We live in a time when each day brings deeper answers to questions about our world, life, and the fundamental principles of nature. We face complex global challenges, but their solutions are within our grasp, provided we dare to recognize the fundamental connections that unify us.

Unfortunately, our era is cursed with divisiveness on many levels as we deal with the epic changes driven by forces such as rapid technological change and globalization. Rhetoric and fear threaten to pull us apart even as we open up new opportunities to come together. We face both daunting divisions and new ways to build bridges between communities. It is good to recognize that we get to choose which is highlighted, and that will determine our future.

At Rensselaer, we actively seek to identify, illuminate, explore, and value what unifies our physical world, our cultures, and our communities. We do this through investigating the commonalities of form, function, patterns, processes, and the heterogeneity of our world and of our society. We deliberately bring together people with different histories, points of view, and areas of expertise with the explicit goal of working together, sharing experiences, and engaging in thoughtful and respectful conversations.

Our Institute is a community where discussion and dispute are welcome, where we do not shy away from ideas that challenge us to rethink our beliefs, and where we appreciate the values, integrity, rigor, and critical thinking that form the foundation for our responsibility and pride in being part of Rensselaer.

We have articulated The New Polytechnic as an emerging paradigm for teaching, learning, and research, to reimagine and provide a focus that recognizes that global challenges and opportunities are so great that they cannot be adequately addressed by even the most talented person working alone. As The New Polytechnic, Rensselaer serves as a crossroads for collaboration—working with partners across disciplines, sectors, and geographic regions—to address complex global challenges, using the most advanced tools and technologies.

Because these solutions will affect many different individuals and communities, the most effective answers will include participation that reflects cultural differences, varying traditions, and the laws, values, and perspectives of those whose lives will change. Even when there is little dispute regarding technological approaches and the underlying science that supports these, the social dimensions need to be reflected in communications and implementation.
What looks good on paper is not good enough. Trust and respect are essential ingredients to meeting challenges in ways that are adapted to how people actually live. It is only through embracing our differences and finding deeper connections that we can make progress that minimizes conflict and optimizes benefits for all the concerned parties.

So, as we at Rensselaer seek to change the world, we need to engage with all the knowledge, skill, and intellectual rigor we can muster, but we also need to access our own humanity. We need to be as curious about other people as we are about nature. We need to appreciate the histories and traditions of different communities. We need to be authentic and invest our relationships with care and respect and recognition of the dignity of the powerless as well as the powerful.

By appreciating our differences as we recognize our unity, we can put together the technologies, policies, and laws that will engender greater equity, fairness, and true economic development. At the same time, these qualities will enable societies to enrich the lives of their citizens, as they push the limits of human knowledge and understanding. And this will be how, in the 21st century, Rensselaer will change our world for the better.

SHIRLEY ANN JACKSON, PH.D.
PRESIDENT, RENSSELLAER POLYTECHNIC INSTITUTE
The future will require leaders with powerful capabilities in collaboration, with the skills to recognize and communicate the unity underlying diversity.
New publication by media studies professor explores history and current significance of reality television.

Rensselaer receives grant from the Bill & Melinda Gates Foundation for the purpose of supporting the Healthy Birth, Growth, and Development initiative to understand more fully the effects of risk factors on growth outcomes and to improve worldwide child health.

Rensselaer STEM education pipeline initiative highlighted in Nature Geoscience.

Rensselaer and Mount Sinai team up to earn prominent role in new NIH program in environmental and children’s health.

A team of international scientists, including researchers at Rensselaer, demonstrate the sensitivity of their detector and recorded results that challenge several dark matter models and a longstanding claim of dark matter detection.

Researchers develop new layered structure for graphene that transforms high-quality 2-D graphene sheets into its 3-D form while maintaining its attractive thermal and electrical properties and mechanical strength.

Rensselaer and IBM Research announce plans for a multi-year collaboration to pioneer new frontiers in the scientific field of cognitive and immersive systems. The research collaboration will be housed in the newly established Cognitive and Immersive Systems Lab (CISL) at Rensselaer.

Student team Amparo receives a prestigious EXIST Business Start-up Grant to help fund their invention—an inexpensive device that could make prosthetic legs readily available to amputees in developing nations.

The U.S. Department of Energy provides $9.44 million to help refurbish and upgrade the electron linear accelerator at the Gaerttner Center at Rensselaer. Once the upgrades are complete, the Institute will be home to some of the nation’s most advanced technology for measuring neutron interactions with nuclear materials.
Rensselaer serves as a crossroads for collaboration—working with partners across disciplines, sectors, and geographic regions—to address complex global challenges, using the most advanced tools and technologies.
Today, the only way for a leader to get the full picture when faced with a challenge is to take advantage of the perspectives, knowledge, understanding, and skills of a diverse community. A good leader must be a master of collaboration, which includes uncovering, communicating, and building upon the common values of participants with different backgrounds—honoring the unity that underlies their diversity. This moves the focus from the losses resulting from compromise to the benefits created by cooperation, encouraging the people working on solutions to put aside conflict and bring the fullness of their talents and skills to the endeavor.

This is not to say the differences between people go away; in fact, they should not. Effective leaders must create environments that welcome different opinions, but ensure their expression is thoughtful and well-meaning. Part of achieving this depends on the culture of the community, and Rensselaer traditions encourage openness to new ideas, critical thinking, logic, and rigor. This ensures just hearings of unconventional concepts and concerns and fair resolution of any conflicts.

Through our work in making The New Polytechnic part of the fabric of Rensselaer, we have built a knowledge base on how to meet the organizational and technological challenges that emerge from work across disciplines.

