When the Class of 2017—at 1,424 strong, the largest incoming class in Rensselaer history—arrived on campus in August, these digital natives were already well-connected to each other. This very public generation of students—who have never known life without the Internet—are more open to sharing their experiences. Their impressions of their new lives at Rensselaer are shared on platforms such as Facebook, Twitter, Instagram, and Pinterest, but their messages are the same as students from generations past—they are proud, excited, and ready to become the next class of students at the nation’s oldest technological university, Rensselaer Polytechnic Institute. To see these and other social media posts, go to www.rpi.edu/about/social.

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Moving? Update your address via email at alum.mag@rpi.edu, or write to: Rensselaer Magazine, Office of Strategic Communications and External Relations, Rensselaer Polytechnic Institute, Troy, NY 12180, or fax to (518) 276-3715.
Creating the World's Smartest Lake

Rensselaer, IBM, and the FUND for Lake George in June announced the launch of “The Jefferson Project at Lake George,” a three-year, multimillion-dollar collaboration with the goal of understanding and managing complex factors—including road salt, storm water runoff, and invasive species—threatening one of the world’s most pristine natural ecosystems and an economic cornerstone of the New York tourism industry. The collaboration partners expect that this world-class scientific and technology facility at Lake George will create a new model for predictive preservation and remediation of critical natural systems on Lake George, in New York, and ultimately around the world.

The Jefferson Project, an homage to Thomas Jefferson’s declaration of Lake George as “without comparison, the most beautiful water I ever saw,” aims to establish one of the world’s most sophisticated lake environmental monitoring and prediction systems, giving scientists and the community a real-time picture of the health of the lake. Located about 50 miles north of Albany in upstate New York, Lake George is an ideal body of water to study due to its size and unique ecosystem.

Scientists from Rensselaer have been studying the lake for 30 years and have noted the emergence of environmental stressors that include rising levels of chlorophyll that threatens water clarity and a threefold increase in salt levels primarily due to road salt applied to roads in the watershed. The long-term health of the lake is critical to the region and New York’s tourism industry. Read more on page 8.
Lake George at dawn—view from Diamond Point looking north toward The Narrows.

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Technology for the 21st Century

Putting computing capacity to work on humanity’s global challenges

Since its first days, Rensselaer has provided the latest tools and techniques to its students and researchers. With the original Rensselaer Plan, we put special emphasis on building our computing capability, in order to advance research in many other disciplines.

Our success is represented through our graduates, our research accomplishments, and, most tangibly, through the Computational Center for Nanotechnology Innovations (CCNI). With CCNI, we have one of the most powerful university-based supercomputing centers in the world. This center enables complex computations at blazing speeds and makes the design and manufacture of nanoscale materials more efficient. It supports sophisticated modeling in fields such as nanophysics, cellular dynamics, fluid flow, finance, and protein modeling.

We have now renewed our plan in advance of the 200th anniversary of Rensselaer in 2024. The Rensselaer Plan 2024 recognizes the degree to which all of us now live in a data-driven, web-enabled, supercomputer-powered, globally interconnected world—and it has made using the incredible digital tools at our disposal to answer humanity’s grand challenges one of the key areas of focus for interdisciplinary research at Rensselaer.

Toward that end, we have boosted our supercomputing capability. With two full racks of Blue Gene/Q power, we now have 420 teraflops of computing power—over four times the capacity of the 16 racks of Blue Gene L that came online in 2007. This computing power is balanced by a 16-fold increase in input/output bandwidth, reflecting the need we see for handling enormous amounts of data.

Of course, we also have recruited the talent that can take advantage of advanced computing capabilities. In a paper published in May, a joint team of Rensselaer and Lawrence Livermore National Laboratory (LLNL) scientists announced a record-breaking simulation speed of 504 billion events per second on LLNL’s Sequoia Blue Gene/Q supercomputer, dwarfing the previous record set in 2009 of 12.2 billion events per second. Rensselaer participants were Computer Science Professor Chris Carothers and graduate student Justin LaPre.

In addition to breaking the record for computing speed, the research team set a record for the most highly parallel discrete event simulation, with 7.86 million simultaneous tasks using 1.97 million cores.

Rensselaer is also the first university to receive IBM’s Watson computer, the computer that two years ago used memory-based artificial intelligence and its ability to understand natural language to vanquish the best human champions on Jeopardy. A number of our alumni and alumnæ helped to engineer this exciting opportunity for Rensselaer faculty and students. The arrival of the artificially intelligent system has been greeted with a great deal of humor. Headlines in major publications worldwide carried the message, “Watson goes to college.” Professor Jim Hendler has assumed the role of faculty advisor, and one of our fraternities rushed Watson. And just as we expect our human students to grow in knowledge and understanding, Watson, too, is here at Rensselaer to deepen its cognitive capabilities, and to find new applications for those capabilities.

In order to bring together and fortify the wealth of research at Rensselaer in cognitive science, data science, high-performance computing, predictive analytics, data visualization, and immersive environments, this summer we launched the Rensselaer Institute for Data Exploration and Applications, otherwise known as the Rensselaer IDEA. Working across disciplines and sectors, our IDEA researchers will apply powerful new tools and technologies to access, aggregate, organize, and analyze data from multiple sources and in multiple formats, in order to address challenges and opportunities across the spectrum, including in basic research, environment and energy, water resources, health and biomedicine, business and finance, public policy, and national security. Educated in this context, with new approaches and analytical capabilities, our students—the next generation of discoverers, innovators, and entrepreneurs—will be better equipped to truly change the world.

The intent of The Rensselaer Plan 2024 is to take us from transforming Rensselaer to becoming transformative in the lives of our students, our pedagogy, and the global impact of our research. The investments we are making in remarkable digital tools and in our capacity to gather and use information in every field of research are going to make those ambitions a reality.
Engineers for a Sustainable World Invite Participants

It was a pleasure to read the “Transformational Change” feature of your Spring 2013 issue. During my time on the ESW National Team, ESW-RPI’s work in Haiti has always been one of my favorite examples of international work, making use of local materials, and showing real impacts to a community. Seeing that effort recognized by the broader community is always rewarding.

ESW, as a national community, has been building on successful chapters like RPI’s, so that we now have a network of 32 chapters. While some of those also do international work, many focus on the domestic side of sustainability, including biofuels, stormwater management, or energy efficiency. As a national organization, ESW is now expanding educational programs with a multi-university course initiative around complex real-world problems and bringing in more project partners in areas such as life cycle assessment, building sensing, and open source machinery.

I’d like to invite any RPI alums who are interested in the technical side of sustainability to see what we’re launching for professionals, even if ESW-RPI wasn’t something you did. Two key ways to get involved, in addition to basic membership, are with one of our new professional chapters, including a strong chapter in Albany/Troy, and opportunities for mentoring chapter projects around the country. In addition, we’d love to see anyone interested in technical sustainability projects join us at our regional conferences at RPI and Pitt this fall, or at Northwestern in the spring!

You can learn more about all of these efforts at our website, www.eswusa.org, or by contacting Andrew Chung ’13 (our communications director) at awching@eswusa.org. I hope that ESW-RPI’s work is as inspiring to RPI’s alumni as it is to us at ESW-National, and I hope to see some other alums getting involved in building a sustainable world.

ALEXANDER DALE
Executive Director
Engineers for a Sustainable World
Pittsburgh, Pa.

Commitment to Veterans

In regards to the article “The Red Behind the Yellow Ribbon” (Spring 2013), RPI has been working with veterans and active duty military for years. This is not something new that RPI has said it wants to do just to get a stamp of approval from “GI Jobs”; rather, this is the newest articulation of RPI’s commitment to veterans.

Lt. Col. Sam Ross is correct in her portrayal of the extremely positive attitude most staff members have shown to the veterans I know. We (the Student Veterans of America—SVA) have been working with the Veterans Education Task Force (VET-F) for about a year now, and we have seen some wonderful progress. Up until last semester, it was a confusing process for veterans to start their education. All the information and forms were spread across the RPI website, or so my wife tells me—she completed the application process for me while I was halfway around the world and far beneath the surface of the ocean.

The SVA worked with the VET-F to simplify and streamline the process and consolidate all the application information. We have worked to include a veterans’ resource link right on the front page of the RPI website. It directs the veterans, or their spouses, to everything they would need to apply.

We are working through several ideas that will help make school life a bit easier and more fluid for our veterans. We have discussed things like early registration, child care, increasing the number of transfer credits for vets, and increasing the number of Yellow Ribbon spots available. Needless to say, I am pretty excited about the coming years with the SVA.

I would like to thank RPI for all it does for veterans, and I would also like to encourage the RPI community and alumni to check out one of our events this coming semester.

DAVE RUNKEL
SVA President
Albany, N.Y.

Remembering Carl Westerdahl

Carl Westerdahl’s dedication to Rensselaer was second to none (Milestones, Spring 2013). I knew him as dean when I was at RPI between 1977 and 1982. Although he had the nickname the “Mean Dean,” which I think he enjoyed, we were well aware that he had our interests at heart.

Sometime in the 1990s, his office called me to invite me to join him for a drink to discuss restarting the alumni club in our area (Silicon Valley). It was so strange having the dean try to treat me as a peer. He called me Andy and I called him Dean Westerdahl. A few years ago at Reunion, he led a tour of the renovated Approach, dispensing his treasure trove of wisdom.

Carl’s contributions to and love for Rensselaer were legendary, and he will be missed.

ANDY DANIEL ’81
Palo Alto, Calif.

We’d love to hear from you! To provide space for as many letters as possible, we often must edit them for length. Address 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.
RENSSLEAER

INSTITUTE FOR DATA EXPLORATION AND APPLICATIONS

Tackling Big Data

RENSSELAER has launched a new universitywide initiative to tackle the challenges and opportunities of Big Data. The new Rensselaer Institute for Data Exploration and Applications (IDEA) brings together and fortifies the wealth of data science, high performance computing, predictive analytics, data visualization, and cognitive computing research at Rensselaer, the nation’s oldest technological research university.

The Rensselaer IDEA represents an investment by Rensselaer of $60 million, and involves faculty members and students from more than 12 departments across the five schools of the university. The new research institute serves as a hub for Rensselaer faculty, staff, and students engaged in data-driven discovery and innovation. Through the use of the vast amounts of available data, they are addressing some of the most challenging problems facing our world—from energy security and job creation to sustainability and health care.

“The Rensselaer IDEA will maximize the ability of our researchers to harness the expanding possibilities for discovery and innovation in a data-driven, supercomputer-powered, web-enabled, globally interconnected world,” says President Shirley Ann Jackson.

“Rensselaer is a leader in the fundamentals and applications of computational science and engineering, information technology, and data science,” says Vice President for Research Jonathan Dordick. “The Rensselaer IDEA is a culmination of the university’s first phase of investment, under The Rensselaer Plan, in faculty, research programs, platforms, and partnerships. With the formation of the Rensselaer IDEA, we will innovate new data-driven solutions to important and complex challenges facing every family, every community, and every nation.”

The Rensselaer IDEA is anchored in the strength of the university in six primary areas: high performance computing, web science, data science, network science, cognitive computing, and immersive technologies.
 ARCHITECTURE

“Urban Furniture” Imagined for Troy’s Riverfront Park

RECREATION GOT A REDESIGN IN AN EXHIBIT of “playscape” furniture designed for the Troy Riverfront Park as part of a collaboration between the city of Troy and the Rensselaer School of Architecture. An exhibit in the Greene Gallery featured a series of full-scale mock-ups of designs developed in the spring 2013 vertical design studio, titled Urban Furniture, a class for third- and fourth-year architecture students taught by Lonn Combs, assistant professor of architecture.

The designs represent a range of objects, says Combs, including a “21st-century jungle gym,” a dual-purpose bench/climbing rock, and a series of looped structures that can serve as seating and tunnels for children. One object even incorporates a misting function for cooling down in hot summer weather.

“How can the furniture that’s installed in the park have an effect on making it a stronger destination for the community?” says Combs. “There’s really a cool and imaginative range of research on how one could—through simply adding, and placing, and sitting some of these objects within the waterfront park—radically change the kind of uses and play that can happen along the water’s edge. The park becomes a playscape.”

The project is an extension of a recent series of collaborations with Capital Region institutions introduced by Evan Douglis, dean of the School of Architecture. In recent years, the school has worked with the Shaker Museum, the Hyde Collection, and the Schenectady Museum of Science and Innovation. Also, second-year architecture students regularly incorporate case studies of housing schemes within the city of Troy in their studies.

“This project has been a wonderful initiation for the School of Architecture and city of Troy to work together as partners and to re-imagine the city of Troy,” says Douglis. “We hope our ideas for urban playscape furniture help to expand the opportunities for play and recreation within the park, and establish it as a cherished and well-used public space.

“Students in schools of architecture traditionally don’t get the opportunity to see their work realized full-scale—if you’re designing a building that’s a million-square-foot space, the chance to build any part of that is unlikely,” Douglis says. “The great part of this project is that students are able to move their designs to a full-scale prototype; they’re able to think at the scale on which it will be built. That prepares them and propels them in a very strong way into the working world after graduation.”

THE NEW YORK STATE ENERGY RESEARCH AND Development Authority (NYSERDA) has awarded $1.8 million in funding to Rensselaer for critical upgrades to the electrical and mechanical infrastructure of the university’s supercomputing center, the Computational Center for Nanotechnology Innovations (CCNI).

