complex task,” the agency wrote in a document last year.

But for the time being, Ganousis’ aircraft—whose two versions range from 12 to 20 pounds and don’t fly more than 40 mph—remain idle. He suggests FAA concerns about drone safety are overblown.

CONCERNS FOR PRIVACY

Propeller-powered drones, which can have fixed wings or an array of rotors that give them the look of a mutant helicopter, have superior maneuverability and are easier to control than a traditional remote-controlled device. They’ve been around for nearly a decade, but mass production now has brought the cost down to as little as $300, making them accessible to everyday Americans. But their prevalence—many of them rigged with high-resolution cameras—is also raising privacy and safety concerns among the general public.

One incident in particular would reshape the life of Brian Hearing ’94.

In 2013, Hearing watched a friend fly, and unexpectedly crash, a camera-rigged “quadcopter” into a neighbor’s Washington, D.C., backyard. Hearing’s buddy initially had gotten the craft, a recreational drone that cost a few hundred dollars, to inspect the roof of his town house. Although the maiden flight hardly went as planned, the abortive attempt had other ramifications.

“He turned it on and the thing just took off on its own and crashed into the yard,” recalls Hearing, who earned his bachelor’s degree in civil engineering at Rensselaer. “But the video was still working, so we could look into the neighbors’ house as they were cooking dinner. They didn’t even know it was back there, which was kind of scary.”

Hearing at the time was working as deputy director of intelligent surveillance and reconnaissance for the National Geospatial-Intelligence Agency (NGA), a federal office that provides images and map-based intelligence to the military.

The crash would steer him in a new direction. That same year, he co-founded
DroneShield with John Franklin, his friend who was at the controls that fateful day. The shoebox-sized “acoustic detection technology” can be attached to a home’s outer wall. Within a few seconds of a drone entering a property, homeowners are alerted via e-mail or text message, enough time for them to get inside or draw the blinds, Hearing says.

His business has so far completed 200 installations around the world, mainly on the properties of celebrities, politicians, and the wealthy, who want to avoid the peeping eyes of the paparazzi. Prisons, outdoor stadiums, the military, and government also have expressed an interest in DroneShield, Hearing says.

The cost of installing a device—or devices for large properties—can range from $1,000 to hundreds of thousands of dollars.

“Let me be clear: I love drones,” Hearing says. “They are fun and they are going to have a positive impact on many industries. The benefits of drones far outweigh the risks. We just want to let people know that there are technologies that can mitigate the misuse of drones, and that hopefully alleviates calls for outlawing them.”

Some of those misuses include the January crash landing of a DJI Phantom recreational drone at the White House. In February, the Secret Service released a brief statement saying it would begin flying its own drones over Washington, D.C.—restricted airspace to everyone else. In another incident, a drone crashed in front of German Chancellor Angela Merkel during a 2013 campaign event. As for the White House breach, Hearing is coy on whether he was contacted by the chief executive’s office about installing DroneShield.

“I can’t comment on that,” he says. “I can definitely say DroneShield was not there when that incident occurred.”

DroneShield, meanwhile, hasn’t been able to escape the media’s gimlet eye. CBS, Fox, and the Al Jazeera television networks all have done stories on the product. “They’ve been great to us,” Hearing says.

CURRENT APPLICATIONS

With drones creating a nearly daily buzz in the media, a pair of Rensselaer alumni in March took part in a Rensselaer Alumni Network (RAN) conference call titled “UAVs: Send in the Drones!” The discussion focused on current applications and expected developments surrounding the technology.

Xerxes Vania ‘97, engineering manager for the Systems Integration Labs at San Diego-based General Atomic Aeronautical Inc. (the maker of military drones that include the Predator, Gray Eagle, and Reaper), and Rich Martin ’05, a senior robotics engineer with the corporate research and development department at Qualcomm Inc., also in San Diego, are both at the leading edge of UAV development.