We have seen that the most important part to get right is finding ways to collaborate more effectively. The more complex the issues, the greater the challenge in scaling up collaboration. The thoughtful use of new tools promises to offer new options for helping people work together.

The future will require leaders with powerful capabilities in collaboration, with the skills to recognize and communicate the unity underlying diversity. Sometimes this will mean immersion in unfamiliar cultures. Sometimes technology will lend a hand. But in all cases, the result will be broader, more innovative solutions.
President Shirley Ann Jackson has been presented with the National Medal of Science, the highest honor for scientific achievement bestowed by the United States government. It was presented by President Barack Obama in a White House ceremony in May. The award honors individuals deserving of special recognition for their outstanding cumulative contributions to knowledge in the physical, biological, mathematical, engineering, or behavioral or social sciences, in service to the nation.

“These scientific laureates exemplify the American spirit and ingenuity that have enriched our society and the global community in profound and lasting ways,” President Obama said at the ceremony. “Their ambition and accomplishments are an inspiration to the next generation pursuing careers in the essential fields of science, technology, engineering, and math.”

At Rensselaer, President Jackson has undertaken a transformation of the university’s pedagogical approach with the implementation of The New Polytechnic, emphasizing collaboration across disciplines, sectors, and regions to address key intersecting challenges and opportunities in energy security, health, food, water, and national security, as well as the linked challenges...
of climate change and allocation of scarce resources so critical to our future.

In 2014, President Obama appointed President Jackson as co-chair of the President’s Intelligence Advisory Board, which assesses issues pertaining to the quality, quantity, and adequacy of intelligence activities. In 2011, she co-authored a report to the President offering an overarching strategy for revitalizing the leadership of the nation in manufacturing.

GLOBAL RECOGNITION
ADVANCING SCIENTIFIC PROGRESS WORLDWIDE

In June, President Shirley Ann Jackson co-chaired the World Economic Forum Annual Meeting of the New Champions in Tianjin, China. In her role as co-chair, President Jackson participated in a debate on the role of corporate-led research in advancing scientific progress, a televised session in which she discussed the key elements of an innovation ecosystem that translates research results into technological innovations and business opportunities.

“The Annual Meeting of the New Champions provides a unique opportunity to evaluate the convergence of the digital, physical, and biological worlds,” President Jackson said. “This dialogue gave us the opportunity to assess this crossroads in conjunction with the great, global, human challenges we face today and work together with influential leaders from top organizations around the world toward a future that addresses these challenges—from a changing climate to the mitigation of disease.”

Joining her for a discussion of the ways the university is looking beyond the boundaries of academic disciplines and leveraging new computational and biological tools to address transmissible disease were Rensselaer faculty members Jonathan Dordick, vice president for research and Howard P. Isermann Professor of Chemical and Biological Engineering, and Heng Ji, Edward P. Hamilton Development Chair Associate Professor in the Department of Computer Science.

NATIONAL COMPETITIVENESS
HALLMARK OF EXCELLENCE

The Lally School of Management has maintained its business accreditation by AACSB International—The Association to Advance Collegiate Schools of Business.

AACSB Accreditation is the hallmark of excellence in business education, and has been earned by less than 5 percent of the world’s business programs. Today, there are 755 business schools in 51 countries and territories that hold AACSB Accreditation.

“We are committed to giving Lally School students an exceptional learning environment where they integrate technology across business functions, apply the latest research to real-world business challenges, and engage directly with big data and powerful computing resources through hands-on projects and teamwork from day one,” said Thomas Begley, dean of the Lally School of Management. “Lally students also benefit from the personal attention they receive in small classes and quality faculty at Rensselaer to enhance their ability to guide businesses toward addressing global grand challenges while they pursue business opportunities.”

U.S. News & World Report

#39 of national research universities by U.S. News & World Report

94% average freshman retention rate

96% percent of faculty who are full time

35th selectivity rating

72% freshmen in top 10% of high school class

LEADERSHIP 7
Graduates from Rensselaer have founded companies that contribute to the regional innovation ecosystem. Here are some examples:

**Vital Vio**
disinfectant lighting

**1st Playable Productions**
video game company

**Apprenda**
software company

**International Electronic Machines**
imaging, optical, and sensor-based safety and security systems for transportation

**Autotask**
world’s leading information technology business management software company

**ThermoAura**
nanotechnology and clean energy company

**Ecovative Design**
biomaterials company that provides sustainable alternatives to plastics and polystyrene foams

**Vistex Composites**
manufacturer of advanced thermoset and thermoplastic composite products

**LOCAL RELEVANCE**

**ECONOMIC ENGINE**

A one-time leader of American industry, the city of Troy is gaining traction as an intellectual and creative hub—and Rensselaer is playing a significant role. In the past decade, the Institute has financed and renovated high-profile properties, while engaging its students in preservation and neighborhood initiatives.

“RPI is now one of the top five employers in the county. With thousands of employees, a high percent are city residents, and Troy’s downtown renaissance has influenced that percentage upward,” says Barb Nelson ’80, executive director of the Troy Architectural Program (TAP), a nonprofit preservation and neighborhood advocacy organization.

Rensselaer has also devoted significant funds to revitalizing Troy. From 2001 to 2009, the Institute spent more than $10 million in streetscape and utility work as well as homebuyer incentive and renovation grants. The downtown commercial real estate market has benefited from the relocation of roughly 100,000 square feet of administrative space off campus.

After renovating the Gurley Building to include laboratories and offices, for example, the Rensselaer Lighting Research Center opened there in 2000. Through partnerships with private developers, Rensselaer has built housing off campus, including the Howard N. Blitman, P.E. ’50 Residence Commons for undergraduates, and the College Suites complex for graduate students, who study up the hill on campus and eat and shop downtown.