These upgrades to CCNI’s power and cooling infrastructure support the operation of the center’s high performance computers. Rensselaer recently transitioned its supercomputing research activities to a powerful IBM Blue Gene/Q supercomputer system, which is four times faster and uses half the amount of energy as its predecessor.

The new Blue Gene/Q system and infrastructure upgrades are expected to save Rensselaer more than $1 million in electricity costs annually.

A partnership between Rensselaer and IBM, the CCNI supercomputing center has enabled industrial, government, and academic researchers in New York state and across the nation to tackle scientific and technological challenges related to advanced manufacturing, health care, renewable energy systems, and many other areas.

The new IBM Blue Gene/Q supercomputers and other improvements at CCNI are expected to reduce the energy usage by more than 15 million kilowatt hours of electricity annually—about the equivalent of powering 2,100 average-sized homes for one year.

“Rensselaer is at the forefront of applying high performance computing to today’s most challenging and complex problems including energy, health, food, water, and national security, and the linked challenges of climate change and allocation of scarce resources. Finding solutions involves massive amounts of data, and requires complex computations, driven by ever-more powerful supercomputers,” says President Shirley Ann Jackson.

“As we dramatically increase the computational power of our supercomputers, we also must reduce the energy requirements. We are working both sides of this equation by partnering with IBM to use more energy-efficient computers, and benefitting from the support of NYSERDA to upgrade the power and cooling systems required to handle the increasing computational capacity.”
HUMANITIES, ARTS, AND SOCIAL SCIENCES

Economics of Immigration

GREG DEANGELO, ASSISTANT PROFESSOR OF ECONOMICS, engages students with economics both inside and outside the classroom—and even uses his love of hockey to situate the study of economics within the sports arena.

A current research project finds DeAngelo looking at—and possibly debunking—theories linking illegal immigration with increased rates of crime, which has been used as the basis for controversial legislation in Arizona and other states in the Southwest. DeAngelo is gathering data from the Los Angeles Police and Sheriff’s Departments and matching it with attendance data from schools across Los Angeles County. “We can see where there are hot spots for crime, and we can see where immigrants are living—and they’re not that close,” he says. “In fact, we’ve found that immigrants are mostly trying to avoid the lower-cost, crime-ridden areas and are moving farther and farther out, housing more people in one domicile so they can be farther and farther from gang-ridden territory,” DeAngelo concludes.

Bud Dickson ’13, an economics major, has been working closely with DeAngelo on the immigration project, helping to link all data to the appropriate GIS location. Dickson says he has learned a great deal about research through this experience.

“RPI has a lot of research opportunities for undergraduates, but I lucked out with Professor DeAngelo because he’s been a mentor to me as well as a professor, offering words of wisdom and advice,” Dickson says.

DeAngelo also serves as a faculty mentor to Rensselaer hockey players, including several economics majors. “A couple of guys have been working with me on a project that examines the increase in penalties and fines in the NHL. We’re trying to get a sense of the cost of a ‘dirty hit’—it’s another way to teach economics,” he says.

DARRIN FRESH WATER INSTITUTE

Making Lake George the “Smartest Lake” in the World

THE ANNOUNCEMENT OF THE JEFFERSON Project—a collaboration among Rensselaer, IBM, and the FUND for Lake George— signaled the start of a new era of research on the “Queen of American Lakes” (see page 2).

The collaboration partners plan to use a combination of advanced data analytics, computing and data visualization techniques, new scientific and experimental methods, 3-D computer modeling and simulation, and historical data, expecting to gain an unprecedented scientific understanding of Lake George. The combination of these unique predictive capabilities will enable scientists and the community to prioritize and act before permanent degradation can take place.

For example, the new monitoring system is expected to give scientists a view for the first time of circulation models in Lake George. Lake George is an ideal body of water to study due to its size and unique ecosystem. Approximately 95 percent of the land surrounding Lake George remains as natural forestland, 46 percent of which is “forever wild” state-owned forest preserve.

IBM plans to provide hardware, software, and supporting services to help create a new Smarter Water laboratory and visualization studio at Rensselaer’s Margaret A. and David M. Darrin Fresh Water Institute on Lake George. A team of IBM Smarter Water experts, in partnership with Rensselaer and the FUND for Lake George, plan to pair their expertise with this new technology 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. Local groups could use this data to make informed decisions on the protection of Lake George’s pristine waters and unique ecosystem.

“Lake George has a lot to teach us, if we look closely,” said President Shirley Ann Jackson at the announcement. “By expanding Rensselaer’s Darrin Fresh Water Institute with this remarkable new cyberphysical platform of data from sensors and other sources, and with advanced analytics, high performance computing, and web science, we are taking an important step to protect the timeless beauty of Lake George, and we are creating a global model for environmental research and protection of water resources.”
Generally, it takes students four years to earn a bachelor’s degree and another five to attain a doctorate. In Rensselaer’s Accelerated B.S./Ph.D. Program, students can earn these degrees in just seven years or less.

JP Trasatti, who earned his B.S. in chemistry in 2011 and is now pursuing a doctorate, found the built-in research rotations of the B.S./Ph.D. program one of its most attractive features. These rotations allow students to sample different labs and explore their interests before committing to one. “It’s not like going to a grad school just to work with one particular faculty member,” he says. “You have the opportunity to learn what you like through the rotations.”

On his third rotation, Trasatti clicked with the lab of Professor Pankaj Karande, where he works on multiple projects, including developing a 3-D human skin model and studying protein-protein interactions of the blood brain barrier—projects consistent with his passion for conducting research with the potential of improving people’s lives.

This spring, Trasatti was awarded a prestigious NSF Graduate Fellowship, which provides a three-year annual stipend of $30,000 along with a $10,500 cost of education allowance for tuition and fees, and opportunities for international research and professional development.

Hannah Trasatti has set out on a parallel path to that of her brother. She will earn her B.S. in biochemistry in 2014, and aims for her Ph.D. in 2017. Hannah took root in the laboratory of Professor Wilfredo Colón, where she is developing a novel method for isolating kinetically stable proteins using different proteases. This research may have application in our understanding of Alzheimer’s disease, type 2 diabetes, Parkinson’s disease, and cystic fibrosis.

JP has served as president of Phalanx, Rensselaer’s senior leadership honor society, has mentored students as a learning assistant and Student Orientation adviser, and has worked on the campus newspaper. Hannah is a founding officer of weR: The Spirit of Rensselaer Society, which promotes school spirit. Both are also active in Greek life.

EMPAC

Latest Dance Movies Commissions Announced

THE CURTIS R. PRIEM EXPERIMENTAL Media and Performing Arts Center (EMPAC) has announced the three recipients of this year’s EMPAC DANCE MOVIES Commission. Chosen out of 69 proposals, the projects range widely in format, style, and intent: from a multichannel video installation to exploration of movement and music in flight. Each project reinforces the quality and inventiveness that has typified previous DANCE MOVIES Commission recipients, while continuing to push the definition of what dance on screen can be. All projects will be developed and produced at EMPAC, taking advantage of full production support while in residence.

In one project, contemporary artist Seline Baumgartner collaborates with professional dancers over the age of 62, exploring how contemporary dance forms indulge in the eternal cult of youth.

In another, video artist Marianne Kim creates a non-narrative investigation of “fugue state,” referring to flight, wandering, forgetting, reinventing, and remembering. And filmmaker and artist Orit Ben-Shitrit explores the psychological struggle that immigration poses for individuals.

The newly commissioned projects will receive awards ranging from $20,000 to $30,000. They will be created over the course of one year by the three collaborative teams that are based in the United States, and will premiere at EMPAC during the 2014-15 season.

EMPAC’s DANCE MOVIES Commission, established in 2007, supports the creation of new works in which dance meets the technologies of the moving image. As the first major commissioning program for dance film in the U.S., it has had a significant national and international impact, with the creation of 20 new commissioned works to date, many of which are winning awards and touring extensively.

The commission is supported by the Jaffe Fund for Experimental Media and Performing Arts. It is open to artists based in North and South America who are making video, film, and installation work.

ACCELERATED PROGRAMS

Hitting the Accelerator

This spring, Lecoq-trained actor, principal clown for Cirque du Soleil, and contemporary artist Colin Gee presented In the First Place…, a multilayered dance film installation. The film was part of the 2011 DANCE MOVIES Commission.
The Icahn School of Medicine at Mount Sinai and Rensselaer have announced an affiliation agreement to collaborate on educational programs, research, and development of new diagnostic tools and treatments that promote human health. The alliance was commemorated in a signing ceremony in May.

The institutions launched the initiative to use their expertise—Rensselaer’s in engineering and invention prototyping and Mount Sinai’s in biomedical research and patient care—to provide synergy in their promotion of human health.

Rensselaer and Mount Sinai will develop complementary research programs in neuroscience and neurological diseases, genomics, imaging, orthopaedics, cancer, cardiovascular disease, and scientific and clinical targets that capitalize on each institution’s unique strengths. Joint funding in research programs will be sought, including precision medicine, drug discovery, stem cell biology, robotics and robotic surgery, novel imaging techniques, cellular engineering, and computational neurobiology.

According to President Shirley Ann Jackson, “Combining Mount Sinai’s leadership in biomedical research and patient care—with Rensselaer’s breakthrough research in biotechnology and interdisciplinary studies, rooted in our leadership in science, engineering, and technological entrepreneurship—we expect this agreement to result in radical innovations in health care. Mount Sinai and Rensselaer are now taking a significant step toward revolutionizing education, research, and practice in the field of medicine—and ultimately, improving human health around the globe.”

Initially, key areas of focus will be genomics, imaging, tissue engineering, and neuroscience. The institutions also will work together in the development and utilization of novel neuroimaging techniques and neurotechnologies that help better understand and treat neurological disorders. These areas are a national priority, with the White House announcing the launch of the BRAIN Initiative (Brain Research Through Advancing Innovative Neurotechnologies)—through which Rensselaer and Mount Sinai will apply for funding.

“Mount Sinai will benefit greatly from Rensselaer’s expertise in prototyping, engineering know-how, and intellectual property development, and Rensselaer from Mount Sinai’s leadership in biomedical research,” says Scott Friedman ’76, M.D., dean for therapeutic discovery at Mount Sinai. “This synergistic relationship will propel both institutions to the forefront of therapeutic discovery and development.”

Under the new partnership, Rensselaer and Mount Sinai also will develop joint graduate educational programs in multiple areas of translational basic science, leveraging the strength of existing doctoral programs at each institution.
**CHEMICAL AND BIOLOGICAL ENGINEERING**

**Bacteria Sent Into Space Behave in Mysterious Ways**

**Colonies of bacteria** grown aboard space shuttle Atlantis behaved in ways never before observed on Earth, according to a new NASA-funded study from Rensselaer. Recent findings provide important evidence of spaceflight’s effect on the behavior of bacterial communities and represent a key step toward understanding and mitigating the risk these bacteria may pose to astronauts during long-term space missions.

The research team, led by Rensselaer faculty member Cynthia Collins, sent the experiment into orbit aboard Atlantis’ STS-132 mission in May 2010 and its STS-135 mission in July 2011. Samples of the bacteria *Pseudomonas aeruginosa* were cultured for three days in artificial urine. The space-grown communities of bacteria, called biofilms, formed a column-and-canopy structure not previously observed on Earth. Additionally, biofilms grown during spaceflight had a greater number of live cells, more biomass, and were thicker than control biofilms grown under normal gravity conditions.

Biofilms are complex, three-dimensional microbial communities commonly found in nature. Most biofilms, including those found in the human body, are harmless. Some biofilms, however, have been found to be associated with various diseases.

“Biofilms were rampant on the Mir space station and continue to be a challenge on the International Space Station, but we still don’t really know what role gravity plays in their growth and development,” says Collins, an assistant professor in the Department of Chemical and Biological Engineering. “Our study offers the first evidence that spaceflight affects community-level behaviors of bacteria and highlights the importance of understanding how both harmful and beneficial human-microbe interactions may be altered during spaceflight.”

“Beyond its importance to astronauts and future space explorers, this research also could lead to novel methods for preventing and treating human disease on Earth. Examining the effects of spaceflight on biofilm formation can provide new insights into how different factors, such as gravity, fluid dynamics, and nutrient availability, affect biofilm formation on Earth. The research findings could one day help inform new, innovative approaches for curbing the spread of infections in hospitals,” Collins says.

**BIOLOGY**

**Award Recognizes Legacy of Research**

SUSAN GILBERT, professor and head of the Department of Biology, has been awarded a National Advisory General Medical Sciences Council NIH Method to Extend Research in Time (MERIT) Award, a recognition of the high quality of her research contributions over time. The MERIT Award offers long-term grant support to investigators of proven research competence and productivity and is expected to facilitate creative, innovative research that will have an exceptional impact on the field.

“Susan is to be congratulated for a very significant and rare achievement in earning an NIH MERIT award,” says Laurie Leshin, dean of the School of Science. “It’s a well-earned recognition of the long-standing, extremely high quality of her research. The award provides her the freedom to explore cutting-edge scientific ideas in ways that wouldn’t otherwise have been possible.”

