RESEARCH & INNOVATION

2009-2010

THE
UNIVERSITY
OF RHODE ISLAND
DIVISION OF RESEARCH &
ECONOMIC DEVELOPMENT

Enhancing
ECONOMIC DEVELOPMENT
in Rhode Island

THE
UNIVERSITY
OF RHODE ISLAND

DIVISION OF RESEARCH &
ECONOMIC DEVELOPMENT

ACKNOWLEDGEMENTS

THE UNIVERSITY OF RHODE ISLAND

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DAVID M. DOOLEY, Ph.D.
President

Research, scholarship, and creative work are at the heart of the University of Rhode Island. As a land-grant public university, we were created to conduct research and then translate that research in ways that would improve the lives of the people of the state. Although our research mission has broadened considerably beyond that originally envisioned – it now encompasses numerous disciplines that could not be foreseen in the 19th century – research for the public good remains a distinctive attribute of the 21st century land-grant university.

As the articles in this edition of *Research and Innovation* illustrate so well, the University of Rhode Island's more recent designations as a sea-grant and urban-grant university are also reflected in the research and scholarship of the university's faculty, research staff, and students. The engagement of our students, at both the undergraduate and graduate levels, in research, scholarship, and creative work is of critical importance to their education. Our students must be prepared for careers that do not yet exist, involving technologies not yet developed, and based on knowledge not yet discovered. Consequently, I am convinced that the best approach to preparing students for such careers is to help them develop the skills and capabilities to discover, create, and innovate. And the best way to do that is to provide them opportunities as undergraduates to become an integral part of the community of discovery that is the modern research university.

Given the dramatic rate of change that is already so characteristic of the 21st century, the human capacity for innovation has perhaps never been more important. The University of Rhode Island has a highly innovative faculty, and they are creating new knowledge, new capacities, and new ways to teach that will serve our students, the state, the nation, and the world extremely well. Thanks for reading.

PETER ALFONSO, Ph.D.
Vice President for Research
and Economic Development

Welcome to the 2009-2010 edition of *Research and Innovation*, the research magazine of the University of Rhode Island. The mission of the University of Rhode Island's research enterprise is twofold: first, to engage in a wide range of disciplines to seek solutions to a host of critical issues that not only affect our state but also our region, nation, and the world; and second, to enhance economic development in our state by the commercialization of the products, technologies and processes that stem from our research. Indeed, we are doing exceedingly well on both of these accounts. The $86 million in research grant and contract awards received by URI in fiscal year 2009, which represents a 26 percent increase over fiscal year 2008, set an all time record for our institution. The corresponding economic impact of these dollars is increasingly significant. For example, it is estimated that the $86 million in sponsored program awards received in fiscal year 2009, which represents new money to the State that we would not have otherwise, generates an additional $150 million in local economic impact, which in turn creates additional jobs and additional state and local taxes. And these numbers do not include the revenue and resultant economic impact that will accrue with the commercial enterprise that stems from URI research generated inventions.

In this year's magazine we feature a few of our research programs that demonstrate how our global partnerships lead to the full development of a knowledge-based economy in Rhode Island. For example, the College of the Environment and Life Sciences is at the epicenter of vaccine development that may have world-wide implications and is taking the lead in training a biotechnology workforce that is an essential element for Rhode Island's Knowledge District. Researchers at the Graduate School of Oceanography are leading the way in tsunami prediction technologies that will lessen the cost of these disasters not only in dollars but in human lives. In the College of Arts and Sciences faculty are discovering new ways to detect and treat cancer. Additionally, in the Colleges of Arts and Sciences and Engineering our international engineering program is built on partnerships with private business and industry in Europe and Asia. It is designed to respond to industry needs for engineers with cross-cultural communication skills and international work experience. The College of Business Administration has developed a supply chain management program which is looking at the development of Quonset Point and is graduating highly skilled professionals who know how to control and manage business operations on a global scale. The College of Pharmacy is discovering new methods of vaccine development for the prevention of MRSA, the most drug resistant virus in the world. The College of Human Science and Services has developed a bioactive bandage combining the unique elements of textile science and biochemistry that will be of world-wide commercial interest. Researchers in the College of Nursing are pioneering novel approaches toward improved health and development of premature infants born around the world. Likewise, researchers in the College of Engineering are developing novel methods that utilize biomedical and computer engineering tools to aid people with loss of limbs, including our veterans who served overseas, with improved prosthetics that anticipate a person's movement for a better ease of motion.

While this year's edition of *Research and Innovation* offers only a glimpse of our comprehensive research programs and commercialization opportunities, I trust you will see that the research enterprise at the University of Rhode Island is definitely on the move. Our research programs span an impressive number of disciplines, all of which bring resources to bear on the problems facing Rhode Island, our country and the world.

The Statewide Economic Impact of Externally-Funded Research at the University of Rhode Island

by Leonard P. Lardaro, Professor of Economics, University of Rhode Island

The University of Rhode Island set a new record in externally-funded research in Fiscal Year 2009 (FY09). Our researchers generated $86 million, a 26 percent increase over FY08, contributing enormously to economic renewal in the Ocean State.

As Rhode Island attempts to attain and sustain greater success in a post-manufacturing economy, the University of Rhode Island's ability to provide externally-funded innovations, adaptive intelligence, and breakthrough research is more important than ever. Although the university has made substantial contributions to Rhode Island's information-based economy for quite some time, these contributions are often not quantified. This article offers some insights into the economic impact on the State of Rhode Island of externally-funded research at its flagship university.

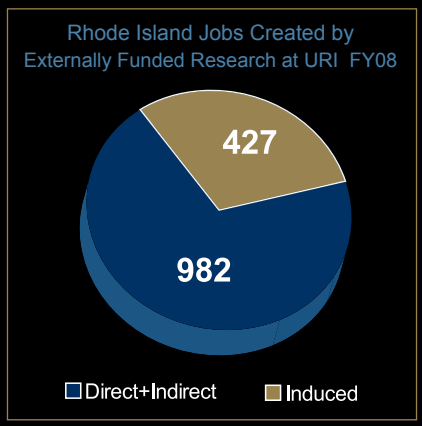
Because FY09 data on the state's economy was not available at the time of publication, this article quantifies and measures the impact of externally-funded research dollars in FY08. Readers should keep in mind three key factors that artificially mute the impacts presented here: FY08 coincides with the start of Rhode Island's current recession, making this an atypical year; this study excludes the impact of a substantial amount of non-funded research that occurs regularly at URI and which also has a significant impact on our state and its economy; and finally, as noted above, FY09 saw a significant increase in total externally-funded research.

The Statewide Economic Impact of Externally-Funded Research at the University of Rhode Island in FY08

- For every $1 in externally-funded research the university received, it contributed $1.67 to the state economy in direct, indirect, and induced impacts of this research.

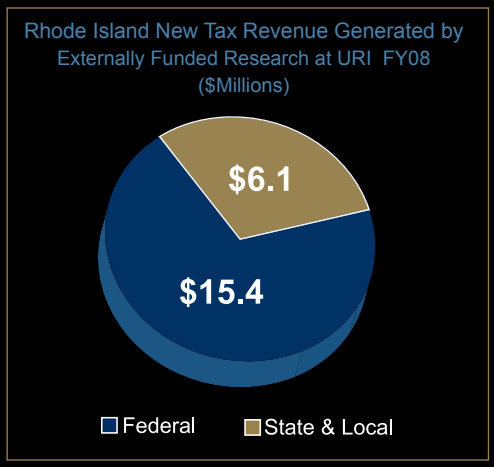
- The $63.5 million received for externally-funded research at the university resulted in an output of $109.3 million (in 2010 purchasing power). The associated gain in employment was 1,409 jobs, which, when taken together with the state's loss of 10,900 jobs, generated an increase in labor income for Rhode Island of $78.2 million.

- The majority of jobs created by externally-funded research resulted from the direct and indirect impacts of this research (982). The income created from these generated further income and spending (induced spending), which resulted in an additional 427 jobs. The average income of all the jobs created was $55,510. So, the short-term effects of this research were highly significant, based on their overall employment impact, which offset some of the overall job loss Rhode Island suffered.