And today, the school can take credit for restoring a key section of Troy’s center. After investing $1.5 million and a decade of work in stabilizing the old Proctor’s Theater and nearby Chasan Building, Rensselaer recently sold these high-profile buildings to a developer and is leasing back space in both buildings.

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**$1 billion**
Annual economic impact of Rensselaer

**$7 million**
Infrastructure improvements Rensselaer has made in areas in city of Troy

**$28 million**
Taxes paid annually by Rensselaer employees
$61.3 million
Estimated annual impact of students, faculty, staff, and visitors

3,100
Indirect jobs created or supported each year
#6
USA Today ranking of Rensselaer in U.S. Colleges To Major in Physics

#12
Forbes ranking for Most Entrepreneurial University

#8
on a CNBC list of the 17 U.S. colleges whose students go on to earn the most money!
NATIONAL COMPETITIVENESS

MANUFACTURING INNOVATION

In June, President Barack Obama announced that the Smart Manufacturing Leadership Coalition will lead the new Smart Manufacturing Innovation Institute, in partnership with the Department of Energy.

The coalition brings together a consortium of nearly 200 partners from more than 30 states—and from across academia (including Rensselaer), industry, and nonprofits—to spur advances in smart sensors and digital process controls that can radically improve the efficiency of U.S. advanced manufacturing.

The Institute will focus on innovations such as smart sensors that can dramatically reduce energy expenses in advanced manufacturing, making our manufacturing sector strong today and positioning the United States to lead the manufacturing of tomorrow, helping sustain the resurgence of U.S. manufacturing currently underway.

It also will launch five regional manufacturing centers across the U.S., each focused on local technology transfer and workforce development. Rensselaer will lead the Northeast center, where glass, ceramic, and microelectronics manufacturing have a strong presence.

Rensselaer will be responsible for administering the center for the Clean Energy Smart Manufacturing Innovation Institute programs, involving regional partners from industry, academia, and government. Overall, the partners will bring more than $140 million in public-private investment from leading universities and manufacturers to develop smart technologies and systems for use in advanced manufacturing.

On Game

The Games and Simulation Arts and Sciences program is No. 8 on the Animation Career Review list of top game design programs in the United States. Rensselaer also came in at No. 4 out of 25 programs offered among East Coast colleges and universities, and was recognized as No. 7 on the list for private schools and colleges.

Building Stature

The School of Architecture has been ranked the 14th best undergraduate program in the nation by the journal Design Intelligence. In addition, Dean of Architecture Evan Douglis was named among the 30 most admired educators in the field of architecture education.

LOCAL RELEVANCE

2016 CITIZEN LAUREATE

President Shirley Ann Jackson has been named a recipient of the University at Albany Foundation’s Citizen Laureate Award, for her notable achievements in academia and research. Established in 1977, the Citizen Laureate Awards honor outstanding leaders in business and industry, government, and academia, and are the most prestigious honors bestowed by the foundation.

“Each of our laureates enriches our community in distinctive ways—economically, scientifically, culturally, intellectually, and socially—their efforts are helping to transform our region,” said 2016 chair John Nigro in his congratulatory letter to Jackson.

GLOBAL CHALLENGE

TALKING SECURITY

Rensselaer hosted John O. Brennan, director of the United States Central Intelligence Agency (CIA), for a conversation on “Technological Change and National Security” with President Shirley Ann Jackson in November.

Essential networks at risk of cyber-attack, terrorists’ use of social media to recruit and direct followers, biotechnology techniques for rapid gene editing—the wide-ranging conversation touched on threats and opportunities technology has enabled.

In answering questions, Brennan addressed current threats: the frustration of a newly aggressive Russia, terrorist platforms based on a perversion of religion, a rise in nationalism in the developed world, and a pervasive dissatisfaction with the status quo.

Climate change, and the wide-scale disruption of the environment, is likely to increase tensions within and among nations. And cyber revolution is creating vulnerability for the United States and our allies, at the same time the country grapples with the role of government in the digital domain, Brennan said.
Curiosity knows no bounds. We hunger to understand the world around us through patterns, data, explanations, interpretations, relationships, and more. Our most creative thinkers mine knowledge across disciplines for metaphors, connections, contexts, models, and ideas that can be applied fruitfully in new venues. By sharing the perspectives of colleagues with different points of view, researchers hone their questions and improve experiments. In fact, the practice of science is predicated on exposing theories and discoveries to open inquiry, analysis, and criticism. Reaching out broadly and working with people with varied backgrounds is the backbone of effective research. It takes advantage of the differences in ways that reveal the consistency and unity in nature.

At Rensselaer, we encourage a focus by both our students and our faculty on the great global challenges—humanity’s food, water, and energy supplies; human health and the mitigation of disease; our great need for sustainable infrastructure; national and global security; and the intelligent allocation of valuable natural resources.

Looking past boundaries and working in the spaces between is part of our heritage. In recent years, we facilitated bringing together partners in different fields of inquiry through the establishment of the Center for Biotechnology and Interdisciplinary Studies. And because new combinations of knowledge can occur by serendipity, Rensselaer created the Curtis R. Priem Experimental Media and Performing Arts Center, which draws together under one roof artists, social scientists, engineers, and those who explore the hard sciences.