The MERIT grant will support Gilbert’s continuing research of kinesins, a class of molecular motors that ferry cargo along the cytoskeleton of a cell. Her work could shed light on diverse pathologies that have been linked to defects in kinesins, including cancer, ciliopathies, neuropathies, and birth defects.

The award includes initial funding of $2 million over five years, accompanied by the opportunity of funding for an additional three to five years.

“I am thrilled to receive the NIH MERIT Award from the National Institute of General Medical Sciences, which has funded my research program since 1996,” says Gilbert.

“The overarching goal of my research program is to understand how molecular motors generate force and to apply this insight to understand their roles in cell organization and function in normal and in diseased states. This award will allow us to continue this important fundamental research and to pursue higher-risk scientific questions to define the relationships between kinesin structure, mechanochemistry, and function.”
This year, graduating seniors who studied in the AML over the past two semesters have secured manufacturing-related jobs at Apple, Boeing, Rensselaer, and other major companies.

EACH YEAR AT COMMEMCENCEMENT, THE GRADUATING CLASS presents the university with a unique and spirited gift. Thanks to the creative generosity of the Class of 2013, the fastest-selling toy in history will find a home on the Rensselaer campus. Members of the class have been raising funds to create a large-scale, fully functional Rubik's Cube, which will be unveiled during Reunion & Homecoming Weekend, Oct. 4-6.

“Last spring, members of the Class of 2013 began considering what they hoped to achieve for their senior class gift and we decided that the gift should be unique to the campus, interactive in nature, and represent the characteristics of every RPI student,” says Class President Christopher Newhard ‘13.

“After bouncing around a few ideas, the Class of 2013 decided on the giant Rubik’s Cube,” Newhard says. “First off, it’s a nerdy toy that resonates with a lot of the student body. Secondly, building it, with a brand-new mechanism by necessity, would be an impressive feat of engineering design and manufacturing, again resonating with the nature of our school. And lastly, it will stand as a lasting piece of art on campus to be admired and used for decades to come.”

The Rubik’s Cube will be placed in the Darrin Communications Center landing at the end of the Great Hall. The sculpture—which will measure over three feet per side—is based on an original design by Sam Seifert ’13, an electrical engineering major.

Thus far, members of the Class of 2013 have raised more than $5,000 to support the project. The committee needs to collect $20,000 to complete the project.

ASTROBIOLOGY

Searching for Life

IS THERE LIFE ELSEWHERE IN THE UNIVERSE? This question lies at the heart of Rensselaer’s NASA-funded New York Center for Astrobiology.

“We’re interested in how the matter that you need to make planetary life came to be: Where did it come from and how was it formed? And since it happened here in our solar system, is it likely to happen elsewhere as well?” says Doug Whittet, center director and professor of physics, applied physics, and astronomy.

Professor Whittet uses the spectrum of light coming from dust clouds surrounding young stars or in interstellar space to determine what molecules may be present in the clouds. Varun Bajaj ’13, a student of physics, astronomy, and electronic arts, joined Whittet’s research group after taking his Origin of Life class.

“Astrobiology uses many of the sciences—chemistry, biology, physics—and it leads to results that help explain the evolution of life,” says Bajaj.

Bajaj, who turned data from the Spitzer Space Telescope into an infrared spectrum of an interstellar cloud, says he chose Rensselaer for its emphasis on science, math, and engineering, and also for the accessibility of undergraduate research.

Based within the School of Science, the New York Center for Astrobiology is devoted to investigating the origins of life on Earth and the conditions that lead to formation of habitable planets in our own and other solar systems. Supported by NASA, the Center is a member of NASA’s Astrobiology Institute, and is a partnership between Rensselaer and the University at Albany, Syracuse University, the University of Arizona, and the University of North Dakota.

Researchers and students within the center seek to understand the chemical, physical, and geological conditions of early Earth that set the stage for life on our planet. They also look beyond our home planet to investigate whether the processes that prepared the Earth for life could be replicated elsewhere—on Mars and other bodies in our solar system, and on planets orbiting other stars.
Forging Research Links to Portugal

Rensselaer and the Instituto Superior Técnico (IST) of Portugal have announced an agreement to collaborate on a number of fronts, ranging from research to student and faculty/staff exchange.

The formal agreement, which grew out of a desire by both universities to strengthen the links for cooperation, will focus on science, engineering, and technology.

“As the nation’s oldest technological research university with existing ties and collaboration across the globe, we are delighted to begin cooperation with Instituto Superior Técnico on a number of fronts,” says Jonathan Dordick, Rensselaer vice president for research and the Howard P. Isermann Professor of Chemical and Biological Engineering. “With their strength in engineering, science, technology, and architecture, they are a natural match to work with us. For more than a century, and similar to our goals, they have immersed their students and researchers in an exciting environment that is geared toward solving global challenges.”

“This agreement is the result of an effective and very fruitful cooperation that has been developed in the last 10 years between the Institute for Biotechnology and Bioengineering (IBB) at IST and the Center for Biotechnology and Interdisciplinary Studies at Rensselaer, which has involved joint Ph.D. and post-doctoral researchers and projects,” says Joaquim Cabral, director of IBB and professor of biological engineering at IST.

“Recently, an international Ph.D. program on ‘Bioengineering: Cell Therapies and Regenerative Medicine,’ coordinated by IST, was approved by the Portuguese Foundation for Science and Technology,” Cabral says. “The participation of Rensselaer in this program brings their expertise and strength in biomaterials, tissue engineering, and nanobiotechnology to this effort as well as its international dimension, leading to a unique platform to foster new knowledge and scientific advances in regenerative medicine.”

Under terms of the agreement, both universities will work together for at least five years. The two institutes will focus on promoting the exchange of undergraduate and graduate students; joint supervision of master’s and doctoral theses; exchange of faculty members and staff; collaboration in curricular development and establishment of undergraduate and post-graduate educational programs; promotion of joint research activities; organization and participation in joint research meetings and conferences; and exchange of scientific materials, publications, and information.

Since its creation in 1911, Instituto Superior Técnico has become the largest and most reputed school of engineering, science and technology, and architecture in Portugal. IST aims to give students and alumni the education and the knowledge tools to improve, to change, and to shape society through science, technology, and entrepreneurship.

To prepare students and career professionals for the expanding scope of careers requiring Big Data and analytics skills, IBM and Rensselaer are combining forces to offer a new, one-year Lally School of Management and Technology graduate degree program, the Master of Science in Business Analytics.

Nearly two million information technology jobs will be created by 2015 in the U.S. to support Big Data, according to research firm Gartner Inc. Analytics skills will be a key differentiator for candidates seeking to fill those jobs.

The news underscores IBM’s efforts to help students and career professionals enter and succeed in the growing, high-demand analytics workforce. In addition to collaborating with Rensselaer on the new degree program, IBM has also recently donated a Watson system to the school in order to help faculty and students explore new uses for cognitive computing and expand their understanding of Big Data and analytics.

The new Master of Science in Business Analytics degree is a one-year, 30-credit graduate program offered by the Lally School. The program will provide students and career professionals with the hands-on experience and knowledge required to succeed in analytics jobs spanning a range of industries, from the data scientist who helps chief residents make sense of millions of medical records, to the marketing analytics specialist who helps chief marketing officers personalize consumer brand campaigns.
MAKING A DIFFERENCE

Mahe’s Generosity Leaves a Lasting Legacy

CHANCES ARE, AS MEMBERS OF THE RENSSELAER community, many alumni have benefited from the generosity of the late George Mahe Jr. ‘42 and his extraordinary gifts to the Rensselaer Libraries. Upon his passing in 2010, Mahe bequeathed approximately $19.5 million to Rensselaer to support the Pauline C. and George F. Mahe Memorial Fund.

Mahe, who died at the age of 88, graduated from Rensselaer with a degree in chemical engineering. He worked for most of his career as a project engineer with Sandoz Pharmaceuticals in East Hanover, N.J. Mahe, who never married or had children, is survived by his niece, Elizabeth Wilson, and her husband, Kenneth, and their children. During his lifetime, he also supported Rensselaer with the establishment of the George F. Mahe Jr. ‘42 Fellowship in Memory of John L. Sharp ’42, for which he bequeathed $100,000.

“Even though he didn’t talk to me much about them, I know that his years at RPI were very precious and special to him,” says Elizabeth Wilson. “He enjoyed the camaraderie he shared with his classmates. I think he felt confident during his time at Rensselaer, and believed he gained the skills necessary to have a successful career.”

“He wanted RPI to be a world-class educational institution and he wanted to do whatever he could to further it toward that goal,” adds Kenneth Wilson.

And so, 40 years ago in 1973, he established the Pauline C. and George F. Mahe Memorial Fund in memory of his parents to provide assistance to the Rensselaer Libraries for the acquisition of books, reference materials, electronic journals, and academic software. In fiscal year 2012 alone, Mahe’s gift allowed for the purchase of more than 550 resources and materials.

These materials supplement and guide students, faculty, and researchers across all schools and disciplines, and enable the Rensselaer community to achieve success. Mahe’s bequest will help Rensselaer achieve prominence as a top-tier world class technological research university by providing seamless access to the widest spectrum of information relevant to the research and learning communities thriving at Rensselaer.

Not one for publicity, according to the Wilsons, Mahe spent his life helping others and this philanthropy was just one part of that.

“He set up the fund not to gain recognition, but to honor his parents in an important and lasting way,” Elizabeth Wilson says. “I believe giving to the libraries was important to him because he wanted to impact the greatest number of students over the longest period of time. By providing resources to the libraries, he believed he was giving students the tools they needed to succeed in their studies and in their lives.”

Smart Lighting

Developing the Next-Generation LED

Researchers from the SMART LIGHTING ENGINEERING Research Center (ERC) at Rensselaer have successfully integrated an LED and a power transistor on the same gallium nitride (GaN) chip. This innovation could open the door to a new generation of LED technology that is less expensive to manufacture, significantly more efficient, and enables new functionalities and applications far beyond illumination.

At the heart of today’s LED (light-emitting diode) lighting systems are chips made from GaN, a semiconductor material. For the LED to function, many external components—such as inductors, capacitors, silicon interconnects, and wires—must be installed on or integrated into the chip. The large size of the chip, with all of these necessary components, complicates the design and performance of LED lighting products. And, the process of assembling these complex LED lighting systems can be slow, manually intensive, and expensive.

In a new study led by T. Paul Chow, professor in the Department of Electrical, Computer, and Systems Engineering, the researchers sought to solve this challenge by developing a chip with components all made from GaN. This type of monolithically integrated chip simplifies LED device manufacturing, with fewer assembly steps and less required automation.

Chow and the research team grew a GaN LED structure directly on top of a GaN high-electron-mobility transistor (HEMT) structure. They used several basic techniques to interconnect the two regions, creating what they are calling the first monolithically integrated a HEMT and an LED on the same GaN-based chip. The device, grown on a sapphire substrate, demonstrated light output and light density comparable to standard GaN LED devices. Chow says the study is an important step toward the creation of a new class of optoelectronic device called a light-emitting integrated circuit (LEIC).

“Just as the integration of many silicon devices in a single chip—integrated circuits—has enabled powerful compact computers and a wide range of smart device technology, the LEIC will play a pivotal role in cost-effective monolithic integration of electronics and LED technology for new smart lighting applications and more efficient LED lighting systems,” Chow says.
The Lighting Research Center (LRC) at Rensselaer has launched the first interactive website to help homeowners, contractors, and builders choose the right light bulbs, fixtures, and controls to maximize energy savings, calculate lighting costs, and achieve lighting effects to meet a wide range of needs in their homes. It also shows how to design safe, healthy lighting for aging adults.

The site, Lighting Patterns for Homes, helps homeowners navigate the increasing number of lighting options and allows them to see how various options will actually look by viewing photo-realistic illustrations created by 3-D modeling software.

Visitors to the website can learn different ways to light a room; compare the benefits of various lighting technologies and equipment, including light-emitting diodes (LEDs); and find out how to use different lighting techniques, such as task lighting or accent lighting.

In addition, site visitors can learn how to upgrade incandescent bulbs to newer technologies, which is important now that new federal lighting standards are raising the energy efficiency requirements of light bulbs to help the U.S. decrease electricity use.

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“The Lighting Research Center has once again proven itself to be a leader in the energy-efficient lighting industry. This site is a great resource for all New Yorkers who want to learn how to reduce their energy costs through lighting measures,” says Francis Murray Jr., president and CEO of the New York State Energy Research and Development Authority, which funded the project.

The website was designed for homeowners, building managers, builders, efficiency contractors, and others who select lighting for residences but would not typically hire a lighting professional.

Created by the LRC’s professional lighting designers, all of the improved designs provide the same or better lighting quality than traditional lighting, almost all use less electricity, and many provide economic payback within several years.

“Designed in the spirit of traditional architectural pattern books, the LRC’s new website gives model designs and components of designs that can be adapted to each individual’s own building and style,” says Russ Leslie, LRC associate director and lead author of The Lighting Pattern Book for Homes, the original book upon which the new website is based. “It is dedicated to all those who strive to create practical homes that harmonize with, rather than deplete, our environment.”