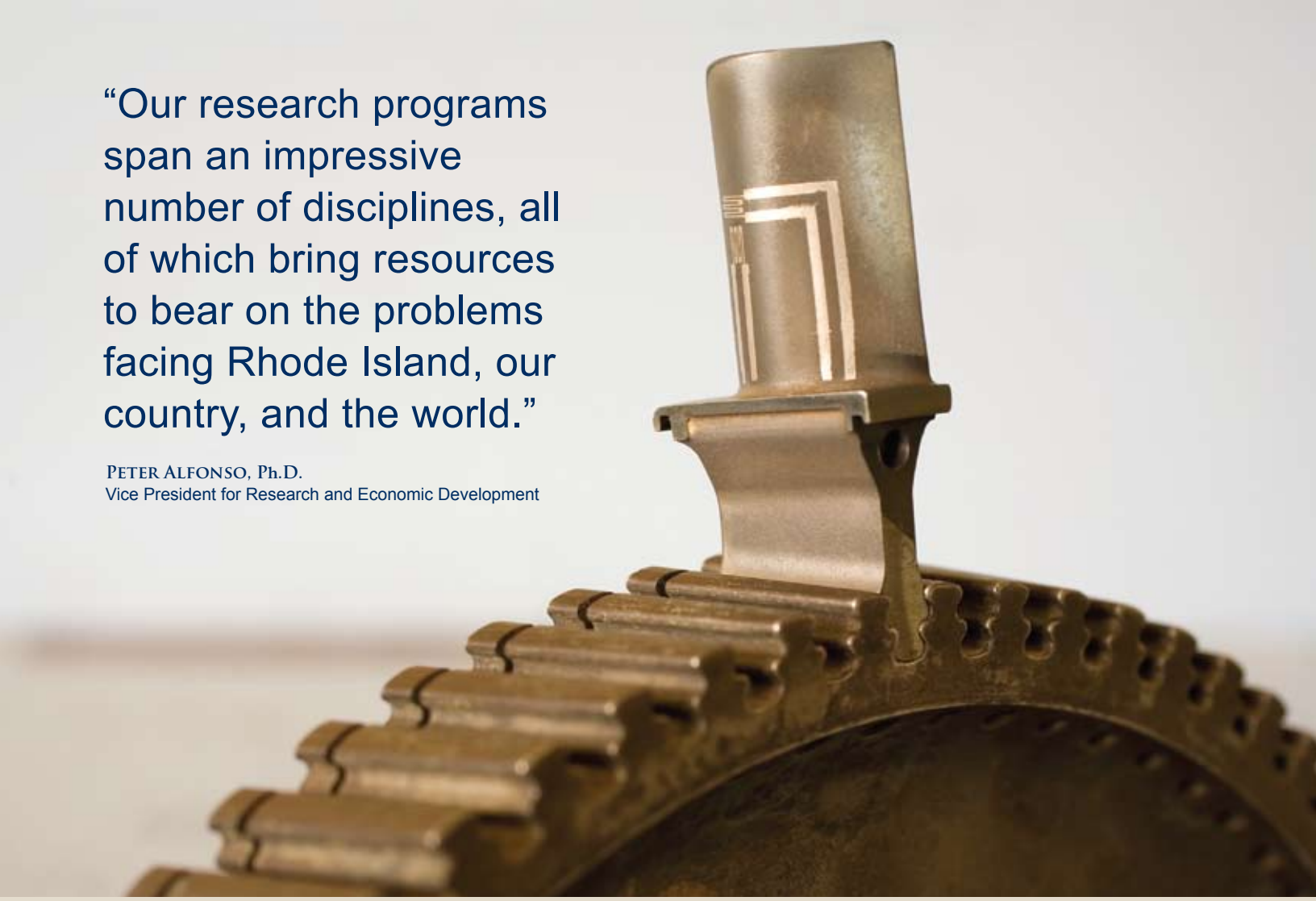


- Rhode Island is a "small-business" state. As of March 2009, according to the RI Department of Labor and Training, 47.9 percent of Rhode Island employers had five or fewer employees, and 61.8 percent employed fewer than 10 persons. If we consider a five-person firm to be "typical," the total number of jobs created by externally-funded research at the university would have added 282 such companies with employees making $55,510, which is likely higher than what might be typical actual earnings.

- Externally-funded research generated $21.5 million in new tax revenue paid by individuals and businesses. Of that, $6.1 million was for state and local taxes, while $15.4 million was for federal taxes. State corporate profits taxes rose by $227,050.



Even with the unusual circumstance of the economic recession, the University of Rhode Island's FY08 externally-funded research clearly made a substantial contribution to Rhode Island's economy. A year from now, this economic impact will prove to be significantly greater as a result of the 26 percent increase in externally-funded research to $86 million.



"Our research programs span an impressive number of disciplines, all of which bring resources to bear on the problems facing Rhode Island, our country, and the world."

PETER ALFONSO, Ph.D.
Vice President for Research and Economic Development

INSIDE THIS ISSUE OF RESEARCH & INNOVATION

The Epicenter for Vaccine Development in Rhode Island's Knowledge District

The University of Rhode Island is on the verge of changing the outlook for infectious disease treatment around the world, largely due to the efforts of URI researcher Annie De Groot, MD, who joined the University of Rhode Island from Brown University in 2008. She is the recent recipient of a $13 million grant from the National Institutes of Health (NIH) to pioneer the development of a multidisciplinary program for the prevention of emerging infectious diseases.

Dr. De Groot is not only the director of the University's Institute for Immunology and Informatics (I'Cubed) at URI's Biotechnology Center in Providence, but is also founder, chief executive officer and chief scientific officer of the Providence-based biotech company EpiVax, Inc. She established I'Cubed to improve the health of humans and animals by applying the power of immunomics (informatics, genomics and immunology) to accelerate the design and development of better vaccines, diagnostics and therapeutics.

I'Cubed is URI's first research laboratory at the Providence campus, located there to enable researchers to easily create partnerships with nearby hospitals, Lifespan, Brown University and local life sciences companies. Rooted in the development of the "knowledge economy" — an initiative created in 2007 to develop the health care, technology, research and design and alternative energy sectors of Rhode Island's economy — I'Cubed hopes to facilitate Rhode Island's move away from the traditional manufacturing sector, which has steadily lost jobs, to growing industries based on research, bioengineering, life sciences, health care and green technology.

Much of the hope for the new economy in Rhode Island is centered within the well-known Jewelry District, once a thriving manufacturing center. Providence Mayor, David Cicilline and others want a hub of high tech and science-related start-up companies to come together in this area which they have now designated the "Knowledge District."

Denice Spero, PhD, co-director of I'Cubed, articulates the goals of URI's new institute as vital to the economic development of Rhode Island. "I'Cubed is structured to work with researchers, post-docs, and students—it is a collaborative effort that makes business sense." These collaborations will no doubt flourish in the Knowledge District with its emerging community of professors, researchers and professionals.

Creating a knowledge hub will inevitably lead to new spin-off companies, expanding the number of biotech companies operating in Rhode Island's state capital. Funding for I'Cubed will continue to

"De Groot's research makes considerable contributions to Rhode Island's economic development efforts through the creation of technologies and products with commercial value and the building of a highly-skilled workforce that is absolutely essential for our economic wellbeing."

- Peter Alfonso, PhD, Vice President for Research and Economic Development

make URI a leader in applied education through advanced technology and research ideas and modern facilities where people can train and work to acquire valuable skills. I'Cubed will position the University of Rhode Island as a leader in applied biotechnology.

Dr. De Groot's NIH-funded grant project is called the Translational Immunology Research and Accelerated Vaccine Development (TRIAD) Program. It is intended to design vaccines with a blend of computer simulation, and *in vitro* and *in vivo* research at the molecular or cellular level, then "translating" them into practical applications. Infectious diseases like HIV, tuberculosis, Hepatitis C, *Helicobacter pylori*, Human Papillomavirus, and engineered bioterror agents are among the targets of TRIAD's work.

Dr. De Groot's immunome-derived vaccines have the potential to be safer and more effective than traditional vaccines because they focus the body's protective immune response on the most essential reactive elements of the pathogenic bacteria or virus, while eliminating potentially cross-reactive and deleterious or simply inert components.

The NIH funding will allow Dr. De Groot to bring more researchers on board, launch pilot grants, and establish a training course in the use of new vaccine design tools developed by the program. An exciting example of this is the contribution of URI Professor Thomas Mather, PhD, a nationally recognized entomologist, who is developing a vaccine to alleviate tick-borne diseases, a worldwide problem with significance in Rhode Island.

"This grant is a dream come true, giving a team of researchers based in Rhode Island the exciting opportunity to collaborate across disciplines and to teach the next generation of scientists to use tools that are accelerating the development of vaccines and therapeutics," she says. "All of the work to be performed under TRIAD funding is directed at moving vaccine products towards the clinic."