We continue to pursue collaborations among people whose diverse backgrounds and perspectives promise new ventures that can provide answers to humanity’s most important questions. This is why we have embraced the perspective of The New Polytechnic, which recognizes that the divisions between areas of inquiry are artificial, and it is often fruitful to find fresh perspectives and to re-contextualize and reimagine familiar concepts. In this way, we gain the insights needed to innovate and to discover truths that would otherwise be invisible to us.
“We are bringing together two separate strains of emergent technologies to enhance the power of the other: cognitive computing technologies coupled with intensive visual and auditory immersive environments we are developing at Rensselaer.” —President Shirley Ann Jackson

ROOMS WITH A VIEW

Rensselaer and IBM Research have launched a multi-year collaboration to pioneer new frontiers in the scientific field of cognitive and immersive systems. The research collaboration will be housed in the newly established Cognitive and Immersive Systems Lab (CISL) in the Curtis R. Priem Experimental Media and Performing Arts Center.

CISL’s mission is to explore and advance natural, collaborative problem-solving among groups of humans and machines. The lab is built around a futuristic “Situations Room” that can be adapted to industry-specific environments (including cognitive boardrooms, design studios, diagnosis rooms, and immersive classrooms) and is designed to surface new ways to improve how people work together.

“With the new lab, we are taking an important step toward a future in which smart machines and smart humans potentiate each other, and the end result is better decisions and outcomes,” said President Shirley Ann Jackson. “We are bringing together two separate strains of emergent technologies to enhance the power of the other: cognitive computing technologies coupled with intensive visual and auditory immersive environments we are developing at Rensselaer.”

“Cognitive computing is poised to transform every profession, industry, and economy, and immersive cognitive systems will play a vital role in shaping the symbiotic work environments of the future in which critical business decisions will be made,” said John Kelly III ’78, senior vice president, solutions portfolio and research at IBM and a member of the Rensselaer board of trustees.

“We are excited to collaborate with Rensselaer on the development of this new frontier as we continue to progress the science that will transform the way professionals around the world work.”

Smart Sensors

With $917,000 in support from the NSF, the Jefferson Project at Lake George is poised to complete the most powerful aquatic monitoring sensor network in existence. A collaboration between Rensselaer, IBM Research, and The FUND for Lake George, the project aims to develop a new model for technologically enabled environmental monitoring and prediction to better understand and protect the lake’s ecosystem.
Researchers suggest that a group of neurons in the hypothalamus area plays a vital role in maintaining blood glucose levels. The team used magnetic forces to remotely control the flow of ions into specifically targeted cells in mice.

Cognitive computing systems are designed to collaborate with human experts in more natural ways, learn through this interaction, and enable individuals and teams to make better decisions by making sense of massive unstructured data. The CISL platform is an immersive, interactive, reconfigurable physical environment that enhances group cognition. It proactively responds to its occupants by “listening” to and “watching” them, engages multiple users working in small groups at the same time on different aspects of a larger activity, and explores interactions and visualizations that would be impossible with a few people looking at limited screens.

To learn what different cells do, scientists switch them on and off and observe the effects. There are many methods that do this, but they all have problems: too invasive, too slow, or not precise enough. Now, a new method to control the activity of neurons in mice, devised by scientists at Rensselaer and Rockefeller University, avoids these downfalls by using magnetic forces to remotely control the flow of ions into specifically targeted cells.

Jonathan Dordick, the Isermann Professor of Chemical and Biological Engineering and vice president for research at Rensselaer, and colleagues successfully employed this system to study the role of the central nervous system in glucose metabolism. The findings suggest that a group of neurons in the hypothalamus plays a vital role in maintaining blood glucose levels. Glucose metabolism is fundamental to human health, and a mechanism for controlling metabolism through remote activation of specific regions of the brain may provide new routes to therapies for a range of important diseases.

“These results are exciting because they provide a broader view of how blood glucose is regulated—they emphasize how crucial the brain is in this process,” said Jeffrey Friedman ’77, Marilyn M. Simpson Professor and head of the Laboratory of Molecular Genetics at Rockefeller.

“We can imagine adapting this method in a number of in vitro applications in drug discovery,” said Dordick. “Depending on the type of cell type we target, and the gene expression we enhance or decrease within that cell, this approach holds potential in development of therapeutic modalities, for example, in metabolic and neurologic diseases.”

Previous work led by Friedman and Dordick tested a similar method to turn on insulin production in diabetic mice. The system couples introduction of a natural iron storage particle, ferritin, and a fluorescent tag to an ion channel called TRPV1.
interactions between light and electrons within phosphorene and other atoms-thick crystals of black phosphorus. Phosphorene—a single layer of phosphorous atoms—was isolated for the first time in 2014, allowing physicists to begin exploring its properties experimentally and theoretically. Vincent Meunier, head of the Department of Physics, Applied Physics, and Astronomy and a leader of the team that developed the new method, published his first paper on the material—confirming the structure of phosphorene—that same year.

Meunier says Raman spectroscopy uses lasers to deliver energy toward the phosphorene that causes it to vibrate intrinsically. However, lighting the material from different directions would produce varying results because of the electron and light interaction within the material. With this, the electron-photon interaction, in itself, is anisotropic as well.

Meunier and researchers at Rensselaer contributed to the theoretical modeling and prediction of the properties of phosphorene, drawing on the Rensselaer supercomputer, the Center for Computational Innovations, to perform calculations. Meunier and his team are able to develop the potential of new materials such as phosphorene to serve in future generations of computers and other devices.

HOW REAL IS REALITY TV?

According to June Deery, professor in the Department of Communication and Media, reality TV has changed television and changed reality, even for those who are not among the millions who watch. Deery’s latest publication, Reality TV, is written for a broad audience and it addresses questions such as: How real is reality TV? How do its programs represent gender, sex, class, and race? How does reality TV relate to politics, to consumer society, to surveillance? What kind of ethics are on display?

Drawing on current media research and the author’s own analysis, the publication encompasses the history and evolution of reality television, its production of reflexive selves and ordinary celebrity, its advertising and commercialization, and its spearheading of new relations between television and social media.