The interactive website is available to the public free of charge and can be accessed from any computer or web-enabled mobile device at www.lrc.rpi.edu/patternbook.
INFORMATION TECHNOLOGY AND WEB SCIENCES

Training Navy Officers

THE U.S. NAVY IS TURNING TO THE INFORMATION Technology and Web Science (ITWS) program at Rensselaer to prepare a select group of U.S. Navy officers with skills needed for military cyberspace operations. Under a three-year agreement, the Navy will enroll a group of five to 10 officers yearly in a new “information dominance” concentration within the Master of Science in Information Technology degree program.

The new concentration will prepare officers for careers designing, building, and managing secure information systems and networks. Such training is essential for the U.S. Navy in an increasingly information-rich environment, according to Professor Peter Fox, director of the ITWS program.

“When you’re deluged with a large amount of heterogeneous information, you’re presented with challenges that you don’t have when you have sparse amounts of information,” says Fox. As an example, Fox points to social networking data during a threatening situation in a crowded area.

“Some of the data will have geo location, some will not; some of the information is good quality and some isn’t; some of the tweets come from within the area and some don’t. How do you take diverse information sources that have different levels of quality and uncertainty and combine them together to have a capability to form analysis, let alone make a decision? The way you view it, assemble it, think about it, is different.”

Although the new concentration was created to meet the specific needs of the U.S. Navy, it is also suitable for IT professionals and data scientists who want to enhance their knowledge of how to use pervasive information in situational awareness, operations scenarios, and decision-making.

The first group of Navy officers to enroll in the program arrived on campus in August. “We’re excited to be working with the Navy in training their next generation of officers in this emerging field of information dominance,” says Laurie Leshin, dean of the School of Science. “Understanding large amounts of information is critical to our future national security and it is an honor to be involved in training Navy officers in how to work in the world of Big Data and IT.”

ATHLETICS

NFL Comes Calling

IN MAY, SENIOR QUARTERBACK MIKE HERMANN ’13 AGREED to a free agent contract with the San Diego Chargers of the National Football League (NFL). Hermann, who had previously agreed to a tryout opportunity with the Oakland Raiders, joined the Chargers for the team’s rookie camp in May and June and opened training camp with the club in late July.

“I am obviously grateful to the Chargers for this opportunity,” said Hermann. “I have had the chance to get to know some of their staff and could not be more impressed.”

“We are all extremely excited for Mike,” said Jim Knowlton, director of athletics. “He has grown as a young man, a leader, and as a football player during his time at Rensselaer and we have all marveled at his transformation. This is an exciting opportunity that he has worked hard to earn and we are thrilled that Mike will be representing our fine institution at the highest level of professional football.”

Hermann, who was waived in late July, is among the top three in nearly every category for quarterbacks in Rensselaer history.

A three-time All-Liberty League choice, including two-time Offensive Player of the Year, and two-time All-Region choice, Hermann completed 178 of 296 passes (60.1 percent) for 2,366 yards and 23 touchdowns last season. He threw for 250-plus yards in five games, including one for 331 yards and another for 355, and had at least one touchdown pass in every game.
RICHARD GROSS, an expert on biocatalytic and chemical synthetic methods, has joined Rensselaer as a chair in the Biocatalysis and Metabolic Engineering Constellation, and professor in the Department of Chemistry and Chemical Biology. Gross was most recently the Herman F. Mark Chaired Professor of chemical and biomolecular engineering at the Polytechnic Institute of New York University. Gross’s research seeks to use the molecular building techniques of whole cells and enzymes to create polymers, peptides, and surfactants that are useful, environmentally friendly, and economically competitive.

JOSE HOLGUÍN-VERAS, the William H. Hart Professor, was honored by the White House as a “Champion of Change” in the field of transportation. He is one of 12 individuals recognized for “exemplary leadership in developing or implementing transportation technology solutions to enhance performance, reduce congestion, improve safety, and facilitate communication across the transportation industry at the local, state, or national level.” As part of the honor, Holguín-Veras visited the White House and participated in the Transportation Technology Solutions for the 21st Century event.

HEIDI NEWBERG, a professor of physics, applied physics, and astronomy, has been selected as a fellow of the American Physical Society (APS). Election to fellowship in the APS is limited to no more than one-half of 1 percent of membership. The APS cited Newberg for “her contributions to our understanding of the structure of the Milky Way galaxy and the universe and for the development of software and hardware infrastructure for measuring and extracting meaningful information from large astronomical survey data sets.”

RICCARDO BEVILACQUA, assistant professor in the Department of Mechanical, Aerospace, and Nuclear Engineering, has been named the recipient of a 2013 Young Investigator Award from the U.S. Navy’s Office of Naval Research. He will use the three-year, $510,000 award to further his research into creating highly maneuverable and inexpensive low-orbit satellites for space weather forecasting, which could lead to a better understanding of low-Earth orbit atmosphere dynamics.

SANDIPAN MISHRA, a control systems expert and assistant professor in the Department of Mechanical, Aerospace, and Nuclear Engineering, has won a Faculty Early Career Development Award from the National Science Foundation. Mishra will use the five-year, $400,000 grant to investigate and develop new sensing and controls paradigms to help push forward the field of additive manufacturing. Mishra aims to develop advanced sensing and controls algorithms for improving precision and reliability of additive manufacturing technologies, including 3-D printing.

GE WANG, a biomedical imaging expert, has been named the John A. Clark and Edward T. Crossan Professor of Engineering, and a faculty member in the Department of Biomedical Engineering. Wang’s innovations over the past 25 years have helped advance the field of medical imaging. He is author or co-author on 335 refereed journal papers, has edited three books, written several book chapters, and holds numerous patents related to his imaging work. Wang served since 2006 as the Pritchard Professor at the Virginia Tech-Wake Forest University School of Biomedical Engineering and Sciences, where he was also director of the Biomedical Imaging Division. He is a fellow of the American Institute for Medical and Biological Engineering, the Institute of Electrical and Electronics Engineers, the International Society for Optical Engineering, the Optical Society of America, and the American Association of Physicists in Medicine.

PETER DINOLFO, assistant professor of chemistry and chemical biology, has won a Faculty Early Career Development Award from the National Science Foundation. Dinolfo will use the five-year, $563,000 award to improve the efficiency of solar cells that use light-absorbing organic compounds—similar to the mechanism plants use to generate energy—rather than silicon to generate electricity.

RON SUN, professor of cognitive science and an expert in cognitive theories and systems, has been selected as a fellow of the Institute of Electrical and Electronics Engineers (IEEE). Sun is one of 297 newly selected fellows recognized for their outstanding contributions to the electrical and information technologies and sciences for the benefit of humanity and the profession. IEEE cited Sun for “contributions to cognitive architectures and computations.” Sun investigates the fundamental nature of the human mind using various methodologies of the cognitive sciences, and, in particular, computational modeling as a means of forging process-based comprehensive psychological theories of the mind.

JOHN WEN, professor of electrical, computer, and systems engineering, has been named head of the Department of Industrial and Systems Engineering. He joined Rensselaer in 1988 and has served since 2005 as director of the Center for Automation Technologies and Systems. His work is in the areas of control systems and dynamic systems modeling, with a particular focus on robotics for industrial automation.

CATHERINE ROYER, an expert in molecular biophysics, has joined Rensselaer as a Constellation Chair in Biocomputation and Bioinformatics, and professor in the Department of Biology. Royer was most recently director of the Centre de Biochimie Structurale in Montpellier, France. Royer’s research seeks to understand the physical mechanisms by which biological molecules work. She has a particular interest in the mechanisms at play as DNA is transcribed into messenger RNA—with particular attention to a group of transcription factors called nuclear receptors—and in the folding of proteins that have been synthesized by the ribosome. Royer is an expert in the use of fluctuation microscopy, a technique that allows her to gather quantitative data on protein interactions in live cells.
Under The Rensselaer Plan 2024, the Institute’s interdisciplinary research enterprise is posing critical questions to answer the world’s most pressing challenges. 

BY JANE GOTTLIEB

RESEARCH, REFRESHED

The goal of The Rensselaer Plan 2024 is to enable Rensselaer to have even greater success, and to continue to gain prominence in the 21st century as a top-tier world-class technological research university with global reach and global impact.

Education and research are inextricably linked in world-class universities. Discovery and innovative pedagogy are core characteristics of the Institute. The creation of new knowledge is critical to fostering an engaging and inspirational learning environment for students. To provide a superlative education, Rensselaer must be a trailblazer in key research fields. Research enables students to be partners in discovery and to remain open to inquiry.

As the impact of the research and education at Rensselaer grows, its prominence as a world-class technological research university also increases. This positions Rensselaer to continue to attract highly talented students and well-respected faculty and staff, to expand its global reach, and to garner increased financial support from private philanthropy and public sources.
JONAS BRAASCH IS A RENOWNED MUSICOLOGIST AND ACOUSTICS EXPERT who studies how humans experience sound and visuals. He is an associate professor in the School of Architecture. John Wen specializes in control systems and robotics. He heads the Industrial and Systems Engineering Department as well as the Center for Automation Technologies and Systems (CATS). Until recently, their paths rarely crossed. Now, they work together, on a robot they hope will enable a friend, David Whalen, to open a refrigerator for the first time since a skiing accident left him paralyzed 30 years ago.

“The robot has a grasping function. If I drop a box of cookies on the floor, it could pick the cookies up. It could do certain tasks, like taking something off the floor, taking something off the shelf, or putting a dish to warm in the oven,” says Whalen, an advocate for adaptive technology who invented a breath-controlled device that allows disabled individuals to play music.

“As a quadriplegic,” he adds, “if I’m in the house alone for a lengthy period, something like this robot could be the difference between getting a drink and not getting a drink. This technology opens a world of possibilities.”

With two human-like arms and a camera on its head and wrists, the robot responds to voice commands. It represents a marriage of highly unique specialties, specialties that are not routinely brought together. But such connections are now being made across campus, as Rensselaer ties its vast treasure trove of research to specific global challenges.

THE BOLD NEW GOALS SHOULD HAVE THE COLLATERAL BENEFIT OF RAISING RENSSELAER’S PROFILE. THE RENSSELAER PLAN 2024 CALLS FOR GROWING FACULTY TO 500 AND RAISING RESEARCH SPENDING TO $250 MILLION ANNUALLY.

The new strategy builds on the success of the original Rensselaer Plan, which transformed the Institute beginning in 2000 by expanding the faculty and degree programs, adding or renovating significant research facilities, and building new performance, athletics, and living spaces. Funding for research tripled, to $100 million. The applicant pool has set a record for each of the past seven years.

This next phase, the “refreshed” Rensselaer Plan 2024, establishes an agenda that looks ahead to the Institute’s 200th anniversary in 2024 and creates milestones in research, as well as in student life and pedagogy.

The research goals are both broad and specific. They fall under two umbrellas that address great global challenges. The first umbrella takes up the daunting job of moving
beyond using the Internet to generate data to make that vast data far more accessible and useful in solving specific social problems. The second puts Rensselaer’s might behind infrastructure resilience in such areas as health care, energy, and cybersecurity.

“We have the research expertise. Now we want to connect the ideas across the disciplines. The question now is ‘how do we aggregate what we are doing?’” explains Jonathan Dordick, vice president for research and the Howard Isermann Professor of Chemical and Biological Engineering.

“We talk about cybersecurity. A lot of people are doing it,” he notes. “We are interested in infrastructure resiliency. Other universities do it, and we all work on the built environment and biotechnology. But at Rensselaer we can relate what we are teaching to the world’s big challenges, and meeting these challenges will separate us from other institutions. We are also posing the critical questions that will drive change.”

The implications of these research goals—expanding the usefulness of digital data and developing tomorrow’s infrastructure—are immense. With them, Rensselaer envisions advancing patient care and public health, natural disaster preparedness, environmental protection, and smarter energy solutions—pursuits that do nothing short of elevating the quality of life at home and abroad.

*The Rensselaer Plan 2024* provides the road map, with a detailed matrix that connects the two umbrellas to the Institute’s five signature research thrusts—biotechnology and the life sciences; computational science and engineering; media, arts, science, and technology; energy, environment, and smart systems; and nanotechnology and advanced materials.

The result is a series of new centers, affiliations, and initiatives that strategically establish important collaborations.

Jonas Braasch has been appointed to head one such new entity, the Center for Cognition, Communication, and Culture. The CCC enlists Rensselaer researchers from the arts, computer science, cognitive sciences, and game design to apply their data to meeting social needs.

In his new role, he has quickly begun seeing his work in a different light. Among other things, he revived an interest in developing so-called social robots, to assist people with limited mobility, like David Whalen.

Braasch’s expertise lies in seeing how people process sound and visuals so that they can use such machines effectively. Next, he needed an engineer.

“People from our center talked to the Office of Research and they said ‘it sounds like you should contact our robot expert, John Wen at the CATS,’” notes Braasch, who had never worked with Wen. “Now suddenly we have all these ideas and it’s really fun and we have a robot.”

“Jonas and his colleagues bring the human interaction and artist’s expression components to complement our robotics and engineering expertise,” agrees Wen.

**BY THE TIME PLANS FOR THE NEW RESEARCH GOALS WERE RELEASED IN THE SPRING,** Rensselaer had spent much of the past decade building a framework to achieve them. The rollout has been steady and dramatic.
In November, Rensselaer launched the CCC, which has pursued new multidisciplinary approaches to protecting freshwater, building better robots, and other projects that tie technology to the community.