Dr. De Groot has received worldwide accolades for her groundbreaking "genome–to–vaccine" process. She believes that when conducting applied research, the development of commercial biotech companies should operate alongside academic research labs whose focus is on basic discovery. Her professional and academic relationship with researchers in biotech centers in the United States, Japan and Europe will continue to contribute to the success of biotech research and development in Rhode Island.

Peter Alfonso, PhD, Vice President for Research and Economic Development, said, "Dr. De Groot's research has regional and national importance for two reasons: First, it will lead to a significant reduction in the time and cost to create new vaccines against a host of emerging infectious diseases such as Lyme disease, which is rampant in Rhode Island. Second, it makes considerable contributions to Rhode Island's economic development efforts through the creation of technologies and products with commercial value and the building of a highly-skilled workforce that is absolutely essential for our economic wellbeing. Through Dr. De Groot's leadership, URI will be recognized throughout the world for our scientific contributions in this area."

"I commend the University of Rhode Island for its efforts to accelerate the development of safer, more efficient vaccines," added United States Senator Jack Reed (D-RI), who supported Dr. De Groot's funding proposal. "This federal funding will boost critical vaccine research to help protect public health against emerging infectious diseases. It will also provide critically important educational opportunities to further expand Rhode Island's health care and biotech workforce."

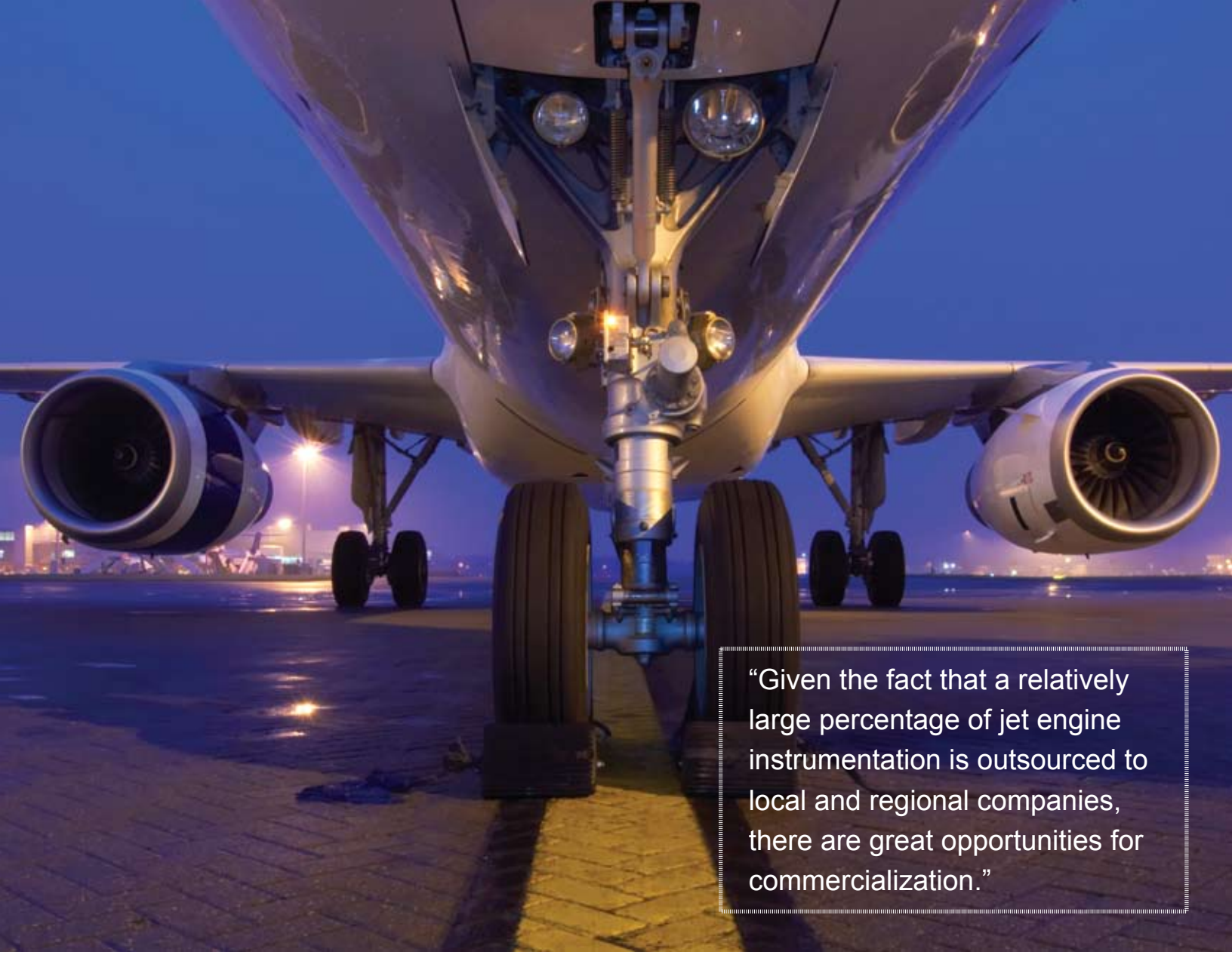
Giving Jet Engines a Better Sense for Safety

The United States Air Force, NASA, Rolls-Royce, Siemens, Pratt & Whitney, and Honeywell all have something in common. They've all turned to University of Rhode Island engineering professor Otto Gregory for his specialized expertise in the area of sensor technology. In fact, with Gregory at the helm as co-director, URI's Sensors and Surface Technology Laboratory is a principal global resource in the highly focused area of gas turbine engine instrumentation and testing.

In the aerospace industry, sensors are an essential and necessary technology used in the manufacturing of jet engines to test for engine safety and reliability. A sensor is a device that measures a physical quantity and converts it into a signal that can be read by an observer or by an instrument. In the case of jet engines, the sensors support aviation safety by helping test for engine reliability and durability, and by measuring important engine parameters while the engine is actually running. This is extremely challenging considering the conditions under which these engines operate.

At URI's Sensors and Surface Technology Laboratory, Gregory is advancing the development of sensors used to measure temperature, heat flux, pressure and stress in jet engine parts. The engine is the most costly component of an airplane, with production costs of a Boeing 777 engine as much as $25 million, of which 15 to 20 percent is slated for engine test and development. It's no wonder that a technological improvement in jet engine instrumentation is big business. In a recent industry-wide testing program, turbine blade material was sent to engine companies around the world where state-of-the-art sensors were applied to the surface and returned to the University of Rhode Island for testing. "We analyzed sensor lifetime and how they performed," Gregory says. "This data provided a baseline that we can use as a metric to improve sensor technology."

Gregory has developed a suite of non-invasive, high-temperature sensors that can be used by engine companies when making design changes, safety modifications and performance alterations. His work has made the



"Given the fact that a relatively large percentage of jet engine instrumentation is outsourced to local and regional companies, there are great opportunities for commercialization."

University of Rhode Island a world leader in thin film research. One of the operational constraints of the sensors is that they do not perturb the flow of air through the engine. Therefore, the dimensions of the sensors have to be less than the boundary layer thickness and thus, the sensors are typically comprised of metallic and ceramic thin films.

In addition to promoting aviation safety, the sensor technology has other commercial and military applications as well. Within 90 minutes of URI's Kingston campus are two Pratt & Whitney gas turbine engine facilities where jet engines are designed, fabricated and tested for both commercial and military customers. Given the fact that a relatively large percentage of jet engine instrumentation is outsourced to local and regional companies, there are great opportunities for commercialization of Gregory's work.

In cases where temperature, gas velocity, g-loadings and other conditions inside an engine environment are quite severe, sensors are integrated rather than added on. High-temperature sensors for such harsh environments being developed at URI's Sensors and Surface Technology Laboratory make it possible to monitor the structural integrity of jet engine components under operational conditions, thus providing unique solutions to the instrumentation engineers at Pratt & Whitney and other companies supporting them. For example, Professor Gregory's research is driving toward wireless sensor technology so that engine performance can be monitored in real time without having to connect the engine and its suite of sensors to wires.

Gregory, a former NASA fellow, has been continuously funded by NASA since 1992 to develop high-temperature sensors for harsh environments. During this time, he and his team of researchers have worked with international companies such as Rolls-Royce and Siemens, as well as domestic companies such as General Electric and Honeywell. In the past several years much of the funding for his research has come from the National Science Foundation, the Department of Homeland Security, the Navy and the Air Force. In total, the Air Force and NASA have awarded URI's College of Engineering more than $1 million over the last three years for the development of an all ceramic thermocouple – temperature sensor – that will allow them to test its engines in the most severe environments imaginable.