“To dismiss this programming as trivial is easy,” says Deery. “Today, reality television merits serious attention and I believe that the analysis included in this study will interest students in media studies, cultural studies, politics, and sociology—or anyone who is simply curious about this global phenomenon.”

Deery’s research focuses on media studies and she is particularly interested in contemporary television and its interface with the Internet. She writes on commercialization, politics, gender, and class. For some time, Deery has also been investigating cultural understandings of fact and fiction and is now exploring their status in multiplatform environments.

EXPLORING PHOSPHORENE

Two-dimensional phosphane, a material known as phosphorene, has potential application as a material for semiconducting transistors in ever faster and more powerful computers. But there’s a hitch. Many of the useful properties of this material, like its ability to conduct electrons, are anisotropic, meaning they vary depending on the orientation of the crystal. Now, a team including researchers at Rensselaer has developed a new method to quickly and accurately determine that orientation using the interactions between light and electrons within phosphorene and other atoms-thick crystals of black phosphorus.

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Today, the development of clean energy is critical to the economy and the environment of the state and the nation. Recently, the Rensselaer Center for Future Energy Systems (CFES) was selected to receive a state grant re-designating the center as part of the New York State Center for Advanced Technology (CAT) Program. The 10-year designation amounts to over $9 million in investment into Rensselaer, the Capital Region, and New York state.

CFES is the locus of energy research at Rensselaer, where world-leading science and engineering researchers from all fields gather to collaborate on advancing energy technologies for the benefit and promotion of economic growth in New York. The center’s research thrusts range from advanced materials for energy conversion and storage, to energy efficiency, renewable energy, smart grids, and grid resiliency.

“The Center for Future Energy Systems was chosen during a very competitive process to be one of 15 New York State Centers for Advanced Technology, and re-designation will enable the center to expand further its partnership, multiply its economic impacts, and help New York realize its vision for a cleaner, more efficient, and affordable future energy system,” said Jian Sun, professor and CFES director.

CFES actively partners with small and mid-sized companies, global corporations, state and federal agencies, and educational institutions to accelerate energy research, move technologies from the laboratory to the marketplace, and ultimately build value and create jobs. Over the last decade, the center has worked with over 70 New York state companies, with a cumulative economic impact of $84 million, leading to the creation of more than 200 jobs.
TRANSFORMING WASTE INTO SUSTAINABLE BUILDING MATERIALS

In Ghana, like many tropical countries around the world, people widely use and export coconuts for their fruit, milk, and cooking oil. The husks are thrown away by the millions, leaving to waste what might instead be transformed into a multifaceted building material.

Building panels made of upcycled coconut husks made a statement at the Chalewote Street Art Festival in Accra, Ghana, last summer. The festival is a forum for showcasing experimental ideas in art and design.

“The coconut is not just any waste product; it has a lot of great properties,” said Josh Draper, an architect and clinical professor at the Center for Architecture, Science, and Ecology (CASE), which hosts Rensselaer’s graduate program in Built Ecologies. “The question is ‘what if we could take it and make it into something useful and something beautiful for our buildings?’”

For seven years, researchers at CASE in New York City and in the School of Architecture in Troy have been developing building products from coconuts and other agricultural waste as a sustainable, low-energy alternative to plywood and other materials made with synthetic adhesives. They are using coconuts to create non-toxic wall modules and an acoustical panel system that can help cool buildings passively.

Ghana is a target country because construction is booming, building materials are largely imported, and...
The total reflectance of conventional black paint, for example, is between 5 and 10 percent (or absorbance of between 95 and 90 percent). The darkest man-made material, prior to the discovery by Lin’s group, boasted a total reflectance of 0.16 percent to 0.18 percent (or absorbance of 99.84 to 99.82 percent).

The end result of Lin’s work was a material with a total reflectance of 0.03 percent (or absorbance of 99.97 percent)—more than three times darker than the previous record, which used a film deposition of nickel-phosphorous alloy. Lin’s darkest material has a higher absorbance than the recently reported value of 99.965 percent by Surrey NanoSystems. The original darkest material from Rensselaer is still the darkest man-made nano-material on Earth.

**SUSTAINABILITY**

**DARK MATTERS**

Nanophotonics expert and physics professor Shawn-Yu Lin received the 2016 Institute of Electrical and Electronics Engineers (IEEE) Nanotechnology Council Pioneer Award in Nanotechnology “for pioneering contributions to the development of 3-D optical photonic crystals and the discovery of the darkest nano-material on Earth.”

The darkest material was discovered by Lin and his team in 2008. The material, a thin coating comprised of low-density arrays of loosely vertically aligned carbon nanotubes, absorbs more than 99.9 percent of light and could one day be used to boost the effectiveness and efficiency of solar energy conversion, infrared sensors, and other devices. The research has been recognized by the Guinness Book of World Records.
“Exposomics” is the comprehensive study of environmental exposures in humans, from conception through development. Rensselaer is part of the Children’s Health Exposure Analysis Resource, whose goal is to assess the full range of environmental exposures that may affect children’s health.
IS YOUR CITY HEALTHY?

Scientific research plays an integral role in how cities are governed, and in the cities’ overall environmental health. But policymakers in such areas as transportation and public health approach science from different perspectives, and, historically, they do not consider how their practices interrelate.

A $300,000 National Science Foundation (NSF) grant awarded to faculty in the School of Humanities, Arts, and Social Sciences will be used to examine how science is applied in six cities, and how it is used to manage air quality. Of significance is the fact that the study of science-based policies in six cities is being conducted through the lens of the humanities.