General Atomics played a paramount role in developing military-grade drones in the early 1990s, taking the aircraft from “small remote-controlled things that people didn’t expect to do a lot,” Vania says, noting that the earliest drones were converted airplanes that were used as targets to train pilots. “And then we added a highly capable data link, and they became remote-controlled planes that could now do a lot of things for you.”

Data links—or the exchange of information through electronic connections—allow drones to take photos and stream video of insurgents in war zones, for example. Drone capabilities will only improve, Vania says. Next-generation drones will be lighter, able to carry larger payloads and munitions, and will likely have power systems run by fuel cells, not lithium-ion batteries or conventional petroleum fuels.

Vania arrived at General Atomics in 2010 as a systems engineer, where he worked with the Department of Defense’s Missile Defense Agency to develop ways for UAVs to monitor ballistic missile launches from a distance. He now works in the system integration lab, where engineers test drone hardware and software.

His duties are an about-face from his previous job. For seven years, Vania worked for General Dynamics Advanced Information Systems in Pittsfield, Mass.,
where he was part of the company’s submarine program.

“I was looking for a complete change in what I did, and I didn’t think I could go much further from being on the water and under the water to being in the air,” Vania says. “At the time, General Atomics was hiring and I thought it would be a great fit.”

Drones, he notes, aren’t the only means of battling terrorism, but they do have one particular advantage. “They’re just another tool, a cost-effective tool in places where you cannot put a pilot in the air for 40 hours,” Vania says.

As many as 64 countries use drone technology for surveillance; many of the devices are launched by hand and resemble toys. Only the United States, Britain, Israel, and China are known to fly larger drones that can fire missiles. Analysts at the RAND Corporation say 23 other countries are developing armed drones.

Martin, meanwhile, shared the commercial aspects of UAVs during the RAN event.

Martin works on the Snapdragon Cargo project at Qualcomm, a semiconductor company whose research division works, in part, on robots built with advanced vision systems, such as depth from stereo and visual inertial odometry. Those functions give a device the ability to perceive, sense, avoid, and localize in its environment. Snapdragon Cargo is a hybrid drone that is 2-1/2 feet long and 8 pounds. It not only flies and can carry parcels, but once it lands, it can then drive to its destination.

“You can imagine this thing landing in the middle of the street and then driving up to someone’s porch and dropping off a package,” Martin says. In January, he helped showcase Snapdragon Cargo at the Consumer Electronics Show in Las Vegas. The device is powered by the same processor that can be found in Samsung Galaxy cell phones and tablets. “We’re really trying to push things to the limit and show the world how cool technology can be.”

Martin has been with the company for two years and flies drones most days at work toward researching and creating advanced flight controllers using the Snapdragon processor, and integrating advanced vision systems such as sense-and-avoid technology, something drone critics have said is necessary to be commercially viable. There have been concerns that people could be injured if a drone fell from the sky after striking such airborne obstacles as power lines, trees, or even other drones.
Off work, Martin owns two of his own drones, and he practices regularly “just to make sure my skills are up to par. And it’s fun to get some really interesting video and see the world from a different perspective.”

**SMART DRONES**

Equipping drones with cognition—toward making them completely autonomous and not in need of a pilot in a remote control room—will be one of the top challenges facing engineers in coming years, says Michael Amitay, the James L. Decker ’45 Endowed Chair in Aerospace Engineering at Rensselaer. Sense-and-avoid technology is only part of the solution, he adds.

“If you have a swarm of drones in the air, how do they communicate with each other? How do you prevent them from going the same routes, and not hit buildings or each other?” Amitay asks. “There are a lot of issues that have to be addressed, but in general, drones are the future.”

Amitay has worked with Boeing on “virtual aero-shaping,” or altering the shape of aircraft to improve their performance. Boeing will begin tests on commercial airliners next year, results that could have implications for military and commercial drones alike.

“My work has less to do with systems and more to do with probing their aerodynamics and improving their performance,” Amitay says. “The research could result in lighter vehicles that are less mechanically complex and stealthier. If you don’t have surfaces that move, they cannot be detected by radar.”