Airport security systems receive a lot of attention these days, but one of the most effective ways to make airline travel safer for the flying public is to ensure that the planes and the engines used to power them remain durable and reliable as the fleet of commercial airplanes age. Due to Professor Gregory's research, URI is leading the way.

A Vision for Being the First State to Harvest Green Energy at Sea

The tiniest state in the nation may be the first to build an offshore wind farm. University of Rhode Island Professor of Oceanography John Merrill is collaborating with Deepwater Wind to provide and operate offshore wind turbines.

As an early leader in offshore wind production, URI stands to help establish a new, high-wage industry in Rhode Island with long-term growth potential. In June 2009, the Quonset Development Corporation approved a development agreement to lease approximately 117 acres to Deepwater Wind for its regional manufacturing facility and development headquarters. When fully operational, the headquarters will support 800 jobs, with combined annual wages of $60 million.

“The development agreement marks a major milestone in the state’s march toward the development of offshore wind projects and positions Rhode Island as the epicenter for renewable energy on the East Coast,” said Governor Donald L. Carcieri. “We are moving in the right direction when it comes to making targeted investments in renewable energy in Rhode Island. Not only is this about bringing clean, green power that is not subject to variations and increases in fuel prices to our state, but this is also about bolstering economic development in Rhode Island and furthering our efforts to enable Quonset to realize its full potential.” Currently there are no offshore wind projects operating off the United States coastline. Many states have looked to solar and wind power to meet clean energy goals, but Rhode Island expects offshore wind power to comprise the bulk of its green energy.

The University of Rhode Island is providing the essential scientific basis for the Rhode Island Ocean Special Area Management Plan led by the Rhode Island Coastal Resources Management Council. It is a project initiated specifically to develop a process for regulation and approval of offshore sites. It will also include community education about the economic and environmental benefits of offshore wind energy, plus the measures being taken to protect sea life, birds, and the integrity of the ocean floor, to name a few.

Rhode Island has launched a 20-year power purchase agreement with Deepwater Wind to build and operate offshore wind turbines and sell their electricity output to National Grid. Merrill is collaborating with Deepwater Wind on the ground-breaking project.

The first phase of Deepwater Wind’s project, called the Block Island Wind Farm, proposes to build eight wind turbines producing 28 megawatts of electricity three miles off the coast of Block Island in state waters.

The project includes plans to build a transmission line to Block Island, which currently relies mostly on diesel fuel. Any excess electricity generated by the project that the island does not use will be fed to the state’s main grid.

This project demonstrates, on a larger scale, the advantages of wind power and other renewable energy resources. With the contributions of Merrill and other URI colleagues, Rhode Island is poised to become a national leader in renewable wind energy.

This research also aims to boost Rhode Island’s status as a green work state. While the wind turbine decreases carbon utilization, it also promotes “green-collar” jobs. The wind turbine is a premier example of how, on a state level, renewable resources can reduce our carbon footprint, create jobs and generate revenue.

Although turbines on land are the fastest growing source of wind energy, Merrill and his colleagues have concluded that, especially in the New England region, more energy can be generated from turbines located in the ocean. “In this project we’re focusing on a specific area and on winds within a few hundred feet of the surface.” Merrill’s research shows that the further offshore one goes, the more wind one can harness to generate energy.

The Deepwater Wind project represents more than 15 percent of the state’s electricity demand. By establishing itself as an early leader in offshore wind production, URI stands to establish a new industry in Rhode Island — a high-wage industry with long-term growth potential.

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Discovering the Long-Term Outcomes of Premature Birth

Approximately half a million infants are born prematurely every year. In fact, fifty to seventy percent require a range of specialized services as they grow. Annually, costs related to premature births are more than $2 billion. University of Rhode Island Nursing Professor Mary Sullivan, PhD, RN, is working to answer questions regarding what happens to premature infants' health and medical issues as they get older.

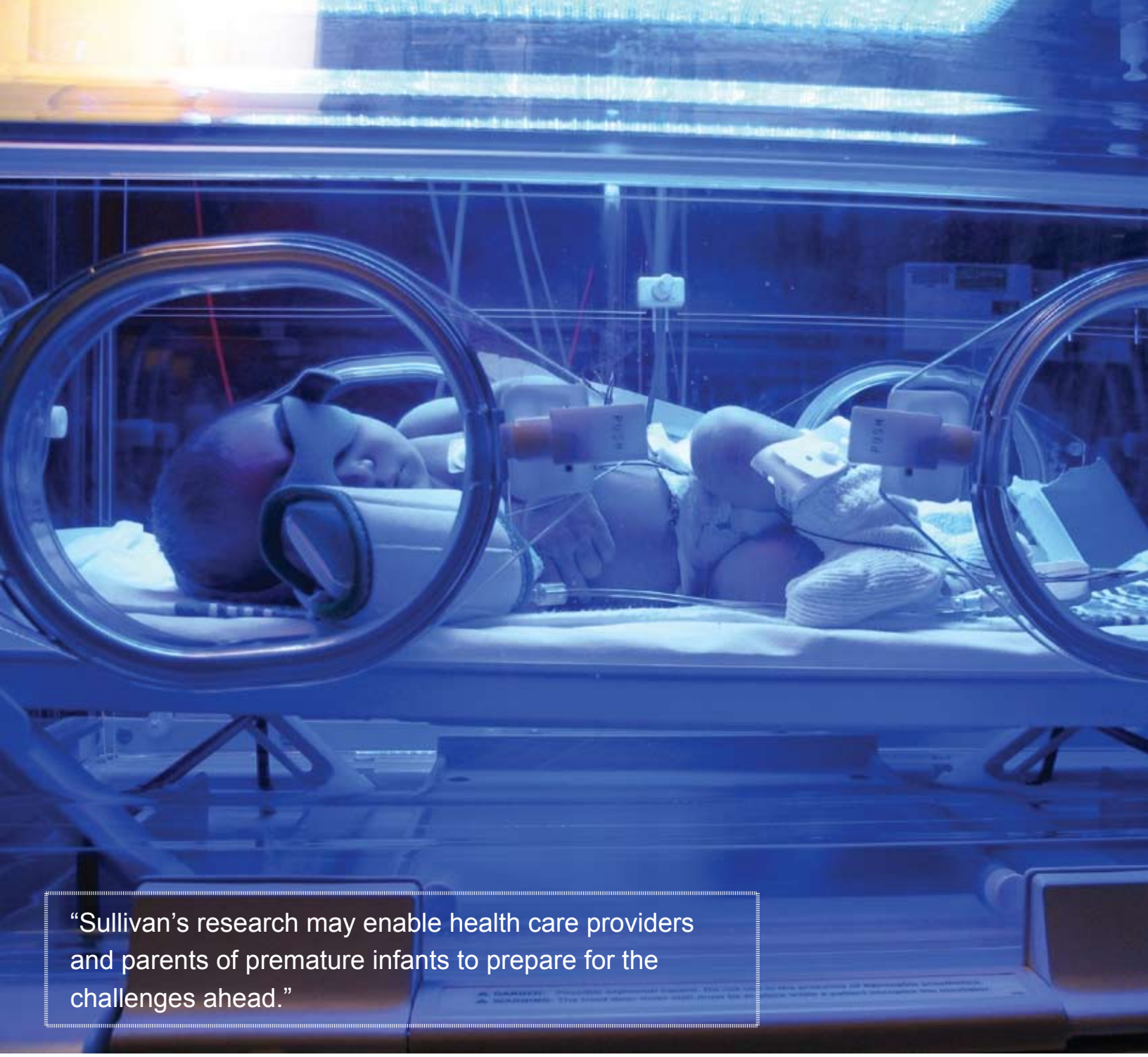
Funded by a $2.4 million grant from the National Institutes of Health (NIH), Sullivan is conducting a unique study tracking the long-term health and developmental outcomes of premature infants from birth through young adulthood. It is the only study of its kind in the United States, and her research may enable health care providers and parents of premature infants to prepare for the challenges ahead.

Sullivan is also an adjunct professor of pediatrics at the Warren Alpert Medical School of Brown University and a research scientist at Women & Infants Hospital's Brown Center for the Study of Children at Risk. She is working on this study with co-investigators Robin Miller, PhD, RN, of the Brown Center for Children; Barry Lester, PhD, director of the Brown Center for Children; James Ziegler, MD, of Rhode Island Hospital Pediatric Heart Center; and Michael Msall, MD, chief of neurodevelopmental and behavioral pediatrics at the University of Chicago. Their research group is comprised of 213 preterm infants to age 23, all born between 1985 and 1989 at Women & Infants Hospital of Rhode Island.