Then, in January, IBM named Rensselaer the first university to receive its Watson technology.

Two years earlier, Watson—represented in the form of a computer monitor and artificial male voice—became famous for confounding the most successful human contestants on Jeopardy. Before millions of viewers who watched the televised contest, the computer earned three times more prize money than its nearest competitor.

The arrival of Watson this time is just as dramatic, promising pioneering research into basic scientific questions and the grand challenges, where science and engineering meet society. Students are already learning how the system works, how to extend its capabilities, and the details of cognitive computing. Next, they will begin applying Watson to projects in smart health and open government applications.

And in May, the Institute announced yet another approach to meeting the challenges, a long-term affiliation with the Icahn School of Medicine at Mount Sinai Hospital in New York City.

The arrangement pools and strengthens the partners’ respective expertise—Rensselaer’s in engineering, invention, and prototyping and Mount Sinai’s in biomedical research and patient care. It has significant implications for data-driven research, medical education, and treatment.

The Rensselaer supercomputer at the Computational Center for Nanotechnology Innovations (CCNI) can use Mount Sinai patient data to identify routes to a faster and better treatment. Implantable devices devised on the Troy campus can be studied through their use at the Manhattan medical center.

And as institutions of higher education, the partners can establish joint degree programs. Rensselaer undergraduates, for example, will be eligible to apply to FlexMed, a Mount Sinai program that combines premedical education with computational science, engineering, or biomedicine. Also envisioned is the opportunity for students to earn both an M.D. from Mount Sinai and a Ph.D. from Rensselaer.

“In terms of medicine, the linkage between technological universities and medical schools has never been more urgent,” says Dordick. “The impact of technological breakthroughs is rapidly reshaping medical paradigms and education.”

The Mount Sinai announcement was followed a month later with the launch of the Institute for Data Exploration and Applications (IDEA), a research hub that will align the vast computational data generated on campus and beyond.
to Rensselaer’s new, front-burner research goals.

IDEA brings together faculty and students from more than 12 departments across the five schools who are taking up problems in such areas as energy security, job creation, and health care. Among them are representatives from the Watson Cognitive Computing Project, the Center for Biotechnology and Interdisciplinary Studies, the Curtis R. Priem Experimental Media and Performing Arts Center, and the Computational Center for Nanotechnology Innovations.

The goal is to use and strengthen the wealth of data science, high performance computing, and cognitive computing research being generated in order to help make the world better.

“As I understand it, my job is that dramatic,” says James Hendler, head of the Department of Computer Science, who has been named director of IDEA. “Computing and IT run all across the Plan and we want to pull it together and add resources to do what we can do to really change the world.”

Achieving this involves aggregating data that may already hold answers in health care, environmental research, or national security. Hendler notes that unless a paper is published, the many, many discoveries a given piece of research contains are not available to someone else whose work would benefit. Sharing such data would give scientists a glimpse of the steps of an experiment that did not work—conceivably sparing months of wasted effort. Moreover, scientists might add data that might lead to breakthroughs.

“Working with Big Data is hard,” Hendler says. “There is no one place where it comes together. There is so much volume and variety. How do you take the new knowledge and process it in such a way that it gets out to the world? We need a pipeline, a data ecosystem.”

Another problem: How do scientists who are not computing experts take advantage of Watson or the supercomputer? Hendler says that the very technology that holds the most promise in tackling large problems also requires an expertise few people have.

IDEA will work closely with the CCNI to explore how the supercomputing capabilities at Rensselaer can support more data-intensive research. In addition, the Institute recently named a new director of the CCNI, Christopher Carothers, a professor in the Computer Science Department, and charged him with making the resource more accessible to students and faculty.

Rensselaer is also providing leadership in this area to the global data community. In September, the National Science Foundation awarded Francine Berman, Rensselaer’s Edward G. Hamilton Distinguished Professor in Computer Science, $2.5 million to lead U.S. participation in the new Research Data Alliance. The organization focuses on accelerating the sharing of research data. It has already attracted more than 850 members in 51 countries.

As an example of what might be done, Berman says that economic data sets, geographic data sets, and census data can be put together as coordinated “urban data sets” that can be used in setting policies.

“Right now, discovering data is a hard thing. Information is available but we don’t know where to find it,” she says. “There are no tools that allow you to do it. Think of the world before your browser, before ‘search,’ and how hard it was to find information that was already there.”

Her Research Data Alliance activities are housed in yet another new center taking shape at Rensselaer, the Center for a Digital Society. Over time, the center will play a growing role in how technical infrastructure is being shaped in an information-rich world.

These ambitious efforts, she and others agree, play to the strengths of a research faculty well-accustomed to working across the disciplines. “The university is a great place for collaboration and has real impact in the broader community,” Berman notes.

Dordick, who succeeded her as vice president of research, agrees. As he examined Rensselaer’s research portfolio to help devise the new Plan, he was struck by the immense collaborative research the faculty generates for its size. But he also noticed that people outside Rensselaer have often heard of the notable scientists but are not aware of their affiliation with the Institute.

The bold new goals should have the collateral benefit

“IN TERMS OF MEDICINE, THE LINKAGE BETWEEN TECHNOLOGICAL UNIVERSITIES AND MEDICAL SCHOOLS HAS NEVER BEEN MORE URGENT. THE IMPACT OF TECHNOLOGICAL BREAKTHROUGHS IS RAPIDLY RESHAPING MEDICAL PARADIGMS AND EDUCATION.”

JONATHAN DORDICK
of raising Rensselaer’s profile. *The Rensselaer Plan 2024* calls for growing faculty to 500 and raising research spending to $250 million annually. Ultimately, the faculty members addressing global goals will benefit from greater institutional support, easing the pressure to continuously find funding on their own.

And, conversely, being known for managing Big Data and creating next-generation infrastructure should bring requests from funded organizations that are seeking the solutions. “The healthier Rensselaer is,” Dordick says, “the more we can do to change the world.”

**IN THE TIME IT TAKES TO FINISH A CUP OF COFFEE**, Rensselaer’s supercomputer can complete simulations that would have taken months not long ago—simulations of big, important things, like when and where the next Superstorm Sandy might hit.

But there is a gap between the experimental scientists most knowledgeable about storm patterns and the computational scientists who can quickly apply the findings to prevent the massive loss of life and property.

“When you get the experimentalists and computation people together, something amazing happens,” says CCNI Director Carothers. “Right now there is a real gap, but the good news is Rensselaer is at the forefront of closing it.”

His staff is reaching out, for example, working with the Lally School of Management and Technology on software that synthesizes massive data to provide a highly detailed profile of a company’s activities.

Carothers has also contacted the professors in the Department of Industrial and Systems Engineering who have made headlines since the World Trade Center attacks for their advancements in disaster and terrorism preparedness.

“We could help them model the next disaster with a higher fidelity and accuracy than they could ever do on their own,” says Carothers, who hopes for a grant to further the work. “It’s not necessarily their domain to write a massively paralleled simulation, which is what we talk about when we talk about running a supercomputer.”

Besides, he says, it won’t be long before using such systems will not be optional.

“In the future a supercomputer will not be a ‘nice’ tool to have. It will be a ‘must’ tool to have,” he says.

Researchers at Rensselaer’s Darrin Fresh Water Institute (DFWI) believe, in fact, that the CCNI, Watson, and the new centers and partnerships represent the best hope for the ecology of Lake George. Though scientists from Rensselaer have been studying the lake for 30 years, carefully noting the emergence of environmental stressors, the data largely has been collected manually and at selected points on the 44-square-mile lake.

“But this is a different era,” says Sandra Nierzwicki-Bauer, a professor of biology who has headed the DFWI since 1993. “This is a quantum leap.”

The DFWI recently joined IBM and the FUND for Lake George on a venture, known as the Jefferson Project at Lake George, which will use the best technology to
study the entire body of water in real time. With the best information in hand, scientists will be able to prioritize and act before permanent degradation takes place. Nierzwicki-Bauer also looks forward to accelerating the work through other new collaborations at Rensselaer.

“I am not a computer scientist and I have no idea how to make maximum use, or minimum use, of a supercomputer. But I am a biologist and I know the type of data we need to collect and the type of questions to ask, and with these new platforms we can make huge advances,” she notes.

Rensselaer prides itself on its culture of interdisciplinary cooperation, as the Institute builds centers, constellations, and de facto partnerships around challenges. With The Rensselaer Plan 2024, researchers accustomed to working across traditional boundaries expect to throw still new approaches in the path of problems.

Even one of Rensselaer’s largest interdisciplinary endeavors, the NSF-funded Smart Lighting Engineering Research Center, can broaden its scope, says the director, Bob Karlicek.

He notes that in some ways, The Rensselaer Plan 2024 mirrors what he and colleagues are already doing as they develop technologies and applications to change the way society uses lighting. The center works extensively with universities in the U.S. and overseas. It relies on the expertise of Rensselaer’s own researchers in mechanical engineering, electrical engineering and physics, and smart-lighting counterparts in the School of Architecture.

“We are excited about working with the new CCC, because lighting has such a huge impact on human perception and performance,” Karlicek says. “What’s now possible with advanced lighting systems can impact a much wider range of human perception, with impact even depending on age and ethnicity. Cognition research is critical to uncovering the new ways illumination can improve the human condition, and that would be an area where we can interact.”

As a cultural anthropologist, Kim Fortun sees university research collaborations as more than a force for innovation. It is a research area in and of itself.

Fortun, a professor in the Department of Science and Technology Studies, examines how disciplines and systems come together around an issue. Her research interests include asthma, a global issue she was drawn to in part because so many stakeholders were involved.

“I’ve studied asthma as an environmental health issue. I’ve worked with chemists, epidemiologists, pediatricians, nurses in schools,” says Fortun. “There’s also a big network—organized as Mothers of Asthmatics—that wants to know what the research community is doing. They know that getting asthmatics on the right medication and using asthma management plans is important. But it does nothing to prevent the dramatic rise in incidents. I have learned that most biomedical people aren’t talking to the people who study air pollution in the home or outside the home. Geographically, cities are doing all different things. It’s hard to find answers in one place.”

She says Rensselaer, with its commitment to sustainability and emphasis on Big Data, is an ideal place to make inroads. Among the hurdles is getting social scientists such as herself, who use qualitative data, in the same room as the quantitative scientists who work in technology—something she believes Rensselaer is more amenable to than many universities.

And, as a result of the goals in The Rensselaer Plan 2024, Fortun is doing so, building what might become pivotal connections. She is working with Fran Berman at the Research Data Alliance on infrastructure that will help researchers paint a more complete picture of asthma.

Fortun has also met with researchers with the Semantic Web and a few who are involved with acoustics. She is not yet clear what roles they might play in asthma research but she is anxious to consider the possibilities.

“I think that The Rensselaer Plan 2024 motivates us,” she says. “We’re motivated anyway, but I think this provides a moral support because it takes so much longer to do collaborative research. When you’re tired or overwhelmed, having the Rensselaer community behind you is really important.”
It’s amazing how many parts make up a squirt gun—at least 25 parts to be sure.

And, Garrett Gross ’13 can easily rattle off the components. There’s the shaft, manifold, nozzle, cylinder, handle A and handle B, blade plug, piston … The list goes on.

“We made just over 400 squirt guns, so a little more than 10,000 parts were assembled, with about half of them made in-house,” says Gross, a mechanical engineering major who didn’t know what a milling machine was during his first weeks on campus as a freshman.

He and a team of classmates assembled the hockey stick-shaped squirt gun, called the Slap Shot, as part of the Manufacturing Processes and Systems (MPS) course that spans two semesters. The product won the team second place in the American Society of Mechanical Engineers (ASME) National Student Manufacturing Design Competition this year.

An integral part of the MPS is the Manufacturing Innovation and Learning Lab (MILL) facility, where students leverage instructor expertise and industry-grade equipment to practice and master manufacturing processes and product assembly. Although MPS students are given priority, others who take such classes as Introduction to Engineering Design...
and senior capstone design courses also have access to some of the manufacturing capabilities.

Gross now knows the machinery that makes manufacturing possible, such as the milling machine and lathe that remove material from standard stock to make useful parts of various sizes and shapes. He also is familiar with more advanced manufacturing technologies, such as the 3-D printer used to fabricate three-dimensional parts in a layer-by-layer process.

“I had been familiar with many of the machines and processes utilized in the MILL from other courses and work experiences, but the MILL offered me my first experience with the entire design and manufacturing process,” says Gross, a recipient of the 2013 Gene Haas Foundation Student Manufacturing Achievement Award.

Although making something as simple as a squirt gun might seem insignificant, the project allowed students a chance to experience the same design and engineering processes, technical documentation, product and process prototyping, and manufacturing process and system development used in industrial R&D settings.

“The product is secondary to the experience the students get in working in a manufacturing environment,” says Sam Chiappone, manager of fabrication and prototyping in the School of Engineering who oversees student manufacturing activities in all three student manufacturing labs: the MILL, the Design Lab, and the Haas Technical Center. “The outcome of the class is to allow students the opportunity to bridge theory with practical application.”

“Our goal is to give students an idea of what it is like to go from a product concept to a complete packaged product,” says Larry Ruff, senior systems engineer who operates the MILL and trains teacher assistants to run the equipment. He also teaches manufacturing courses. “They learn what it takes to develop a workable design, plan for manufacturing, and solve problems.”