“This is an attempt to characterize the governance styles of officials, scientists, nonprofit organizations, and concerned citizens,” said Kim Fortun, professor of science and technology studies and principal investigator on the project. “There are remarkable differences between, say, Houston and New York, which partly result from the political and cultural history of the places.”

In addition to those two cities, the two-year project, “Environmental Health Governance in Six Cities: How Scientific Cultures, Practices and Infrastructure Shape Governance Styles,” will study Philadelphia, Pennsylvania; Albany, New York; Bengaluru, India; and Beijing, China.

Teams in each city will examine policy governing the environment, health, transportation, and education. Researchers, coordinated by the core team at Rensselaer, will do extensive interviews with the stakeholders to see how they approach and apply science to address air pollution and other health threats.

“EXPOSOMICS”

To support its groundbreaking work in the emergent field of “exposomics,” the National Institutes of Health (NIH) has awarded two grants to research teams from Rensselaer and the Icahn School of Medicine at Mount Sinai. In addition, the state of New York and Mount Sinai provided $3.2 million to these grants in matching funds through the state’s Division of Science, Technology, and Innovation program; these funds were critical in securing the grants.

“Exposomics” is the comprehensive study of environmental exposures in humans, from conception through development. The grants, totaling $20 million over four years, are from the NIH’s newly formed Children’s Health Exposure Analysis Resource program, or CHEAR.

The first grant—made possible by the Icahn School of Medicine’s partnership with Rensselaer—will be for a Data Repository, Analysis, and Science Center. The Data Center will address methodology for combining data from a wide range of environmental health studies, developing precise vocabularies for semantically accelerating the exposomics field, developing statistical approaches for analyzing exposomic/chemical mixtures, and performing big data science, integrating exposomics with genomics and epigenomics. The Rensselaer team’s principal investigator, Deborah McGuinness, Tetherless World Research Constellation Professor, and co-principal investigator Kristin Bennett, professor of mathematical sciences, will lead the ontology and data science research for the data center.

Almost all diseases have both environmental and genetic causes. The overarching goal of CHEAR is to bring together environmental exposure measures with genomic measures of health risk.
While we routinely reach beyond our Institute into the broader world in visible and high-impact ways, the primary purpose of Rensselaer is the preparation and advancement of our students. Students are the heart of our community.
RE-IMAGINING SUMMER

The Summer Arch, Rensselaer’s most recent transformative teaching innovation, is designed to help students develop intellectual agility, multicultural sophistication, and a global view. During the Summer Arch, which is built on a restructuring of the academic calendar, students will remain on campus after their sophomore year for a full summer semester of junior-level classes. They will then spend one semester of the traditional junior year away from campus, preferably abroad—pursuing a project aligned with their interests—but still graduate within the typical time span. Summer Arch will be piloted over the next two summers, before making it a required academic experience for all Rensselaer undergraduates in the summer of 2019.

During their summer on campus, students will profit from the focused attention of the faculty and Student Life staff at a key point in their educational careers, before they pivot to advanced classes. They will also take advantage of unique cultural, environmental, and professional experiences only available in this region in the summer. Then, during their “away” semester, Rensselaer juniors will go abroad, or do a co-op or internship, research, volunteer, or launch an entrepreneurial business—or some combination of the above.

In the context of Summer Arch, a key outcome for Rensselaer graduates is a greater appreciation and understanding of the global environment in which their careers will unfold. Immersion and day-to-day interactions in vastly different socio-economic and multicultural settings are essential for such learning, and are only possible if one lives and works in those environments.

When the students return to campus after their semester away, they will have had new experiences—and will be able to forge new connections. When they graduate after the Summer Arch, they will be in even greater demand with employers and graduate schools.

FIRST-CLASS STUDENT EXPERIENCE

CLASS (Clustered Learning, Advocacy, and Support for Students) is a comprehensive approach to the student experience at Rensselaer. Through ongoing support, guidance, and co-curricular activities, CLASS connects students to a network of faculty, staff, and other students, ensuring that they are part of a strong community of learners. As our students strive to become the leaders of tomorrow, CLASS fosters personal and professional growth, creating gateways...
Most Diverse Class in History

+34% increase in underrepresented minorities over 2015 incoming class

+22% increase in geographic diversity

to transformative experiences that will help them realize their potential.

All first- and second-year students live in tight-knit communities centered in their residence halls, with live-in assistant deans supporting them, or in the Greek Life Commons. If, later in their college careers, they choose to move off campus, they are still connected through Greek Life or the Off-Campus Commons.

In the coming year, Rensselaer is establishing a physical Off-Campus Commons as a place where off-campus students will gather for CLASS-based programs, take breaks between classes, hold events, or catch a safe ride home.

Time-based clustering allows the Institute to offer programming and experiences designed for each stage of a college career. When students are freshmen, CLASS programming largely focuses on awareness of an issue. As they grow here, they are increasingly expected to lead, and Rensselaer offers them opportunities to do so.

**ART_X**

Rensselaer is in the second year of another unique pedagogical innovation: Art_X@Rensselaer, which is designed to help students see and understand the science in and of art, and the art in and of science, and to explore the ideas that connect art, science, and technology. Although the intention is for students to appreciate art in all its forms, Art_X is about helping all Rensselaer students acquire a new vocabulary for creativity. To make that happen, faculty have infused it throughout the curriculum.

For example, in the capstone design class taken by seniors in all engineering disciplines, students now address not just considerations such as function, budget, safety, and performance—but also aesthetics, and its relationship with—and sometimes conflict with—other considerations.