"Through this research, we have been learning about the trouble spots that preterm infants have experienced throughout their lives," said Sullivan who became involved in the original studies in 1990 while earning her doctoral degree. "The unique examination of this group has allowed us to examine and describe, over a period of time, the challenges they faced and how they were resolved. Ultimately, we hope that this may provide guidance to parents of premature infants and inform professionals such as the physicians, nurses, and physical and occupational therapists providing care."

Specifically, the study examines the successes and challenges that this group of preterm infants encounters, and how medical, social and other factors influence their growth and development. A look at this longitudinal database of young adults is intended to allow professionals to make accurate predictions about the necessity, timing and content of interventions required to promote, support and sustain normal development.

Some of the assessment tools used in this study include the biomarkers of blood chemistry, pulmonary function testing, cardiopulmonary response to exercise and metabolic functioning, and HPA (hypothalamic-pituitary-adrenal axis) function by salivary cortisol. The intent is to show whether prematurity impacts health and how early disease onset could be explained by alterations in HPA function.



"Sullivan's research may enable health care providers and parents of premature infants to prepare for the challenges ahead."

Sullivan is also collaborating on another related research study at Women & Infants Hospital entitled "Effects of Open Bay versus Single Room NICU on Infant Outcome at Discharge," that aims to compare the medical and neurobehavioral status of infants at discharge. The study is conducted with the principal investigator Barry Lester and colleagues at the Brown Center for the Study of Children at Risk.

Women & Infants Hospital spent two years and $76.8 million to build a brand new, two-story NICU committed to increasing the survival rate of premature babies. The new unit is made up of single-family rooms for each baby in order to provide them and their families with a private, cozy space. These qualities enable babies to carry on with natural sleeping and eating cycles and enables parents to feed and care for their babies. In addition, the new environment changed the work setting for nurses, physicians and therapists. Investing in this facility is an investment in the best start for the babies and their families, thereby setting a pathway toward healthy development.

Over the last 50 years, advanced resources and state-of-the-art neonatal intensive care units, like the newly-opened unit at Women & Infants Hospital in Providence, have decreased the mortality rate for premature infants. Sullivan hopes her work will make a big impact on the lives of our smallest babies.

Supply Chain Management: Responding to the Globalization of Industry

In the 21st century, supply chain management has become a big factor in the success of big business. The University of Rhode Island is poised to graduate students with supply chain management skills that give them a competitive advantage in their field.

URI's supply chain management program is an example of how the university adapts to respond to the world's changing demands and graduates students who are well positioned for work in the global marketplace. It also makes URI one of just 22 universities nationwide eligible to grant the Certification in Transportation and Logistics from the American Society of Transportation and Logistics – a certification that gives URI graduates an advantage on a multitude of global job opportunities with starting salaries above $54,000.

Today's supply chain management major at URI was initially designed by College of Business Administration Associate Professor Douglas N. Hales, in collaboration with Assistant Professors James Kroes and Yuwen Chen and Professor Paul Mangiameli. The program has evolved to teach students skills in strategic planning, design, operations and improvement of all activities connected to the procurement, manufacture and delivery of finished goods and services, from the point-of-origin to the point-of-consumption. Studies are not limited to the boundaries of the Kingston campus, or even Rhode Island. Students learn about international policies and business practices that may differ from country to country. They engage in cross-cultural study abroad internships and learning experiences with manufacturing countries such as China. They also have the advantage of domestic internships with regionally based international companies like CVS Caremark, Hasbro, VIBCO Vibrators, Royal Bank of Scotland (Citizens Bank), and Ocean Spray.

At Rhode Island's South County Hospital, supply chain management students are assessing the entire diagnostic imaging operation to determine ways customer service can be improved and business efficiencies maximized. Working with the Economic Development Corporation and Deepwater Wind on the development of an offshore wind farm, URI students are examining issues related to permitting, port development, transportation, and the environment – a project that Hales says will affect the company's competitiveness regionally and globally. At the Quonset Development Corporation (QDC), supply chain management students are evaluating the business climate and demand for a potential mega-port for container freight shipping at Quonset Point in Rhode Island. Central to the supply chain program is intensive instruction in Lean Management and Manufacturing Principles and Six Sigma, both of which are designed to eliminate wasteful processes. Graduates of the program are eligible to seek Six Sigma Greenbelt Certification – a prestigious certification in process improvement now required for most US Government contracts.

Deborah Rosen, associate dean in the College of Business Administration, has started a student organization for the major. "Demonstrating distinct career paths will make this major popular," Rosen said. "Jobs are out there in this field."

Professor Hales has received a Korean Maritime Institute Research grant, a Rhode Island Department of Transportation grant, and a College of Business Research Grant, as well as funding from the URI Transportation Center, all vital to developing the best teaching strategies and promoting research in supply chain management. He has also been supported by INSIGHT, Inc., which provided $480,000 in industry best software that gives students training on the cutting-edge technologies used by businesses around the world. Students exiting the supply chain management program at URI are first in line to contribute to domestic and global business networks.

Professor Hales' current research is analyzing the economic and environmental impact of developing wind energy businesses at the Davisville Port in Quonset Point, Rhode Island. Quonset Point currently has 168 companies with over 8,800 employees and imports a small number of product containers each year. Hales and his colleagues have made a case for the environmental and financial benefits of making Quonset Point a more desirable destination and a potential East Coast hub for regional wind energy development. With the help of this research, the QDC recently received the only federal TIGER grant awarded to Rhode Island, in the amount of $22.3 million, to upgrade infrastructure to support wind energy businesses.

They are specifically researching the various impacts of receiving products from New York and Boston, including potential wind energy equipment. For example, they are investigating how shipping goods by barge along the Atlantic coastline instead of in trucks along already congested highways cuts costs and reduces our carbon footprint. Hales, Kroes, Chen and Mangiameli as well as supply chain management students continue to investigate the national and international potential for this Rhode Island port.

Consistent funding for the supply chain management area contributes to developing the economy of the State of Rhode Island as a global participant in business networks through research and education.

The supply chain management program at the University of Rhode Island is graduating highly skilled professionals who know how to control and manage business operations on a global scale – a considerable contribution to the emerging new economy of the nation's smallest state. Currently, 90 percent of the program's graduates receive job offers prior to graduation.

"Consistent funding for the supply chain management area contributes to developing the economy of the state of Rhode Island as a global participant in business networks through research and education."

Textile Science Wraps It Up for Wounded Soldiers, Police & Firefighters

University of Rhode Island Textiles Professor Martin Bide is an internationally renowned textile chemist who has played a key role in inventing a new "bioactive" wound dressing surface. It could revolutionize wound dressing for soldiers, police officers, firefighters and others who suffer a traumatic wound in the line of duty.

"We have developed a novel, lightweight, bioactive compression wound dressing that provides durable infection-resistance and has the ability to control bleeding," Bide says. "It is a living bandage that fights infection and stops bleeding."

This "bioactive bandage" is one of the results of a 20-year collaboration between Bide and Matthew Phaneuf, who is now president and chief technology officer of the Massachusetts biomedical firm, BioSurfaces, Inc. It began when Phaneuf was doing research on artificial arteries in the vascular surgery research unit at Beth Israel Deaconess Medical Center in Boston. His wife, a former student of Bide's, thought Bide might be able to help Phaneuf with a problem he was having in his research. The two partnered and eventually found a way to use a textile dyeing process to enhance the impact of antibiotics in fighting infection in artificial arteries. Bide says, "We have a multi-use textile with a multifaceted surface. We found a successful way to attach chemical groups without degrading the polyester." Bide and Phaneuf now hold patents on this and several other inventions.

The science behind their cutting-edge wound dressing is multidisciplinary, combining the unique elements of textile science and biochemistry. To construct the bioactive bandage, a textile polyester material with stretch properties is chemically modified so that it provides an anchor for protein attachment. Next, a broad-spectrum antibiotic is introduced into the material using textile dyeing technology. Finally, the biologically-active agent, thrombin, an important enzyme in the blood clotting process, is attached to the 'anchors.'

"The thrombin kicks off the body's clotting mechanism, and while that is working, the antibiotic is moving into the wound to prevent infection," Phaneuf says.

Incorporated into a single device, this bioactive bandage provides an innovative wound dressing that prevents uncontrolled bleeding by contracting the tissues or blood vessels while the thrombin promotes the rapid clotting of blood. Their invention has laid the foundation for other applications as well. For example, other bioactive agents could be added to the bandage to address other treatment issues, thus making the discovery more valuable and useful to a broader range of the population.