The tests have implications for commercial drones, he notes: “With fewer components and fewer moving parts, you can make drones simpler and cheaper.”

Drone technology got some of its widest publicity in April 2009, when merchant marine Captain Richard Phillips was taken hostage by pirates as he piloted his containership past Somalia in East Africa. Real-time video footage from a Boeing ScanEagle UAV helped Navy SEAL marksmen rescue Phillips after they killed three of the pirates and captured a fourth.

In April 2009, merchant marine Captain Richard Phillips was taken hostage by pirates as he piloted his containership past Somalia in East Africa. Real-time video footage from a Boeing ScanEagle UAV helped Navy SEAL marksmen rescue Phillips after they killed three of the pirates and captured a fourth.

Behind the scenes was Andrew Pouring ’54, CEO and chief technical officer for Annapolis, Md.-based Sonex Research Inc., which designed the engine on the ScanEagle. The two-horsepower engine is based on a regenerative combustion cycle enabled by the unique cylinder head design now being scaled up to pump natural gas.

Pouring had been a tenured professor at the U.S. Naval Academy for nearly 19 years (he taught at Rensselaer for three years prior to that and one year at Yale) when he decided to give up academia to research the idea at an Annapolis garage based on research with graduate students from the University of Maryland and George Washington University.

“I had to face the music that I’d found something that I thought was very valuable in terms of the potential it had,” Pouring says of his engine, whose initial design allowed it to run on any fuel.

“Someday I have to face my maker and he’s going to say, ‘Well, I gave you that life, what did you do with it?’ It’s as simple as that.”

But drones aren’t yet a wholly palatable proposition to the public, and the word itself, for some, remains a lightning rod for criticism. Despite touted and even demonstrated benefits, they’ve been accused of depersonalizing warfare in much the same way that the advent of aerial bombardment did in the 1930s and 1940s.

“It’s a somewhat controversial subject,” Rosen acknowledges. “I recently served on the National Research Council committee to develop directions for Autonomy Research for Civil Aviation, and even the very name ‘drone’ itself took up much discussion.”

Rosen firmly believes in the future of autonomous aircraft, which he prefers to call Uninhabited Aircraft Systems, or UAS. The FAA itself has struggled to establish a set of rules for these “robotic” aircraft, as some people are concerned with their proliferation in society.

But he’s hopeful that society will eventually accept the concept and learn to appreciate the benefits of autonomous flight vehicles.

“It’s largely a manifestation of what I would call limited thinking based on fear of the unknown,” Rosen adds. “Go back to the 19th century, when the Luddites destroyed factories because they feared the Industrial Revolution was hurting the craft industries. Frankly, it’s ignorance. We’re moving into a highly technological global society, and if we can’t manage this contextual change, we’re just going to become modern Luddites who will also be overcome by history.”

Adds Ganousis: “Drone is an awful word, and I do everything I can not to use it. It’s one of the reasons we’ve all standardized it to UAS. That’s what anybody who knows what they’re talking about will call it in this business. If you’re talking to somebody about a drone, then you’re talking to somebody from Hollywood.”
It’s All About Connections

The RAA continues to foster connections among alumni and with their alma mater

IN 1975, STEVE SASSON ’72, M.E. ’73, invented the world’s first digital camera. At a recent alumni event at the George Eastman House and International Museum of Photography and Film in Rochester, N.Y., Sasson explained how he built the camera. From his remarks, it was evident that he benefited greatly from the many innovations and technologies that had been developed by fellow Rensselaer graduates. The microprocessor, semiconductor, and even a large television set were some of the technologies he used—all with Rensselaer alumni origins. Now, everyone uses the digital camera, sending their pictures using the electronic mail platform for which we can thank Ray Tomlinson ’63.

It is with this realization and sense of pride that the Rensselaer Alumni Association (RAA) has continued to foster connections among alumni and between alumni and their alma mater. Staying connected has never meant more than it does today. The RAA is well positioned to support alumni around the world in meaningful and powerful ways.