Art_X@Rensselaer also advances art appreciation and understanding, and has become an important part of the student experience outside the classroom. For example, students are encouraged to take full advantage of the productions developed and presented at the Curtis R. Priem Experimental Media and Performing Arts Center—one of the most advanced performing arts venues in the world, which draws remarkable artists from around the world. A new program called EMPAC+ offers free tickets to all EMPAC-curated events to students who enroll—a gift that may well change their lives.
NATIONAL COMPETITIVENESS

LARGEST INCOMING CLASS

More than 1,690 students—representing the largest incoming class in the Institute’s history—joined Rensselaer this fall. The first-year students hail from 47 states, the District of Columbia, Puerto Rico, and from countries all around the world.

The high-achieving group includes 544 women, representing 32 percent of the class; and 281 underrepresented minority students, representing 16 percent of the class. The continued geographic and international diversity of the incoming class reinforces the global reach and global impact of Rensselaer.

“We are proud of the fact that the Class of 2020 is not only the largest incoming freshman class in the history of Rensselaer, but also one of the strongest academically,” said Jonathan Werber, vice
were valedictorians or salutatorians of their high school graduating class.

A record total of 18,524 high school students filed applications to attend Rensselaer this fall, according to the Office of Admissions. This year’s total represents an increase of approximately 4 percent from the previous year.

The Class of 2020, the largest incoming class in Rensselaer history, is also among the most academically, ethnically, and geographically diverse classes in history.

The overall class SAT average was 1370 based on the 1600 scale and 195 incoming students received a perfect 800 SAT critical reading, math, or writing score. Four students scored a 1600 on the critical reading and math portions of the exam. In the incoming class, 99 students...
The Rensselaer Medal is a tradition more than 100 years old that honors high school students who have distinguished themselves in mathematics and science. This scholarship is valued at $100,000 ($25,000 per year).

200 enrolling medalists

28 ROTC program 2016 graduates who started active military service as officers.
Amparo is developing a prosthetic socket that is easier and cheaper to make than current options. Sockets are the interface between a prosthetic device and the amputee’s limb. They have to be made by a specially trained prosthetist and custom fit to the amputee, so they are the most expensive part of a prosthetic limb.

**RESEARCH MATTERS**

Rensselaer strongly encourages undergraduate students from all five schools to take part in the Institute’s vibrant research enterprise. Whether the choice is to join an ongoing research project, or to seek faculty guidance in pursuit of research ideas, Rensselaer provides students with the opportunity to make research an integral part of their undergraduate education. In addition, programs like the Change the World Challenge, a twice-yearly competition created to support entrepreneurship education, inspire students to consider ways to transform their ideas into innovative products and services for social and global impact.

**Aiding Amputees**

A student team named “Amparo” has developed a prosthetic socket that makes it easier and cheaper to connect a patient’s residual limb to a prosthetic leg. The socket is made of a thermoplastic material that becomes pliable when heated and, as a result, offers significant advantages. It can be easily molded and customized for each patient, without the expensive casting and tooling required for existing sockets. Fittings can be done more quickly and don’t require the specialized skills of prosthetists, who typically practice in major population centers. Many amputees must travel for days to see these specialists. Amparo can be reheated and remolded to maintain the proper fit—an important consideration because the size and shape of residual limbs fluctuate over time.

**Hand-Gun Safety**

Another student team took home the top award in this year’s New York Business Plan Competition and a $100,000 grand prize. Team Dual:Lock’s winning idea focuses on a conveniently placed stainless-steel sleeve or “safe” into which gun owners will slide and lock their fully armed, ready-to-use pistols. At the top of the “safe” is a biometric scanner—the location of this sensor places the user’s hand in a ready-to-fire position—that releases the lock the instant it recognizes the gun owner’s registered thumbprint. This technology can sharply reduce firearms injuries caused by unauthorized or unintended users, including suicide victims, children who encounter loaded guns in the home, and criminal suspects who get their hands on officers’ weapons.

**Upcycling**

Architecture students in the Center for Architecture, Science, and Ecology have been developing building products from coconuts and other agricultural waste as a sustainable, low-energy alternative to plywood and other materials made with synthetic adhesives. In many tropical countries around the world, people widely use coconuts for their fruit, milk, and cooking oil. Unfortunately, the husks are thrown away by the millions, leaving to waste what might instead be transformed into a multifaceted building material. The architecture students are using coconuts to create non-toxic wall modules and an acoustical panel system that can help cool buildings passively.
ACCOLADES AND HONORS

Audrey Bennett, professor of communication and media, was named the 2015 Andrew W. Mellon Distinguished Scholar at the University of Pretoria, South Africa. Bennett traveled to South Africa to collaborate with the University of Pretoria Department of Visual Arts Visual Technologies project, which explores critical encounters with the digital, curatorial, archival, creative, and theoretical dimensions of technology in contemporary society.

B. Wayne Bequette, professor of chemical and biological engineering, has been named a fellow of the Institute of Electrical and Electronics Engineers. Bequette, a modeling, design, and controls expert, was recognized for contributions to design and control of chemical processes. Much of his recent work has been toward the development of a closed-loop artificial pancreas for individuals with Type 1 diabetes.

Francine Berman, the Edward P. Hamilton Distinguished Professor in Computer Science, has been appointed by President Barack Obama and confirmed by the U.S. Senate to serve on the National Council on the Humanities, a board of 26 distinguished individuals who advise the chairman of the National Endowment for the Humanities.

Jonathan Dordick, vice president for research and the Howard P. Isermann Professor of Chemical and Biological Engineering, received the 2015 Food, Pharmaceutical and Bioengineering Division Award in Chemical Engineering from the American Institute of Chemical Engineers. This national award recognizes an individual’s outstanding chemical engineering contributions in the food, pharmaceutical, and/or bioengineering field, which are of fundamental nature or of practical significance to industry and industrial practice.