The revolutionary product is easy to apply and may be used on the battlefield by medics to treat injuries occurring during armed conflict. The medics can simply take this bioactive bandage out of a package and apply

“This new product provides an expedient method to prevent infection, reduce healing time and treat wounds successfully.”

it directly to the wound site. Without this new bandage, the medical personnel must use their hands to first apply pressure, clotting and anti-infection medications, then lastly attach the bandage. Bide’s new product combines these three steps and saves time in situations where rapid delivery and treatment are essential.

For soldiers, police officers, firefighters and others who suffer life-threatening wounds in isolated locations far from medical personnel, this new product provides an expedient method to prevent infection, reduce healing time and treat wounds successfully. A large proportion of trauma deaths happen because of uncontrolled bleeding, especially on the battlefield, which makes Bide’s and Phaneuf’s invention invaluable and potentially life-saving.

State Needs May Change Human Need Remains

Rhode Island state agencies such as the departments of Human Services, Children, Youth and Families, and the Executive Office of Health and Human Services, to name a few, face big budget cuts and staff reductions, but no shortage of needs in the communities they serve.

Deborah Mathews, principal investigator at the University of Rhode Island’s Center for Human Services, has worked with these RI state agencies for the past thirteen years helping employees strengthen skills to better deal with changing state needs.

Mathews partners with these agencies to help fortify employees’ skills, including leadership, supervision and project management. These skills are essential to accomplish the important work they do on a daily basis for the people of Rhode Island.

“I try to find how I can help organizations work with the resources they have,” Mathews said. “Though they may find many things challenging in this current climate, it’s important to utilize the energy and strengths they have in order to build a resilient, effective work force.”

Despite the challenges, agencies continue to meet the needs of Rhode Islanders.

Mathews says that one of the most promising partnerships has been working with the department of Children, Youth and Families to help with its current organizational culture change, the implementation of the Family and Community System of Care. The program would support family preservation and shift greater focus towards home and community-based support systems.

Deborah Mathews is just one example of many meaningful partnerships between the University of Rhode Island and Rhode Island’s human service community. She states, “I am continually impressed by people’s commitment to their work and their clients. These agencies constantly inspire me to provide the very best to help with their challenges and to attain their goals.”

Revolutionizing the Battle Against Cancer

Professors collaborating from the University of Rhode Island and Yale University are discovering new ways to detect and treat cancer. Yana Reshetnyak and Oleg Andreev from URI's physics department, along with Donald Engleman from Yale's department of molecular biophysics and biochemistry.

The groundbreaking new technology could revolutionize cancer treatment as we know it. The key is in cell acidity, and their technology can detect it. Researchers have known about tumor acidity for years, but did not know how to target it.

Engelman discovered a peptide that inserts across the membrane at acidic conditions, now called the pHLIP™ (pH Low Insertion Peptide). Reshetnyak, who joined his lab as a postdoctoral fellow in 2003, and Andreev, then a senior scientist at a cancer drug delivery company, suggested testing pHLIP™ as a cancer targeting agent since tumors develop in an acidic environment.

"It is possible" says Andreev, "that one day this novel detection method could be used as a universal procedure, similar to mammography or colonoscopies, but applicable to almost all types of tumors. The imaging test we are developing is useful because it has the potential to locate a problem before the patient ever feels ill."

The implications for pHLIP™ are even more far-reaching. Its unique ability to distinguish between diseased and normal tissues makes it a universal marker not only for cancerous tissue, but also for diseased tissue developed during ischemia, stroke, inflammation, arthritis, infections, wounds and other pathological states. The possibilities and applications for pHLIP™ in detection, treatment and imaging are vast due to the Reshetnyak-Andreev-Engleman team.

Since joining the University of Rhode Island's physics department in 2004, Reshetnyak and Andreev, along with Engleman, have made two innovative discoveries. First, that a modified version of the peptide can "find" a tumor in a mouse and deliver an imaging agent to cancer cells. Second, that pHLIP™ can act as a molecular nanosyringe that inserts a cargo molecule into the cell membrane and translocates cell-impermeable materials (therapeutic or diagnostics agents) inside the diseased cell while bypassing healthy cells.

"Since we know the mechanism of delivery and translocation, we believe that we are able to tune the nanosyringe properties and engineer a novel class of therapeutic and diagnostic agents," says Reshetnyak.

While the entire project is a collaborative team effort, Andreev is supervising the nanotechnology projects, cell microscopy and whole-

> "The ground-breaking new technology could revolutionize cancer treatment as we know it."

body fluorescence imaging, and projects for cancer detection. Reshetnyak is overseeing the biophysical studies of various pHLIP™ sequences and mechanism of the peptides interaction with membranes and the chemical conjugation of small molecules to pHLIP™ as well as the purification of the products.

Over the past four years their research has brought more than $6 million in extramural funding and the attention of several global health care and pharmaceutical companies to the University of Rhode Island. Their technology has already lead to the development of a joint research project with Rhode Island Hospital. "Drs. Reshetnyak's and Andreev's research offers a potential for a new and more effective approach to the treatment of cancer with radiation, making it highly intriguing and important," said Edward Sternick, PhD, medical physicist-in-chief for radiation oncology at Rhode Island Hospital and professor and vice chair of radiation oncology at the Warren Alpert Medical School of Brown University.

Reshetnyak and Andreev are also collaborating on a $1.5 million research grant from the National Institutes of Health National Cancer Institute with Jason Lewis, PhD, chief of radiochemistry service at Memorial Sloan-Kettering Cancer Center in New York City.

"Their research is innovative and exciting," said Lewis. "It is also timely; the understanding of the tumor microenvironment, and in particular, the pH of a tumor is believed to be important in the metastatic spread of cancer. The technology that the couple has developed could non-invasively predict the metastatic potential of cancer as well as monitoring the effectiveness of potential therapies. Their technology may allow for patient personalized therapies in the future."

Reshetnyak and Andreev are also working with Rhode Island Hospital (RIH) to develop a new five-year degree program that combines medicine and physics, yet another of the University of Rhode Island's innovative interdisciplinary majors created to respond to the world's changing needs.

"The proposed URI/RIH medical physics program now under consideration by URI is the first in New England specifically designed to closely integrate academic and clinical preparation," said Sternick. Graduates of the program will be sought after by hospitals to calculate radiation prescriptions for radiologists or by industry for the development of medical devices.

New technologies and treatments discovered by inventors such as Reshetnyak and Andreev are not only important to the health care and biotechnology industries but could potentially play an important role in the growing knowledge-based economy and Providence's rising Knowledge District - a proposed hub of high-tech and science-related start-up companies. Not only are Reshetnyak and Andreev revolutionizing the battle against cancer, they are placing Rhode Island at the forefront of a new growth in biophysics and health sciences.

Building a Prosthesis That Improves Quality of Life

University of Rhode Island researchers are developing an artificial leg to accurately anticipate its user's movement. This innovative technology could yield increased mobility for people with lower limb amputations.

Engineering professors Helen (He) Huang, Yan Sun and Qing Yang, are developing new methods for the design of prosthetic legs in hopes of improving amputees' ability to move with greater precision and ease. The Veterans Health Administration alone performs about 5,000 lower-limb amputations each year. At least 1,000 service members have suffered lower-limb amputee injuries in the current military conflicts in Iraq and Afghanistan. Thousands of additional amputees are treated outside the military health system each year.

The three researchers in the URI College of Engineering's electrical, computer and biomedical engineering department, recently received a grant for $1.4 million in stimulus funds from the National Science Foundation (NSF) under the American Reinvestment and Recovery Act (ARRA).

Receipt of the award will allow this team of engineers to conduct research that will enable the design of neurally-controlled artificial legs that may initiate a new direction for the research and design of prosthetic legs. Huang, Sun and Yang recognize that the loss of a limb can profoundly influence an individual's quality of life.

Their ground-breaking idea is to develop a neural-machine interface (NMI) prototype consisting of multiple sensors that reliably monitor neural and mechanical information to accurately determine the intent of an amputee's movement. The computer code or "algorithm" is implemented on a high-performance graphic processing unit (GPU) to meet real-time requirements. The GPU-based embedded system provides quantitative information to translate the patients desired movement into an actual movement. The final prototype will be attached to a self-contained prosthetic device.

Their work requires the distinct yet related areas of expertise which each researcher uniquely contributes to the project. Huang, a biomedical engineer and expert in neural control of prosthetics, leads the design of NMI software, development of instrumented prosthesis, and system evaluation on patients with leg amputations. Yang focuses on biomedical applications of computer engineering and embedded computer systems and applications. Sun, an electrical and computer engineer, ensures reliability of the NMI. They also collaborate with Nunnery Orthotic & Prosthetic Technologies, LLC, a North Kingstown, RI company, specializing in customized braces and artificial limbs and participating in rehabilitation care in nearby hospitals. Nunnery will provide their expertise and clinical insights on the socket and prostheses development. Huang and her team are assisted by undergraduate and graduate students who are gaining a rich hands-on experience in their labs.