Alumni Career Services

In the summer of 2014, the RAA began the creation of a new platform of alumni career offerings. The need for career programs for alumni was first made clear and evident in a resounding response from the Alumni Attitude Survey conducted in 2012. Alumni wanted a single place to help expand their horizons, promote jobs in their companies, and find new opportunities for employment. It was also obvious that alumni wanted a way to talk with their Rensselaer connections in a simple and easy way.

Rensselaer Alumni Career Services has a variety of offerings for the benefit of alumni around the world. It can assist you with your job search, grow your networking base, encourage you to support your fellow classmates and friends, and keep you posted on important events and programs specifically on career and professional development.

Perhaps the most exciting piece of Alumni Career Services is “Rensselaer Alumni Connect.” This free, online tool allows alumni to network, post and search jobs, and obtain career advice. Read more about Rensselaer Alumni Career Services on page 42.

Alumni Communications

With an expanded program focused on career services for alumni, it was necessary to promote and highlight this new offering. The RAA has used many platforms to showcase new programs, using social media such as Facebook, Twitter, and LinkedIn. In fact, alumni involvement with Rensselaer on these three platforms is quite impressive, with over 52,000 alumni staying engaged through LinkedIn, and approximately 18,000 on the RAA LinkedIn Alumni Group. RPI Spirit Day, held this year on Feb. 13, is a great example of how we are reaching alumni through social media. On Spirit Day, alumni are asked to wear red to show their Rensselaer pride, and then share photos of themselves on social media. More than 180 #RPISpiritDay photos were posted via Facebook, Google+, Instagram, and Twitter, and our Facebook posts reached over 30,000 individuals. Participation has quadrupled since the first Spirit Day in 2012.

Regional Programs and Chapters

Volunteers are the cornerstone of all that we do, and the RAA is supported by thousands of individuals every year, such as the 150 loyal volunteers who work throughout the world to support our regional chapters. These alumni give of their time and talent to host admissions
programs, sponsor networking events, welcome our athletic teams as they pass through their hometown, and offer “send-off” programs as our newest students (and future alumni) head to campus for the first time.

Twenty-eight domestic and eight international chapters conducted hundreds of programs and events last year, allowing thousands to see President Jackson and our academic deans, hear from fellow alumni, cheer on the Engineers, and celebrate regional and local accomplishments. In particular, we give special recognition to the 2014 Craig W. Angell ’35 Chapter of the Year recipient—the Hudson Mohawk Chapter. The chapter engaged more alumni and guests than any other, and set the gold standard for chapter programming by partnering with campus departments for events, providing exclusive benefits and services for chapter members, and supporting Rensselaer and current students through engagement with philanthropy.

RAA Endowment Fund

Fueling much of this innovation and creativity is the newly formed Rensselaer Alumni Association Endowment at Rensselaer. Thanks to the leadership of President Roger Mike ’70 and Vice President Rich Bollam ’66, the early leadership support of the RAA Founders, and subsequent generous contributions of hundreds of alumni, the RAA Endowment now stands at just over $1 million in commitments.

The RAA Endowment Fund has sponsored and supported many things such as Reunion Class programs, Rensselaer Alumni Connect, and the new Red & White Emerging Leader Award. The Award is given to a rising junior or senior who is a member of the nationally recognized Red & White Student Organization. The inaugural award was presented to Elise Budd ’15 in recognition of her dedication to strengthening the student and alumni communities of Rensselaer, and her exceptional leadership.

Contributions to Rensselaer in support of the RAA Endowment Fund are still possible at giving.rpi.edu.

Final Words

The Rensselaer Alumni Association sends its condolences to the family of Major General Harold J. Greene ’80, who was killed while visiting a military base in Afghanistan. Maj. Gen. Greene was the highest-ranking officer killed in action since the Vietnam War, and was a treasured member of the Rensselaer community.