Anna Dyson, professor of architecture and director of the Center for Architecture, Science, and Ecology, was named by Architectural Record as a winner of one of the second annual Women in Architecture Awards, celebrating architects for their contributions to the field while highlighting the increasingly visible role women play in the profession.

James Hendler, Tetherless World Professor and director of the Rensselaer Institute for Data Exploration and Applications (IDEA), has been appointed to the Homeland Security Science and Technology Advisory Committee. The committee provides scientific and technical advice to the undersecretary for science and technology on matters related to the expansion of technological capabilities across the homeland security enterprise.

Miles Kimball, professor and department head in communication and media, received the 2016 College English Association Professional Achievement Award, which recognizes an association member who has significantly contributed to teaching and scholarship at the college level.

Lee Ligon, associate professor of biological sciences, was awarded a Science & Technology Policy Fellowship through the American Association for the Advancement of Science. With the support of the 2015-16 fellowship, Ligon served for one year at the U.S. Agency for International Development in Washington, D.C. Ligon worked on international human rights policy, specifically advancing lesbian, gay, bisexual, transgender, and intersex inclusive development.

Patricia Search, professor of communication and media, has been selected as an inaugural member of the Fulbright Ambassadors Program, a flagship initiative established by the Australian-American Fulbright Commission to enhance the academic and cultural exchange between the U.S. and Australia through alumni of the Fulbright Program.

Linda Schadler, vice provost and dean for undergraduate education and the Russell Sage Professor, has been elected to the Class of 2016 Materials Research Society Fellows. She was recognized for her “seminal research in the field of polymer nanocomposites and for leadership in materials education.” Schadler’s research has focused on the mechanical, electrical, and optical properties of two-phase systems, primarily polymer composites.

Michael Shur, the Patricia W. and C. Sheldon Roberts ’48 Professor of Solid State Electronics, has received an Institution of Engineering and Technology Achievement Award for pioneering contributions to deep ultraviolet light-emitting diode technology. The award recognizes individuals from around the world who have made exceptional contributions to the advancement of engineering, technology, and science.

Lirong Xia, assistant professor of computer science, has been recognized by IEEE Intelligent Systems magazine as one of “AI’s 10 to Watch.” The biennial honor celebrates scientists in the field of artificial intelligence (AI) and promotes cutting-edge research among next-generation researchers, industry, and the general public. Xia’s research focuses on “social choice”—the analysis of individual preferences used to reach collective decisions or social objectives.

Suvranu De, the J. Erik Jonsson ’23 Distinguished Professor of Engineering and head of the Department of Mechanical, Aerospace, and Nuclear Engineering, is a fellow of the American Institute of Mechanical Engineers; and Assad Oberai, professor of mechanical, aerospace, and nuclear engineering, have all been inducted into the College of Fellows of the American Institute for Medical and Biological Engineering (AIMBE). The AIMBE College of Fellows includes the top 2 percent of medical and biological engineers in the country.

CHAIRDED PROFESSORSHIPS

Jeffrey W. Banks has been named the Eliza Ricketts Foundation Career Development Professor of Mathematics.

Vivek Gholas, expert in antitrust and regulatory matters, has joined Rensselaer as the Virginia and Lloyd W. Rittenhouse ’57 Teaching Professor of Humanities and Social Sciences.

Mattheos A.G. Koffas, professor in the Howard P. Isermann Department of Chemical and Biological Engineering, has been appointed the Dorothy and Fred Chai ’71 Career Development Constellation Professor.

Kevin Rose, biologist, has been named the Frederick R. Kolleck ’52 Career Development Professor.

Jacob T. Shelley, chemist, has been appointed the Alan Paul Schulz Career Development Chair in Chemistry.

RENSSELLAER HONORS

DAVID M. DARRIN ’40 COUNSELING AWARD

Marianne Nyman, associate professor of civil and environmental engineering. The award honors productivity in both teaching and research, with outstanding achievement in one of these areas.

JEROME FISCHBACH ’38 FACULTY TRAVEL GRANT

Minoru Tomozawa, professor of materials science and engineering. The award recognizes contributions faculty members have made to the education and motivation of students.

WILLIAM H. WILEY 1866 DISTINGUISHED FACULTY AWARD

Shengbai Zhang, the Gail and Jeffrey L. Kodosky ’79 Chair in Physics, Information Technology, and Entrepreneurship, and professor of physics, applied physics, and astronomy. Established by Edward P. Hamilton, Class of 1907, in memory of William H. Wiley, Class of 1856, the award honors those who have won the respect of the faculty through excellence in teaching, productive research, and interest in the totality of the educational process.

CLASS OF 1951 OUTSTANDING TEACHING DEVELOPMENT GRANT

Aram Chung, assistant professor of mechanical, aerospace, and nuclear engineering. The fellowship was established by the Class of 1951 to commend faculty members for their outstanding accomplishments in education.

RENSSELLAER ALUMNI ASSOCIATION TEACHING AWARD

Ryan Gilbert, associate professor of biomedical engineering. The award was established in 1994 to recognize outstanding accomplishments in classroom instruction.
STUDENTS | FALL 2016
7,442 enrolled students including:
6,200 resident undergraduates
1,090 resident graduate students
78 working professionals (includes Hartford)
74 nonmatriculated students

ACADEMIC PROGRAMS | FALL 2016
Includes new accounting concentration in the Business & Management B.S. program and new philosophy minor.
39 programs leading to the B.S. or B.Arch.
63 programs leading to the M.S., M.Eng., M.Arch., MBA, or M.F.A.
29 programs leading to the Ph.D.

FACULTY | FALL 2016
499 total faculty members including:
453 full-time faculty (of which 342 are tenured or tenure track)
46 part-time faculty
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