Huang's proposed methods seek a technical breakthrough to accurately and reliably interpret human neuromuscular system and permit adequate computation power to process neural signals in real-time. The study allows cyber or computer systems to cope with uncertainty, a common challenge in cyber-physical systems, and will pave the way for applying high-performance computing to biomedical engineering. The work has tremendous potential for commercial applications and will create novel opportunities for disabled people to live a more varied life.

Huang, Yang and Sun are all award-winning academics with outstanding scholarship and funding track records. Huang was the 2008 recipient of the prestigious Delsys Prize for Innovation in Electromyography and has received the Mary E. Switzer Fellowship from the National Institute on Disability and Rehabilitation Research in the US Department of Education. She also received grants from the National Institutes of Health, Rhode Island Science and Technology Advisory Council, and the Telemedicine and Advanced Technology Research Center in the US Department of Defense. Yang is an Institute of Electrical and Electronics Engineers Fellow, an honor reserved for engineers who have demonstrated unusual distinction in the profession, and he holds more than 15 patents. His research in computer architecture and parallel processing has been supported continuously by NSF for the past 20 years and he has published numerous technical articles in the field. Sun is the 2007 winner of the prestigious NSF Faculty Early Career Award. She has served on technical program committees of several international conferences on security, networking and wireless communications. She holds two pending US Patents and co-authored the book "Network-aware Security for Group Communications."

Huang began her career in motor control as a postdoctoral research associate under the direction of Todd A. Kuiken, MD, PhD, in the Neural Engineering Center for Artificial Limbs at the Rehabilitation Institute of Chicago. "Huang's work has great potential to become an effective neural interface for the next generation of lower limb prostheses. I believe her work has launched an important new area of analysis, with clinical applications that are far reaching," praises Dr. Kuiken.

"The work has tremendous potential for commercial applications and will create novel opportunities for disabled people to live a more varied life."

Answering Employer Needs Across the Region

Eighteen million dollars. That's how much University of Rhode Island Education Professor John Boulmetis has received in grants and contracts since joining the university 37 years ago. He also just happens to be highly sought after by local, state and federal agencies for his expertise in program evaluation, staff training, program development and research.

The list of agencies that have drawn upon Boulmetis' expertise is long: from the Rhode Island departments of education, human services, corrections, elderly affairs, and others, to the Connecticut Department of Education, to local school districts here and in neighboring states, to national industries including Texas Instruments, McNeil Consumer Products, and Pizza Hut.

"The skills used in curriculum development, program planning, training and evaluations are universal and can apply to a variety of agencies, institutions and environments," Boulmetis says. "People and agencies look to URI to assist in their planning and implementation efforts. I'm energized by working with professionals in workplaces that are both new and familiar."

The fact is, professor Boulmetis is a leader and innovator in the education of educators. He is director of the University of Rhode Island's Center for Human Services and coordinator of graduate studies for the School of Education. Despite these leadership roles, he hasn't walked away from the classroom he loves. In fact, he still coordinates and teaches for the university's graduate program in adult education. Thanks to professors like John Boulmetis, the University of Rhode Island is relied upon as a valuable resource to the educational and economic sectors of Southern New England. And that's no small thing.

Antibiotic Resistance – A New Perspective on an Old Problem

When penicillin became widely available it was a medical miracle. But four years after drug companies began mass-producing penicillin, microbes quickly developed resistance.

Worldwide, methicillin-resistant *Staphylococcus aureus* (MRSA) is one of the most drug-resistant bacteria known to man. In 2005, 94,360 infections were reported, of these cases 20 percent (18,650) resulted in death and these numbers continue to increase. MRSA, the bacteria known as the "super bug" has killed more people than HIV.

Today, controlling antibiotic-resistant bacteria and subsequent infections is an increasingly important public health concern because it dramatically impacts the lives of patients and contributes to escalating hospital costs. MRSA bacteria communicate through cell-to-cell signaling. These cells make a biofilm to protect themselves from our body's immune system. It is this biofilm that even antibiotics cannot penetrate, allowing the infection to spread and possibly become fatal.

University of Rhode Island College of Pharmacy Assistant Professor Kerry LaPlante specializes in infectious disease research, particularly the treatment, virulence inhibition, colonization and control of MRSA. Her clinical practice site is at the Veterans Affairs (VA) Medical Center in Providence, Rhode Island. LaPlante's innovative collaborations and ground-breaking research are already making an impact and gaining recognition on an international level.

Professor LaPlante has received over a quarter of a million dollars in funding from the National Institutes of Health, the Rhode Island Science and Technology Advisory Council, and the American Association of Colleges of Pharmacy. Over the last five years, she has received almost half a million dollars in industry grants, including nearly $164,000 from Pfizer, $91,000 from Cubist Pharmaceuticals, and $104,000 from Astellas. Not only does the funding demonstrate industry recognition for the value of her work, but it is also critical to further her research.

At the VA her research is conducted in a cutting-edge laboratory featuring the unique catheter-lock model, which allows scientists to grow bacteria in the catheter and test "novel agents" or new kinds of antibiotics. She is developing new ways to effectively treat resistant infections and to manage reservoirs of antibiotic strains in the environment.

MRSA is responsible for several difficult to treat infections and is the most common cause of "staph" infections. The likelihood of being infected with staph is greater in hospitalized patients who have open wounds from catheters, ventilators and other surgeries. Catheter-related bloodstream infections in particular are a serious problem in the US. They cause up to 20,000 deaths each year, and, according to the Centers for Disease Control, generate hospital costs ranging between $296 million to $2.3 billion annually.

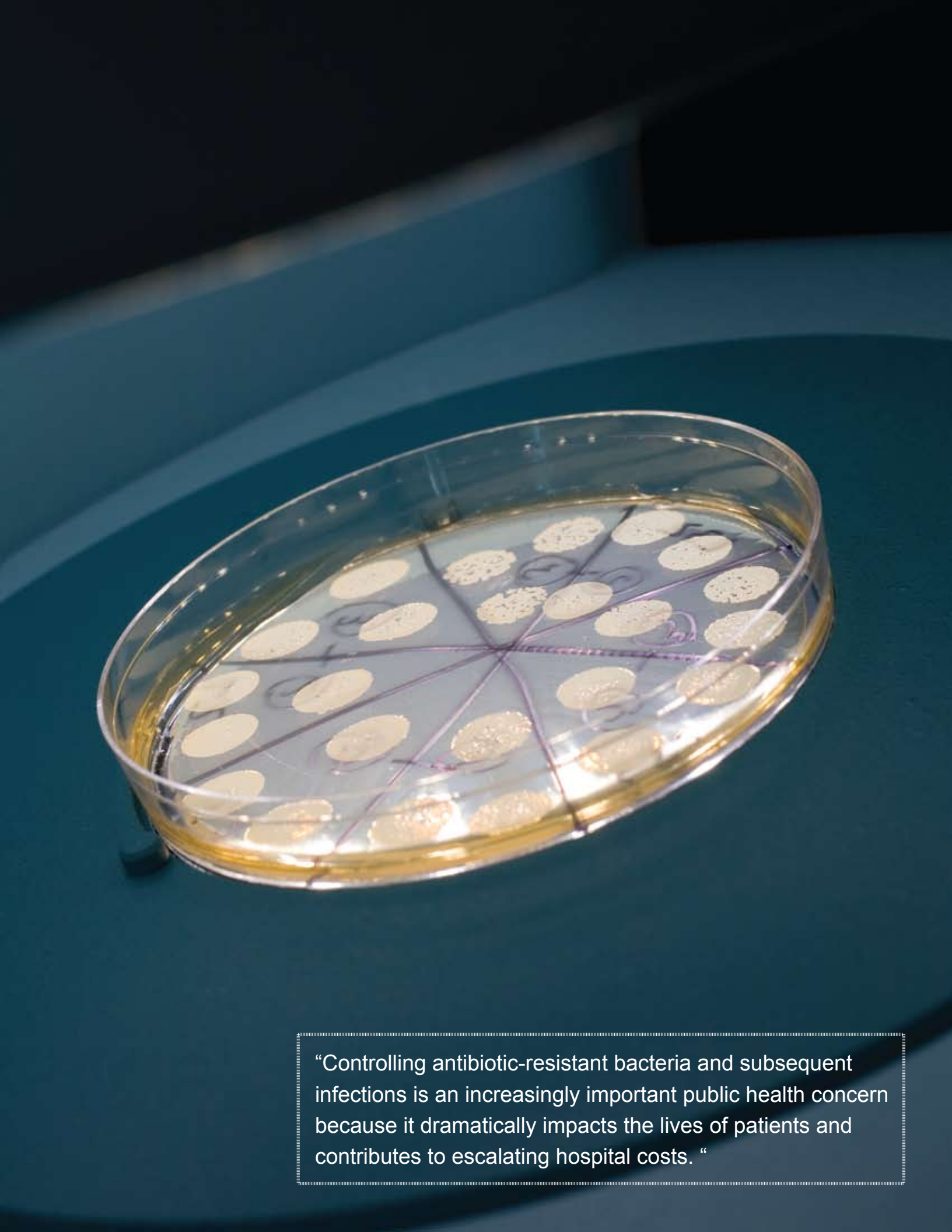
LaPlante, along with another University of Rhode Island College of Pharmacy Professor, David Rowley, and Dr. Leonard Mermel of the Rhode Island Hospital and Brown University Medical School, received an award from the Rhode Island Research Alliance to investigate new compounds that may prevent MRSA from infecting patients. "We are trying to find a molecule that can serve as a tool to prevent infections," Rowley says. Led by LaPlante, the team hopes to discover molecules that reduce virulence in *Staphylococcus aureus.* Their goal is to develop an anti-pathogenic drug that can halt bacterial colonization in medical devices like catheters and treat systemic infections.