REINVIGORATING MANUFACTURING

In June 2011, the U.S. President’s Council of Advisors on Science and Technology (PCAST) and the President’s Innovation and Technology Advisory Committee (PITAC) released the Report to the President on Ensuring American Leadership in Advanced Manufacturing. The report provides an overarching strategy and specific recommendations for revitalizing the nation’s leadership in advanced manufacturing.

Rensselaer President Shirley Ann Jackson co-authored the report as PITAC co-chair. Under the umbrella of PCAST, PITAC advises the U.S. president on matters involving science, technology, and innovation policy. Jackson was appointed in 2009 to serve on PCAST and has been co-chair of PITAC since 2011.

To ensure that new technologies and design methodologies are developed in the United States and that technology-based enterprises have the infrastructure to flourish here, the report recommended the creation of the Advanced Manufacturing Partnership (AMP). President Obama launched the AMP shortly after the report was released in 2011.

The AMP is a national effort that brings together industry, universities, and the federal government to invest in the emerging technologies and skills that will support a domestic advanced-manufacturing sector that creates high-quality career options. The initiative supports, among other things, innovation in advanced manufacturing through applied research programs for promising new technologies and public-private partnerships around advanced manufacturing technologies.

Although the U.S. still has the world’s largest single national economy, it will be a struggle to stay at the top without a renewed focus on manufacturing, according to the report.

“It is increasingly apparent that technology innovation is closely tied to manufacturing knowledge. We cannot remain the world’s engine of innovation without manufacturing activity,” the authors stated. “Innovations made by advanced manufacturers are reshaping how today’s goods are made and creating the industries of the future.”

In short, creating new products, as well as developing advanced materials to make better products, is only as good as the ability to economically produce and package high-quality items in adequate quantities.

Thanks to a confluence of faculty expertise, student interest, and manufacturing research platforms such as the Center for Automation Technologies and Systems (CATS), Rensselaer’s leading advanced-manufacturing center, along with the MILL, Rensselaer is positioned to become a significant force in accelerating an advanced-manufacturing movement both on campus and in the national arena.

Earlier this year, U.S. Undersecretary of Commerce Patrick Gallagher provided the keynote address to kick off the inaugural CATS/CEG Advanced Manufacturing Conference. Co-hosted by Rensselaer’s CATS and the Center for Economic Growth, the conference brought together
leaders from industry, government, and academia to address challenges facing regional manufacturers and to look at emerging ways to leverage the power of automation and advanced-manufacturing technologies, business best practices, and available state and regional resources.

To target a student pipeline with the goal of strengthening manufacturing education in the earliest grades, Rensselaer also co-hosts the annual Haas Technical Education Center Manufacturing Conference. Now in its sixth year, the event is attended by K-12 and university instructors from across North America.

“Student access to the MILL will continue to strengthen the intellectual core of our integrative approach to engineering education,” says Prabhat Hajela, provost. “To build a useful and usable product in an economic and efficient manner requires the student to think about analysis, design, and manufacturing in a different light—it helps bridge the gap between a theoretical design and one that meets the constraints of a practically realizable artifact.”

WHERE APPLYING MANUFACTURING SKILLS HAPPENS

The MILL is a manufacturing platform with computer-integrated manufacturing equipment that supports Rensselaer’s focus on educating the next generation of manufacturing leaders.

Located in the George M. Low Center for Industrial Innovation (CII) High Bay, the MILL builds on the many successes of its predecessor, the award-winning Advanced Manufacturing Laboratory (AML), and the course with the same name, which was established in 1980.

“Rensselaer has a long history of manufacturing-related instruction and research, and the AML was a big part of this history for more than 30 years,” says Chiappone.

Chiappone, who started his career in 1980 at Rensselaer on the eve of the founding of the AML, has played a key role in developing the MILL into what it is today. Since the 1990s, student teams
involved in the AML course, which has evolved into the MPS classes, have won or placed high in the national ASME and SME Student Design and Manufacturing competitions. Rensselaer students won first place five years in a row, from 2009 to 2013.

The MPS course sequence spans two semesters. In MPS I, student teams learn about advanced manufacturing processes through a series of four hands-on lab modules. Each team designs and demonstrates a manufacturing system around a particular product.

Students come up with their own product design ideas. Sometimes, though, the product design comes from a Rensselaer high school summer program, such as PREFACE, in which high school students spend four days designing and building a single product in the MILL. These high school student prototypes many times are redesigned by the MPS students for utility and ease of manufacture.

One MPS team, for instance, added a significant feature to the initial idea of a simple tabletop candy dispenser with an RPI logo on it.

“George Ferris is a well-known RPI alumnus, and we felt it would be fun and more challenging to build a tabletop Ferris wheel that could dispense candy,” says Christina Pacifico ’14, whose team won first place this year in a national student competition organized by the Society of Manufacturing Engineers.

At the end of the semester, the MPS student teams present their product prototypes and manufacturing system plans in front of a panel of faculty, staff, and industry sponsors to show how the product would be manufactured. In 2013 the MPS class was sponsored by numerous industry partners, including AngioDynamics, Ensign-Bickford Aerospace & Defense Company, Energizer, Haas Automation-Allendale Machinery, LoDolce Machine, RBC Bearings, SABIC, Sonoco Plastics, Sandvik, and Snap-on.

The two best product designs are then used in MPS II to implement the proposed manufacturing systems in the MILL, where the students will assemble and manufacture 400 to 600 units.

“They build molds and learn how to use tools and automated equipment to make the components, and then assemble the parts into a product. And that’s what they do all semester—they make stuff. Toward the end of the semester, they run the manufacturing line and replicate their product hundreds of times,” says Dan Walczyk, professor of mechanical engineering, who teaches both MPS courses along with Johnson Samuel, an assistant professor in the same department.

“The course is very unique, and I don’t think there’s another one out there that’s run like this or is as comprehensive. And, obviously the MILL supports that with its own unique space,” Walczyk adds.

“The evolution of AML into the MILL has made Rensselaer students even more prepared for careers in manufacturing,” says Linda Schadler, Russell Sage Professor of Materials Science and Engineering and associate dean for academic affairs. “The MILL is the foundation in Rensselaer’s effort to significantly enhance the scope of education in advanced-manufacturing technologies, beginning at the undergraduate level and extending through the graduate student experience.”

BUILDING A CAREER

Seniors who studied in the AML, and now the MILL, have secured manufacturing-related jobs at Apple, Boeing, Pratt & Whitney, RBC Bearings, General Electric, and many other top-tier manufacturers.

“Our students are highly coveted by a number of manufacturing companies, including many of our industry sponsors,” Walczyk says. “Manufacturing companies realize that Rensselaer students have an edge over students in other schools because of their MILL experience, along with their manufacturing studies. Likewise, hiring our students gives the companies a distinct advantage over their competitors because the students can hit the ground running. They understand manufacturing and how it integrates with design.”

Pacifico can speak to the multifaceted skill set she learned by working hands-on in the MILL to complete the Ferris wheel candy dispenser from start to finish.

“The product is secondary to the experience the students get in working in a manufacturing environment. The outcome of the class is to allow students the opportunity to bridge theory with practical application.”

SAM CHIAPPONE
“I learned how to use a lot of different manufacturing processes, how to work under pressure, how to meet deadlines, and coordinate presentations and documentation,” says Pacifico.

Solving problems is a nonstop activity when working in the MILL, Pacifico adds. Her team had to make or purchase 32 parts for each of the 400 Ferris wheel dispensers they assembled.

“One important thing I learned is nothing goes the way you plan and everything takes longer than you expect,” says the mechanical engineering student who was in charge of doing all the CAM (computer-aided manufacturing) modeling and CNC (computer numerical control) machine coding for the molds. “None of us really understood what manufacturing 400 candy dispensers really meant until we started making the parts. There were so many times where we would encounter bumps along the road, but toward the end of the class, we became so used to the bumps. We would just focus on solutions and keep going.

“Once, we found out our Ferris wheel was not turning the way we wanted. Within a day and a half, Trevor Burtzos ’13 and I designed and made a whole mini-mold to use with the plastic injection molder to fix the problem,” adds Pacifico.

In the case of the Slap Shot, ordering the wrong hose fittings was one among other time-consuming issues that came up. The result was that the team needed longer springs.

“The fittings we used for our prototype were from a generic online parts supplier, but when we were ready to buy parts in quantity, we went to a different supplier that sold the parts with a different hole diameter on the threaded side,” Gross says.

To save time and money (teams have a $3,000 total budget to adhere to), the team slightly modified the design by purchasing spacers to extend the reach of the springs.

“Every year, teams have issues like that, and when that happens, they have to modify their design or have to add some additional manufacturing operations to make the parts match how they planned them to be,” Ruff says. “The whole idea is to learn from this experience so that when you’re in a professional job setting, you’ll think back to this class and say, ‘Oh yeah, I better make sure that we have a backup plan or I better make sure I recheck the design before we order 10,000 parts.’”

But, the reward was definitely worth the intense workload, Gross says.
“At the end of MPS II, our Slap Shots spoke for themselves. They held about 12 shots of water and would consistently shoot 30 feet,” Gross says. “I gave one to a friend to take home and got a text a few hours later that read, ‘Just drenched someone in the hallway.’ That made my day.”

Gross has since gone on to bigger challenges, which is the ultimate goal of the MILL. This spring, he served as a project manager for a project funded by the U.S. Department of Defense that involved replicating the look and feel of human tissue using 3-D printing technologies.

**LOOKING FORWARD**

The MILL will be an important cornerstone for infusing micromanufacturing, nano-manufacturing, composites manufacturing, additive manufacturing, and other advanced manufacturing technologies into both the undergraduate and graduate engineering curriculums.

To that end, Rensselaer is mapping out a development plan to expand the MILL facility as well as the curriculum programs it supports. The plan includes the addition of an advanced-manufacturing space with resources to support undergraduate and graduate-level advanced-manufacturing classes, a common teaching/meeting space for all manufacturing-related courses, an additive manufacturing center, and a common space for large projects.

- The new space will involve constructing a mezzanine level at the east end of the CII high-bay space above the existing MILL. This space will provide technical support for teaching and research-enabled graduate education. It will include the capacity to operate the facility as a manufacturing test bed for students, faculty, and industrial sponsors.

The expanded facility will showcase advanced technologies related to additive manufacturing, composites, advanced machining, manufacturing systems control and simulation, nano- and micro-manufacturing, and advanced industrial robotics. The technologies featured also will change as needed to meet the needs of sponsors and students.

“We want to create a teaching and learning facility that addresses the skills gap in advanced-manufacturing processes and systems and to provide our students with the best and most up-to-date skill set when it comes to product development and manufacturing,” Chiappone says.

Courses being developed at the graduate level that will tie into the MILL include Advanced Manufacturing Processes and Systems (AMPS) I and II. AMPS will be similar to the MPS undergraduate course, but the focus will be on more advanced topics, such as developing a new composite material process. Graduate students would be required to take both parts of the course. A pilot project will be initiated this fall.

“It’s great that we have undergraduate students who know how to manufacture things. They can take what they’ve learned and go into a conventional manufacturing plant and produce a new-process machine or manufacturing line,” says Walczyk, who will teach the graduate courses. “But how about if a company wants to manufacture a new material, like a nanomaterial or a biological material? Who’s going to handle that really advanced stuff? The AMPS course will address this need.”

In AMPS II, students would work with an industry mentor, who would...
propose a real company need, such as a new composite material for a battery or an aerospace part. Students would then propose and demonstrate a process to make and manufacture the part or product. At the end of the semester, the company sponsor would have the option of taking the design and test results for its own use.

“Essentially, the class would serve as a surrogate manufacturing research and development department for companies. What we envision is that many of these projects would become longer-term research projects in collaboration with the MILL and either the CATS or other centers or labs on campus focused on product design, new materials, and manufacturing,” Walczyk says.

Despite rapidly changing technologies and new advances in the digital frontier of manufacturing, Walczyk gives the same advice to his students now as he did 15 years ago on what it takes to be successful in the manufacturing field.

“They do have to learn some of the latest advanced-manufacturing automated systems, but the overall premise is the same. They have to know how to make parts and how to efficiently assemble the parts into a product at the proper scale,” he says.

What is different from when Walczyk first starting teaching manufacturing and design courses at Rensselaer in 1997 is the growing excitement that is reinvigorating the manufacturing potential in the United States.

Of course, that type of excitement is nothing new to Chiappone.

“Manufacturing plays such a key role in our society and economy, but most people don’t really think about it. Just step back and think about when you got up this morning; you may have touched your iPod to turn off the alarm. And, what about the cereal you ate for breakfast or the chair you sat in or the car you drove to work? All of this has to be manufactured,” Chiappone says. “There are so many opportunities for creative people to be involved in manufacturing. And, I still get excited about it.”
THE ART OF THE SHOW

A TEAM OF CURATORS CULTIVATES AND SHOWCASES INNOVATIVE PRODUCTIONS AT THE CURTIS R. PRIEM EXPERIMENTAL MEDIA AND PERFORMING ARTS CENTER.

by ELISA GALLARO
WHEN THE CURTAIN RISES THIS FALL on virtuoso pianists Craig Taborn and Vicky Chow, one member of the audience at the Curtis R. Priem Experimental Media and Performing Arts Center (EMPAC) will be at least as nervous as the performers. EMPAC Associate Curator Argeo Ascani will be seated in the back row, blending in with the other spectators, assessing their reaction, and casting a critical eye on a performance that he has nurtured for over a year.