RAA Endowment Fund
Alumni Career Services Launched

New website, online tools, offer professional services to alumni

The RAA recently launched a new suite of career services, including the online tool Rensselaer Alumni Connect, which allows alumni around the globe to network, post and search jobs, and obtain career advice. The effort was made possible by the many individuals who supported the Rensselaer Alumni Association Endowment Fund.

The renewed focus on career services was initiated after analysis of the Alumni Attitude Survey that was conducted in 2012. The message was clear that professional development resources were a top priority for alumni, and the RAA Board was excited to take on the challenge of upgrading existing programs and creating new ones to fill this need. Since the fall of 2013, the board has been hard at work, benchmarking with peer institutions, researching available products, and assembling an implementation plan for the new Rensselaer alumni career services program.

A key component of the program is Rensselaer Alumni Connect, an online service that allows you to network with fellow alumni, post and search jobs, find career advice, and more. To date, over 800 alumni have signed on to this service, which is available to alumni free of charge, thanks to the generosity of RAA Endowment supporters. Join now at rensselaeralumniconnect.com—you may sign in with your LinkedIn or Facebook account, making the process quick, secure, and simple.

In addition to the Rensselaer Alumni Connect portal, the site features a full complement of links to help you in whatever career assistance you may need. You will find assistance if you are seeking a job yourself or if you are an employer needing qualified candidates. If you need help preparing for your job search, networking tips, or links to point you to events or programs in your area or in your field to help you make connections, you’ll find it all through Rensselaer Alumni Career Services.

“The entire RAA Board has participated in this extensive project, but special thanks go to Teri Kozikowski ’85, career and professional development committee chair; Rich Bollam ’66, RAA Endowment committee chair; and Alli Woodford ’93, communications and branding committee chair,” says Jeff Schanz, assistant vice president for alumni relations.

Visit the website at alumni.rpi.edu/career and take advantage of this exclusive, free service for Rensselaer alumni.

No matter what stage you are at in your career, you will find helpful tools and resources online. Post and search jobs, find professional tips and tools, and network with fellow alumni. Visit alumni.rpi.edu/career.

25 Networking Reception—Minnesota. Join alumni for a networking reception at the elegant Minnesota Club. The event will feature remarks from Jeffrey Schanz, assistant vice president for alumni relations. Contact Kathy Kinsey at kinsek@rpi.edu or (518) 276-2832 for details.

18 Annual Rensselaer Alumni Day at Del Mar Racetrack. San Diego, Calif. Join local alumni in a private box for an exciting day at one of America’s most picturesque and prestigious thoroughbred racetracks. Contact Susan Haight at haighs@rpi.edu or (518) 276-6042 for details.

6 Summer Send-Off for the Class of 2019—New York City. Join alumni and current students at The Cornell Club—New York to welcome incoming students from the New York City area to Rensselaer. Contact Kathy Kinsey at kinsek@rpi.edu or (518) 276-2832 for details.

10 Men’s Hockey Annual Golf Outing at the Shaker Ridge Country Club. Latham, N.Y. Current team members and distinguished hockey alumni join for a day of competitive fun. Contact Peter Pe done at pedonp@rpi.edu or (518) 276-6061.
Alumni Website Gets a Makeover

The alumni website completed a major redesign at the start of 2015. The site has the same content and functionality, but with a new, mobile-friendly, completely responsive design, which allows for easier use and navigation, and readability on any device.

You'll find much of the same content on the alumni website as always—important news and program information, links to resources and benefits, event information, opportunities to get involved, and of course the newly updated networking and career pages (see story at left).

The site also includes new content about how you can support today’s students, and stories about the impact of alumni giving.

Take a look at alumni.rpi.edu, and send any comments or questions to ar-consult@rpi.edu. We’d love to have your input!

MARK YOUR CALENDAR!

Reunion & Homecoming—October 1-4, 2015

Mark your calendar, and plan to join your classmates for another extraordinary weekend of friendship, fun, entertainment, education, sports, and more!