A saxophonist who performed at EMPAC before joining the staff, Ascani finds it far more nerve-racking to watch a show he has curated than to take to the stage himself. But, as he is quick to admit, the experience also can be significantly more rewarding.

Ascani is one of four curators at EMPAC, each of whom is responsible for programming in a specific discipline, yet ever alert to opportunities to stretch boundaries and collaborate with colleagues. Ascani is associate curator for music. Victoria Brooks is curator for time-based visual arts, and Ash Bulayev is curator for dance and theater. Emily Zimmerman is assistant curator for film and lecture series.

Having four full-time curators on staff is rare, perhaps even unheard of. But this is EMPAC, where everything—from the creative vision to the technical infrastructure and performance venues—is groundbreaking.

“I know of no other place that has this combination of curatorial expertise under one roof,” says Johannes Goebel, director of EMPAC. “If you happen to find them in another place, they are operating in separate boxes. In our case, the goal is to have curators with specific expertise collaborate in an interdisciplinary way, which means no one claims a single territory.”

The result, every semester, is a programming schedule that challenges the audience and, often, the performers, to join the curators in stepping outside comfort zones.

This fall, for example, Bulayev presents Small Narrations by Wojtek Ziemilski. The visual artist and theater director uses personal confession, academic lecture, video art, and choreography to try to come to terms with the knowledge that his grandfather, a prisoner of war and concentration camp survivor, collaborated with the secret police. Ascani’s presentation of Craig Taborn and Vicky Chow brings pianists from two different musical worlds together for the first time to perform contrasting solo sets. Zimmerman’s A Door Ajar series features enigmatic films that forgo cliché endings, leaving audience members to draw their own conclusions. (Brooks joined EMPAC earlier this year, after the fall schedule was set. Since EMPAC performances typically take six to 18 months to develop, Brooks’ curated works...
No two performances, and no two EMPAC seasons, are alike. Yet all have the same objective: to showcase some of the most innovative productions in what is arguably the world’s most technologically advanced and acoustically perfect artistic venue. The programming “is not about what we like,” Goebel explains, “but about striking the balance between content and what only EMPAC can offer.”

Bulayev puts it this way: “Whenever I consider an artist or project, a major question I ask myself is, ‘Does this project need EMPAC?’ Seventy to 80 percent of the work performed at EMPAC is developed and produced here and would not happen—or would not happen in the same way—without EMPAC.”

REDEFINING THE ROLE OF CURATOR

For centuries, the term curator has been associated with museums and other institutions that own and display valuable collections. The curator’s primary role has been to take care of the collections: to preserve and store them and decide when and how certain pieces should be exhibited.

In recent years, there’s been a shift in the role of the curator and, as usual, EMPAC is on the cutting edge. Instead of preserving and exhibiting physical treasures,
“VERY OFTEN, THE ARTISTS HAVE AN IDEA IN MIND, BUT THEN THEY GET HERE AND SEE HOW THE POSSIBILITIES CAN BLOSSOM. YOU CAN ALMOST SEE THEM ENGAGING THEIR IMAGINATION AND THINKING, ‘OH, I CAN DO THIS AND I CAN PUSH IT FURTHER AND FURTHER.’”  — Argeo Ascani

the EMPAC team curates creative visions, artistic experiments, and thought-provoking interpretations. “Each of us functions as a combination of curator and producer,” Bulayev explains, helping the artist through every step of the process, from conception to staging.

All four curators were chosen not just for their expertise but also for “their ability to further the mission and vision of EMPAC, which is to bridge the digital and physical worlds,” Goebel says. “The expertise is a given. It is more a question of openness, of whether they can work in an interdisciplinary way.

“They are hired not to execute, but to create,” Goebel adds, “and to fulfill Dr. Jackson’s vision of what EMPAC is supposed to be.”

President Shirley Ann Jackson conceived of EMPAC as an incubator of sorts, a place where researchers, engineers, artists, and performers could collaborate to push the limits of their disciplines. She envisioned EMPAC as a “point of origin” for creativity in culture and the arts and research; as a “point of intersection” for technology and the arts, and for artists and scientists; and as “a gathering point,” the platform that brings everyone and everything together.

Most of all, as President Jackson wrote in the preface to The Architecture of EMPAC: The Tangible and the Tantalizing, she foresaw a one-of-a-kind facility that “is part of a grander mission at Rensselaer: the development of leaders.”

Less visionary and less courageous souls questioned whether EMPAC was a dream for a different setting, perhaps a liberal arts campus. But, in the words of President Jackson, “The multiple venues for research at EMPAC—joined under one roof, linked to one of the world’s most powerful supercomputers, and deliberately placed on the campus of the oldest private technological university in the country—will provide rich opportunities for crossing even more boundaries.”

Those who have experienced EMPAC concur. Many, including Ascani, maintain that EMPAC could only exist here, in a place that’s committed to research and experimentation in all different disciplines. He draws parallels between Rensselaer’s approach to artistic and scientific discovery. “This is a very special place for the advancement of art,” Ascani says. “Here, you have the facility and technology to take a specific idea and, in a very scientific way, to push it as far as you can to realise all of its potential.”

The 220,000-square-foot architectural marvel is home to four main venues, including a 1,200-seat acoustic concert hall, a 400-seat theater, and two experimental studios. All are designed to accommodate traditional performing arts and experimental media, and to serve as
a platform for research at the leading edge of science, engineering, and the arts. All are optimized for scientific visualization, animation, immersive video projection, freespace optics, acoustical and architectural studies, and other capabilities.

Zimmerman points to yet another singular EMPAC attribute: an audience that reflects the rigor of Rensselaer. She recalls the first lecture she curated back in February 2010, Mathematics as Poetic Enchantment by Margaret Wertheim, an Australian-born science writer and founder of the Institute for Figuring. The lecture included a discussion of the use of crochet models to explore and understand hyperbolic space.

“It was a beautiful lecture, in keeping with EMPAC’s emphasis on thinking about science in a different way, from a different perspective,” Zimmerman says. “It also made great use of an audience that would be difficult to find anywhere else, one that could engage in a very high-level conversation about the fundamentals of hyperbolic space.”

Zimmerman and her colleagues create and program about 60 events per year. An estimated 200 additional EMPAC events are hosted by other campus entities.

Even while developing projects, curators are constantly on the lookout for talent that will thrive at EMPAC. On the one hand, the curators are in an enviable position.

Their invitation to be an artist-in-residence at EMPAC—with access to unparalleled facilities and a staff of experts in audio, video, interactive interfaces, and stage technologies—is among the most coveted in avant-garde circles. But the responsibility to choose from among so many deserving artists can weigh heavily.

For Bulayev, the decision is complicated by the fact that EMPAC truly is in a class by itself. “If a project can work in a different studio, one that doesn’t need this mediated space, I think it’s almost ethically wrong to develop it here,” he says.

Most curated performances are presented either in the 400-seat theater or one of the studios, and most attract a full house. While that is gratifying for the curator, what matters more is how the audience reacts.

“Very few people come out of an EMPAC performance saying, ‘That was nice,’” Bulayev says. “Most of the time, they either love or hate something. They are passionate about it, which is very rewarding.”

Although the audience varies from show to show, Ascani believes that each performance helps build “a greater understanding of what happens here. The world is slowly realizing how special EMPAC is—and that Dr. Jackson’s vision is truly remarkable,” he says.
It was only natural that Ascani, as a New York City-based musician, educator, and curator, would be aware of EMPAC almost from the start, especially given his interest in contemporary music and innovative performance techniques. He had heard through the grapevine of an opening for a music curator at EMPAC, but wasn’t sure whether to apply. That changed in November 2010, when Ascani recorded and performed at EMPAC with The Argento Chamber Ensemble, the performance arm of The Argento New Music Project.

“It was one of the best venues I had ever played in. The sound was so incredible, and the staff was so helpful, so willing to facilitate what we were doing,” he recalls. But even more, “from the moment we arrived, it was so clear what Rensselaer was building here and that I needed to be part of it.”

At the time, Ascani was performing internationally as both a solo saxophonist and with ensembles. He was lecturing at conservatories and universities on topics such as experimental compositional techniques and new music performance practice. He also was teaching music history and contemporary performance practice at the

“...and that I needed to be part of it.”

“A LOT OF WHAT I DO INVOLVES CREATING BRIDGES BETWEEN WHAT THE STUDENTS ARE DOING ON CAMPUS AND WHAT THE CURATORS ARE DOING IN THEIR PROGRAMS.” Emily Zimmerman

Manta Reactive Acoustic Surface, Smart Geometry Conference, 2012
Manhattan School of Music, where he had earned a master’s degree.

Curators are required to give up performing during their tenure at EMPAC to avoid potential conflicts of interest. For Ascani, it has been well worth it. Since joining EMPAC in late 2011, he has curated six to eight residencies and performances per semester. Although he is familiar with the artists’ work before they arrive, it is impossible to predict what they will produce during their stay here, he says.

**ASH BULAYEV**
**DANCE AND THEATER**

A native of Ukraine, Bulayev came to the United States when he was 18 and studied theater and political science at several U.S. universities. After nearly a decade of working in New York City as an artist and director, in 2002 he decided to return to Europe, where he earned a master’s in theater from DasArts in Amsterdam.

“At some point, I stopped creating my own work and concentrated exclusively on producing other people’s work. I realized that what feeds me and drives me is being a springboard for the artist,” he says.

Bulayev remained in Europe for 10 years, working with a broad range of European institutions at the cross section of performing arts, new media, and research in collaborative processes. He served as programming consultant for PALLAS, one of the largest performing arts venues in Greece. He also was project initiator and research director for i-MAP (Integration of Media Art and Performance), an interdisciplinary collaboration dedicated to integrating interactive technologies and live performance.

Bulayev was working with a group of artists on an island off the coast of Brazil, when he learned that EMPAC was looking for a new curator for dance and theater. He was familiar with the EMPAC DANCE MOVIES Commission, which “is unique worldwide and made a large ripple in the dance community,” Bulayev says. The commission supports the creation of new works in the field of experimental dance for the screen.

Given EMPAC’s reputation, “I would have come from anywhere for this position,” Bulayev says, “and I did. I left an island paradise to come to Troy.” He arrived at EMPAC in spring 2012 and not once has he regretted that decision. Bulayev is reminded of the wisdom of his choice every time he sees an artist’s first reaction to the facilities. “They get almost giddy and they are filled with inspiration.”

**EMILY ZIMMERMAN**
**FILM AND LECTURE SERIES**

Zimmerman joined the EMPAC team six months before the building opened, so she has witnessed and played a role in its evolution. Her programming choices reflect her understanding of the essence of Rensselaer and her insight into the audience.

“A lot of what I do involves creating bridges between what the students are doing on campus and what the curators are doing in their programs,” Zimmerman says. Her *Observer Effects: Conversations in Arts and Science* series, “had one foot firmly planted in the arts and one in the sciences. I chose topics that truly cut across both disciplines and created another kind of dialogue.”

For the fall 2013 schedule, Zimmerman collaborated with Bulayev to pair her *In Other Words* lecture series with a series of his lecture performances. Although each series can stand on its own, together they articulate the connection between EMPAC performances and scholarly inquiry.

Zimmerman has a master’s degree from the Center for Curatorial Studies at Bard College and was named a Loris Ledis Curatorial Fellow by BRIC Contemporary Arts of Brooklyn in 2012. Before coming to EMPAC in 2008, she worked with a variety of nonprofit arts organizations in New York City and Philadelphia, where she also curated several exhibitions.

**VICTORIA BROOKS**
**TIME-BASED VISUAL ARTS**

Brooks focuses on experimental film, video, and audio performances that the audience experiences over a specific period of time. This represents a departure from more traditional visual arts—such as paintings, sculptures, and photographs—that are displayed as static, gallery exhibits.

“In a gallery, you can view the artwork in any order and come and go whenever you like. You can start in the middle and walk out without seeing the entire exhibit,” Brooks explains. By contrast, time-based visual arts “is durational work. You expect to spend a certain amount of time with it, and you make that commitment.”

Brooks’ background is in experimental film and video performance. She came to EMPAC in March from London, where she was an independent curator and co-founder of the itinerant curatorial platform *The Island.* She was adjunct curator for ARToN AIR.org in New York, and in 2011 launched a yearly series of performance, film, and music events for the Calder Foundation. Brooks has a master’s in curating contemporary art from the Royal College of Art in London.

“My interest has always been in working with artists outside the traditional gallery space and encouraging them to push past what the gallery means,” Brooks says. She views EMPAC as the ideal medium because “the point of EMPAC is that it is limitless. You can do anything in any space, and that is very rare for visual artists.”

Her first artists-in-residence will arrive this fall.

**ABOUT THE PHOTOS**

Photos on pages 36–40 by Kris Qua, Kevin (Yiming) Chen, and Michael Villardi.
Here’s to Ol’ RPI!

Alumni Attitude Survey points to positive feelings toward their alma mater

In 2013, the Rensselaer Alumni Association commissioned a survey of the entire alumni population to collect information relative to how Rensselaer alumni view their loyalty to the Institute, their experiences as alumni, and their experiences as students. This survey is similar to one conducted in 2007.

RAA Vice President Teri Kozikowski ’85, MBA ’86, took the lead on the survey project, helping to personalize the tool for the Rensselaer experience. “The survey was well-received,” she notes, “and data was collected from a record number of alumni spanning a diversity of age, geographic locations, and gender, to help determine the feelings and attitudes of our nearly 100,000 alumni worldwide. The survey results will help us refine RAA programming and services going forward.”

When asked to rate their decision to attend Rensselaer, 90 percent of respondents said that it was a great or good decision, and 85 percent reported an excellent or good student experience while on campus. The alumni experience was also viewed positively, with 64 percent rating their experience as good or excellent.

In general, the overall opinion on Rensselaer today is strongly positive, with 84 percent having an excellent or good opinion. Alumni also feel Rensselaer has prepared them well for further graduate education, getting their desired job after graduation, and for skills needed for current employment.

According to the survey, alumni loyalty is impacted most when Rensselaer communicates information relative to the value of the Rensselaer degree, accomplishments of students and alumni, school rankings, and information on scholarship support.

Alumni were positive on the level, mode, and quality of communications they receive. The vast majority across all demographics indicated Rensselaer’s presence on the Web, alumni email newsletters, and social media met or exceeded their expectations.

Overall, alumni have a positive opinion of Rensselaer, but they have identified things that could be improved relative to career and professional development offerings for alumni, Rensselaer rankings relative to our peers, and continued focus on student success while on campus.

According to Jeff Schanz, assistant vice president for alumni relations, “The results of the Alumni Attitude Survey will be useful as we plan for the future of the Rensselaer Alumni Association.” For more on the survey results, visit alumni.rpi.edu/survey.

When asked to rate their decision to attend Rensselaer, 90 percent of respondents said that it was a great or good decision.
GIVING BACK

Supporting Students Through the Patroon Society

Patroons are an elite group of leadership donors who set the standard of philanthropy for the Rensselaer community. Their gifts provide essential support to our students.

Kevin Bleyle '98 is his class vice president, an Annual Fund and admissions volunteer, and a proud 15-year Rensselaer Patroon.

When asked why he has been a Patroon every year since graduation, Bleyle says, “It was an easy decision for me to make. Rensselaer had done so much to prepare me as an engineer and as a person to be successful in the working world that I had to return some of that success through giving of my time, talent, and treasure. I have been amazed at the pace of change at the university since we graduated, and I am truly grateful to Dr. Jackson and her team that has made The Rensselaer Plan come to life. I look forward to the progress Rensselaer will make in the next 15, 30, and even 45 years as The Rensselaer Plan 2024 continues to pay dividends.

“To be able to say that my fiancé, Jasen, and I are giving back to my alma mater at a leadership level, supporting the programs that taught me so much, and placing my ‘seal of approval’ on the changes occurring on the campus and within the university, it shows how much my time at Rensselaer meant to me and still means to me. I hope that all of my fellow alumni and alumnae can look back on their experiences at Rensselaer with the same fondness as I do, and think about both the history and the future that they are supporting by giving to Rensselaer at the Patroon level.”

To learn more about supporting current students, visit alumni.rpi.edu/give.

Kevin Bleyle ‘98 (right) and Jasen Coole are proud to be 15-year Patroon donors.

STAY CONNECTED ELECTRONICALLY

Most communications from the Alumni Office, including details and registration information for Reunion & Homecoming, are sent via email and social media. Help us continue to “go green” and make sure you don’t miss out on any information! Write to alumni_update@rpi.edu with your email address, updated contact information, and your social media user name, or go to alumni.rpi.edu/gogreen to update it online.

RAA Visa Credit Card

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

RAA Worldwide Travel Program

Visit exotic and exciting destinations with people who share your interests—fellow Rensselaer alumni. Trips for 2014 include the Galapagos Islands, Turkey, Normandy, and more. Visit alumni.rpi.edu/travel for a full schedule.

FEBRUARY

1 Alumnae Basketball Weekend. Women’s basketball alumnae are invited to return to campus for the traditional alumnae basketball game, women’s varsity game, and more. For more information, contact Peter Pedone at pedonp@rpi.edu or (518) 276-6061.

50th Anniversary Celebration of the 1963-64 NCAA Final Four Hockey Team. Come back to Troy to celebrate the achievements of the 1963-64 men’s hockey team. For more information, contact Peter Pedone at pedonp@rpi.edu or (518) 276-6061.

Men’s Alumni Hockey Game. Men’s ice hockey alumni are invited to return to campus for the traditional alumni hockey game, men’s varsity hockey, and more. For more information, contact Peter Pedone at pedonp@rpi.edu or (518) 276-6061.

Big Red Freakout Ice House. This annual hockey tradition takes place at the Heffner Alumni House, and includes a buffet dinner, face painting, and more. Take the shuttle to the Houston Field House, then return post-game for a dessert reception with the team and coaches. For more information, contact Peter Pedone at pedonp@rpi.edu or (518) 276-6061.
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This column is getting more difficult to write. I am now 95 and would like to be able to attend my 75th Reunion, but that is not until October 2014, many months away. Second, many of my classmates have passed away, and I will be one as part of our "Sad News". Louis Schonoll (BME) and Alson MacKay Shantz (BIE) died March 5, 2013, after a long illness. Louis was a special MIP graduate, doing many wonderful things, such as working on the 18 systems that launched the Mercury astronaut, the Memorial at the 1984 World's Fair in New York, a surgical stapler (patent), an airline baggage handling system, a resume, and a device to crush deep sea choose chips to turn them into fish food. Louis was listed as Wescott without the "t." Richard Van Kersen, Robert Keros, Albert Blum, Alton MacKay Hunt (BEE), Harry McDonald (B.S.), Joseph Whitwell (B.S.), William Wooten (BIE), and Richard Wooten (BIE) all passed away. Some of these individuals did not graduate in 39. It took me months to verify the Westcott death, as it occurred in 1975 in El Segundo, Calif. Had America been a year later, his "W." would have been used. The newspaper obituary in Ashland, Ohio, also added that in the nort, he was listed as Wescott without the "n."

Richard Topp (BCH): Last I heard from Dick, he was having the second cataract implant. Due to his difficulty in hearing, he has a new "caption phone" to be able to get to a computer for email. He is at a retirement community, where he resides. Jay is especially close to me as we did our senior thesis together on boundary layer control, new at that time.

Robert Huston (BME) is now communicating via his son, Joe, as he is using a walker, and is able to get a to a computer for email. He is at a retirement community in Durham, N.C. He has many of the ailments of those at 96.

Joy Miller (BIE), also 96, had been spending a lot of time caring for her ill wife (married 71 years), Naomi, who succumbed to cancer July 1. Not as active on the computer sending emails, using that time for more important things, like keeping up with sudoku puzzles, which keep his mind active. Also busy with managing investments and work on the Bayview Retirement Community Foundation, where he resides. Joy is especially close to me as we did our senior thesis together on boundary layer control, new at that time.

Robert Cox (BEE) and his wife of 71 years are still traveling to their summer place in Michigan, where they do a lot of sailing, and he finally admitted that at almost 90 he is finally slowing down.

Earl Lewis (BIE) lives at a retirement community, but has set up a slot race track in another room, where he races model cars at high speed (up to 130 mph at scale), enjoyed by a lot of the women at the facility in their 90s. He also eats good and watches basketball games on his large screen TV. He is one of the younger "Survivors" at 95.

Karen Lynch "NJ" (BCH) enjoys reading about us "Mills" gone. She has had a very interesting career, working originally for the Port Authority of NY and N.J. on tunnels and bridges and even has walked the cables. She then went to work with General Electric since 1986, mostly on maintenance and maintenance work, especially on the dome roof structure. Also worked on Super Bowl halftime shows and Olympic Center opening and closing ceremonies. She was a "neutral" to work in RPI, as she has switched to sport facilities. She has two kids at RPI, Andy studying computer engineering, and Matt studying civil engineering.

To finish this column, I would like to share my story of what RPI has meant to me since graduation in 1939.

I am having RPI classmates from both. I must give to the main reason I came to RPI and Me:

RPI is the only school I applied to in 1935. If I had not been accepted, I am not sure where my education would have gone.

My first job was at Wright Field, Dayton, Ohio, and immediately I discovered that since my boss was an MIT graduate, most of my associates were from MIT or Caltech. I was the only one from RPI. The difference was that the others were selective as to what tasks they would undertake for a research project. On the other hand, I took on the tasks the other.
summer. Sihui Li, who is pursuing her Ph.D. in mechanical engineering, works with the robot Baxter in the CATS Robotics Lab.
Head Start on Opportunity

Program provided boost needed to become a tech entrepreneur | BY ANNMARIE LANESEY ’01

When I was 4 years old, my family was struggling with challenges I was too young to understand. Despite our struggles, my mother remained focused on my development and decided to enroll me in Head Start. After a difficult separation from my father, my mother was alone raising two children. While she made best efforts to maintain a stable, loving home, her financial resources were very limited. My mother saw education and Head Start specifically as a window of opportunity to something better.

I can say definitively that Head Start did provide that opportunity—for me, and for the 30 million others who have been served by Head Start since the program began in 1965. When my mother signed me up for Head Start, she knew I would be safe and engaged. The comprehensive services offered by my Head Start program fostered my development and allowed my mother to find her own window of opportunity. With my brother enrolled in kindergarten, my mother registered at Hudson Valley Community College. Despite our struggles, Head Start afforded my entire family the flexibility to pursue our own educational growth and path out of poverty.

Today, my life is very different. Nearly 30 years after walking out of that Head Start, the rewards are clear. My education and love of learning, a disposition I picked up at Head Start, have been the cornerstones of my success. I have two STEM degrees from Rensselaer. I’ve taught on the faculties of both Rensselaer and the University at Albany.

I’ve won international awards for my creative projects, and I built my own business, a software development firm. Every day I work with highly successful entrepreneurs, organizations, and CTOs to build robust, scalable web applications for millions of users worldwide. Skills I use to make my business successful originated at Head Start.

I recently gave birth to a child of my own. I am both grateful and proud that the cycle of poverty has been broken for him. Thanks to my mother’s determination and my experience as a Head Start child, I found my window of opportunity toward a brighter future.

Hundreds of studies, and almost five decades of research, make a strong case for Head Start. Early education delivers academic and social-emotional gains, provides support for stronger, more stable families, and pours a foundation for immediate and long-term economic growth.

That’s not abstract. My life has been a vivid example of every one of those improved outcomes. I honestly believe I wouldn’t be where I am now without access to Head Start’s high-quality early learning environment.

Head Start has opened a window of opportunity for 30 million children just like me, many of whom have gone on to success in every field you can name. We all believe in the power of our own experiences, and we remember what we learned in our Head Start classrooms about community and kindness and curiosity.

It is imperative that we continue to keep open the window of opportunity that Head Start delivers. President Obama is committed to expanding early learning opportunities, but automatic budget cuts under “sequestration” are forcing out programs in communities across the country.

I am particularly concerned that the children who need Head Start today are the STEM workers of tomorrow. We are behind so many other countries in engineering and math achievement; we must provide widespread educational opportunities in these fields.

The future of our country is in the hands of today’s little ones—rich or poor. They will shape the world of tomorrow and we need to do all we can to support them.

Today I am proud to sit on the board of directors at the same Head Start program that touched my life as a child. When I spend time with the children there, basking in the light of their optimistic smiles, I’m reminded of my own experience. I hope that my success will one day be their success, and I know that Head Start will be a foundation for them to achieve great things.

For now, Head Start children are too young to speak for themselves, too young to be their own advocates and tell the country what they need. From experience, I and 30 million Head Start alumni know how critical it is for America to keep its commitment to young children. Together, we are America. Our children are the future of America. And no American future will shine bright unless we can keep the window of opportunity open.

Annmarie Lanesey ’01, MFA ’04, is co-founder and president of Greane Tree Technology, which builds dynamic software systems ranging from mobile applications to enterprise-wide business intelligence tools. For more information, visit: www.greaneTREE.com. Lanesey can be contacted at alanesey@greaneTREE.com.
“Our intent was to have Rensselaer emerge re-energized, re-awakened, refocused. It meant that we had to imagine a different, bolder future for the Institute. We needed to recognize that, while building on its legacy and existing strengths, Rensselaer had to change.”

President Shirley Ann Jackson

Renaissance at Rensselaer: A President, A Plan, A University Transformed

Written by national higher education writer Stephen G. Pelletier for the Institute, with a foreword by Dr. Paul Gray, Professor and President Emeritus, Massachusetts Institute of Technology, this book chronicles the extraordinary transformation of Rensselaer Polytechnic Institute that has occurred under the leadership of President Jackson under *The Rensselaer Plan.*

Available in hardcover and e-book format. Go to www.rpi.edu/transformed for details on downloading.
EMPAC is Rensselaer’s international hub for contemporary art, performance, science, and technology. This dynamic center offers adventurous public events and performances in dance, theater, music, and the visual arts throughout the year. EMPAC is also a space where artists and researchers engage in new creative practice through its residency program.

For information on these and other upcoming events, visit empac.rpi.edu.