Classes ending in 0 or 5 will celebrate milestone Reunions with class dinners and other class-specific events. Many athletics teams will host reunions as well, bringing together former athletes for friendly competition and to meet and cheer on our current teams. Greeks take advantage of the weekend to gather for dinners, barbecues, and to celebrate milestones. Former student groups also will be meeting.

In addition to the various groups who will be planning events and programs, there will be Rensselaer sporting events, student performances, a celebration of the Rensselaer Union’s 125th anniversary, and plenty of special programs for all attendees to enjoy. Visit the website for more details: alumni.rpi.edu/reunion.

REGIONAL CHAPTERS

WELCOME CLASS OF 2019

In the months of July and August, alumni chapters around the country will be welcoming our incoming class and their families to Rensselaer. Chapters host a wide variety of events, where new students may meet local alumni, and have all their last-minute questions answered before they begin their journey to Troy. Visit alumni.rpi.edu/chaptersendoffs to see what is planned in your area.

GO RED! GO WHITE! GO GREEN!

Most alumni programs and services are advertised via email and social media—including Reunion & Homecoming and regional chapter information. Help us continue to “go green,” and make sure you don’t miss out on any of the exciting events and benefits offered exclusively to Rensselaer alumni. Write to alumni_update@rpi.edu or visit alumni.rpi.edu/gogreen with your email, social media user name, and updated contact information.

RAA ON SOCIAL MEDIA

The RAA is on Facebook, LinkedIn, Twitter, Instagram, Google+, and Pinterest. Find us on your favorite social media platform and connect with fellow alumni and Rensselaer.

RAA VISA CREDIT CARD

The RAA Visa card, offered through a partnership with U.S. Bank, features no annual fee and your choice of benefits and rewards. A percentage of each purchase goes directly to support the RAA. Visit alumni.rpi.edu/service for details.

WORLDWIDE TRAVEL PROGRAM

Visit exciting destinations with people who share your interests—fellow Rensselaer alumni. Go to alumni.rpi.edu/travel for a complete listing of upcoming trips, or contact program coordinator Michael Wellner ‘64 at captmike46@aol.com or (212) 486-3064.
When you get letters like this, how can you stay silent? Lila Miller in our Class Notes section (631) 382-9350; lml9350@gmail.com; 4435 Foxen-Lane, Santa Maria, CA 93455-6718; h: (805) 932-0421, lml9350@gmail.com

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Where you get letters like this, how can you stay silent? Lila Miller in our Class Notes section (631) 382-9350; lml9350@gmail.com; 4435 Foxen-Lane, Santa Maria, CA 93455-6718; h: (805) 932-0421, lml9350@gmail.com

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The 1995 men’s hockey ECAC championship

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The 1995 men’s hockey ECAC championship

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Ed Long notes that he has happily settled into a vibrant retirement community near Oklahama College. He is pleased to be able to hang up his white coat and pursue his interests in part time. He also notes that he enjoys the company of other retired medical professionals and the camaraderie of the community. He plans to be active in his retirement and will continue to volunteer his time and expertise to help others.

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Send news to: Lou Shornick ’39, loushornick@mindspring.com; 853-0265; Garden Terrace, Madison, MS 39110; h: (601) 932-0421, loushornick@mindspring.com

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The 1995 men’s hockey ECAC championship

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The 1995 men’s hockey ECAC championship

Class Notes

Click to view Alumni/ae Notes and the complete Class Notes section (log-in required)
team celebrated the 20th anniversary of their victory during an on-ice ceremony at this year’s Big Red Freakout game in February.
THOUGHTS ON HOCKEY, DIABETES, AND PETE SEEGER

A father’s memory of a memorable visit to Rensselaer | BY FRANK GARDINER

FROM WHERE I SIT AS A HOCKEY-loving 71-year-old Canadian grandfather, I remember (Je me souviens!) Pete Seeger!

In 1996, my wife, Jennifer, and I made our first trip to RPI, with our youngest son, Peter, and dog, Biskit, and stayed at the closest motel to the RPI arena, which was the Best Western in Troy, N.Y.

Our family hockey history centered around our hometowns of Goderich and North Toronto, and that weekend we had been invited to RPI to discuss a possible hockey scholarship for Peter, who was a good Lawrence Park student, excellent hockey player, and a Type 1 diabetic inspired by Team Canada hockey player Bobby Clarke!

We were having Sunday breakfast waiting for our son and RPI hockey coach Dan Fridgen to join us to discuss the opportunity for Pete to play hockey for RPI.

In that same motel dining room was only one other couple—a tall, lanky elderly gentleman with a woman companion. This informally dressed gentleman had a familiar, relaxed air about him and I asked the waitress if by chance she knew who that gentleman was, because to me he looked vaguely familiar.

The waitress said that she only knew that his first name was “Pete,” and then I realized that he was none other than one of my American heroes from long-ago hauntingly beautiful folk singing protests of my own youth.

I got up and walked over to his table and in true Canadian fashion apologized for interrupting him but said I simply wanted to say “hello” and thank him for his music and community leadership.

Pete Seeger got up from his chair and after learning my wife and I were visiting RPI for our first time, welcomed me to Troy and introduced me to his charming wife, Toshi.

Pete explained that he and Toshi were in Troy attending a concert at RPI, where his granddaughter was a student, and he spoke very highly of RPI.

When Coach Fridgen arrived with our son, I introduced them to Pete Seeger and his wife. Pete Seeger then engaged the coach in a friendly discussion about the potential of having outdoor skating rinks along the Hudson River.

It was a brief, memorable moment for me personally, and at the end of our own breakfast with Coach Fridgen, Pete accepted the offer of a four-year RPI hockey scholarship. That introduced me and our entire family to the generous and fun hockey family experience of RPI Division I hockey, culminating in an RPI business degree for our son, Pete, who graduated in the year 2000.

During our four years at RPI we launched “Cure Diabetes Now!” in kids of all ages.

If you Google “Goderich Dash for Diabetes 2014,” you will hear “The Homecoming” by the late Hagood Hardy and the inspiring “We Shall Overcome” sung by Pete Seeger, a great American man of integrity.

Thank you, Pete Seeger, for your great legacy to all of us.

Thank you, RPI, the RPI hockey team, and Ryerson University for helping us launch our ongoing 10K Team CDN! Dash for Diabetes.

Nineteen years later, our family pet, Biskit, is no longer with us, but our fond RPI memories linger on along with our evolving “strictly volunteer” family project to promote 10K fun and family fitness.

Frank Gardiner is father of Pete Gardiner ’00, a Toronto native who played right wing for the Engineers. He finished his career third on the team in goals and set a school record for games played in a career with 144.
Whose life will you change?

Though he wasn’t at the top of his class, Joseph R. Takats ’41 went on to a very successful career in mechanical engineering.

By making a generous legacy gift to Rensselaer, Joseph established a scholarship to benefit students who, like him, just needed a chance to prove themselves.

Today, his legacy lives on at Rensselaer through Cara Porto, Class of 2018. Cara is grateful for the support, which will help her to realize her dreams of becoming an architect who designs homes for people all over the world.

Rensselaer students share a legacy of academic achievement, discovery and innovation, entrepreneurship, creative expression, and global leadership. By including a bequest to Rensselaer in your will or living trust, you are ensuring that we can continue our mission to educate the leaders of tomorrow for years to come.

Create a lasting legacy by making a gift through your estate.

Visit www.alumni.rpi.edu/giftplan to learn more. Or, contact Arthur Tracy at (518) 276-2561 or tracya@rpi.edu.
REUNION & HOMECOMING

CLASSES ENDING IN 0 OR 5, THIS IS YOUR YEAR!

OCTOBER 1–4, 2015

Plan to join us for a weekend full of everything you might expect from Reunion & Homecoming... & so much more!

www.alumni.rpi.edu/reunion