Rowley isolates antibiotics in marine bacteria and sends them to LaPlante's lab for testing against MRSA. To find the desired types of compounds, the team has evaluated a large library of molecules produced by marine bacteria and fungi. To date, they have found 10 samples that inhibited toxin production by *Staphylococcus aureus.* Additionally, Dr. Mermel collaborates with LaPlante on the development of newer and older antibiotics and uses the catheter-lock model in her lab to test them.

These compounds will serve as novel starting points for pharmaceutical development, thereby impacting the lives of thousands of patients worldwide and producing tremendous costs savings for consumers and health insurance costs. This collaboration receives support from pharmaceutical companies and biotech companies in Boston and San Francisco.

LaPlante's work at the VA Medical Center puts her at the heart of infectious disease research. The VA hosts the largest database of infectious disease research in the healthcare system. URI also provides LaPlante with valuable resources for her research, and in turn LaPlante cultivates the potential for putting the university at the forefront of infectious disease research on a national and international scale.

"Federal, state and industry support has allowed me to dedicate more time to research," says LaPlante. "This means more time in the lab where I can develop and test ideas that have both commercial potential and practical results – results that can be brought to the hospital bedside and save patient lives."



“Controlling antibiotic-resistant bacteria and subsequent infections is an increasingly important public health concern because it dramatically impacts the lives of patients and contributes to escalating hospital costs. “

The Epicenter of Tsunami Prediction Research

Stephan Grilli, University of Rhode Island Distinguished Professor of Ocean Engineering, has been collaborating with fellow URI ocean engineering professors Malcolm Spaulding and Annette Grilli-Delrez along with Raymond Sepe, Jr., and Steven Bastien of Electro Standards Laboratories in Cranston, Rhode Island to develop a renewable wave-energy-powered generator for free-floating ocean buoys. This cutting-edge development is crucial to acquiring wave data that can be used for ocean engineering design and disaster prediction and preparedness, in particular regarding tsunami coastal hazards, and could stimulate local business opportunities in related areas.

A 9.1 magnitude earthquake, the third-largest ever recorded, struck the coast of Sumatra, Indonesia, on December 26, 2004. The devastating Indian Ocean tsunami that followed killed more than 280,000 people.

Tsunamis are caused by a number of natural occurrences including earthquakes and volcanic eruptions, but other natural hazards such as hurricanes, can cause similar coastal destruction. In 1938, Rhode Island experienced the deadly effects of a hurricane, which generated tsunami-like surges as high as 18 feet. “In that instance,” says Grilli, “models to predict the wave magnitudes and inundation levels would have saved countless lives.”

The only way to avoid a natural disaster is to be prepared for it, according to Grilli. He is a world-renowned expert in computational wave and fluid dynamics, coastal and surf-zone modeling, and wave-structure interaction. In other words he is researching the science of tsunami prediction. “For each type of tsunami, the ability to predict wave magnitudes, arrival times to shorelines, and inundation levels is critical to public safety,” he says.

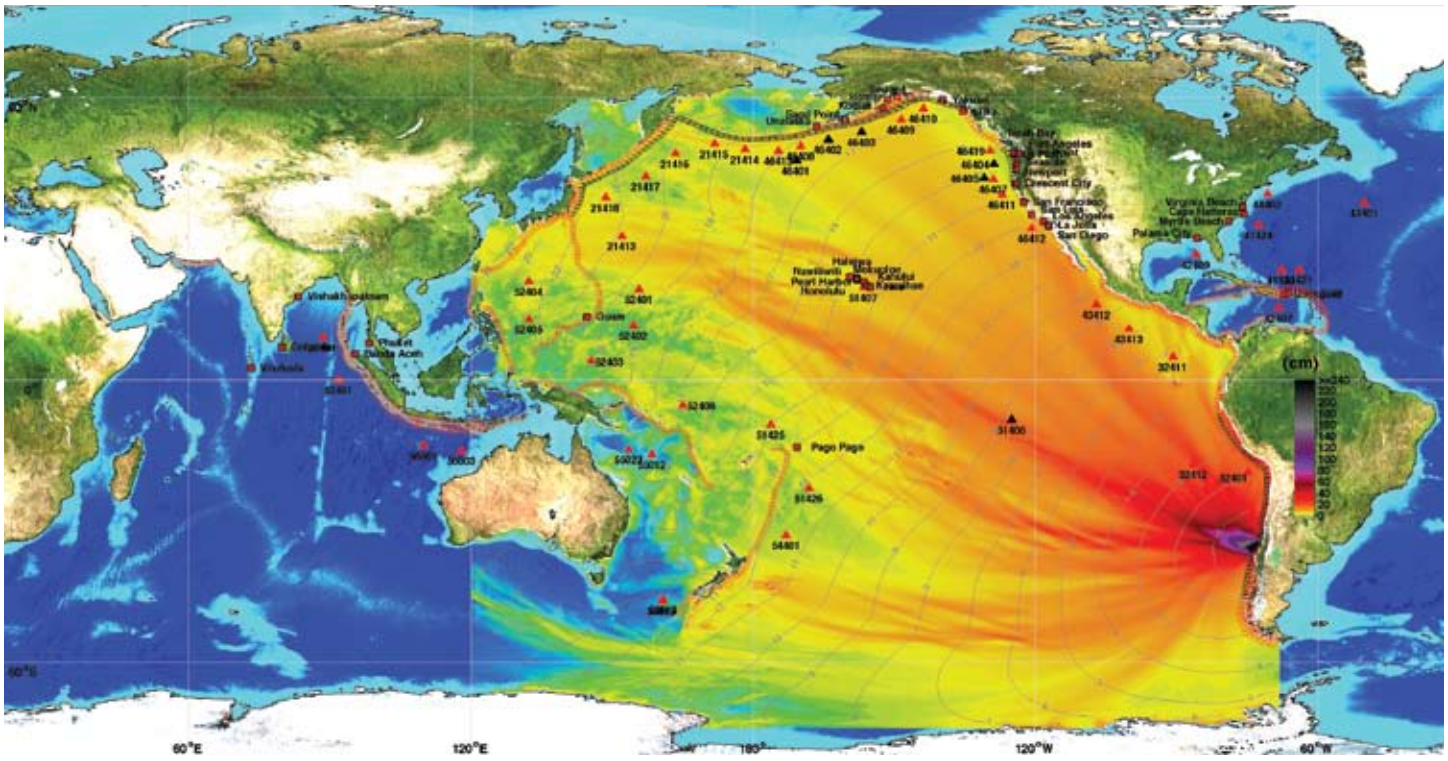
Over the last 20 years and with funding from the Office of Naval Research and National Science Foundation (NSF), Grilli has developed a numerical wave tank, a computer model that simulates physical processes taking place in actual wave tanks. His most recent grant for $200,000 was provided by the Rhode Island Science and Technology Advisory Council.

“To predict generation and impact, the NOAA [National Oceanographic and Atmospheric Administration] Tsunami Warning Centers use a variety of tsunami generation and propagation/impact models. My research helps to improve the state of the art in modeling and eventually will help make more accurate real-time predictions.” says Grilli.

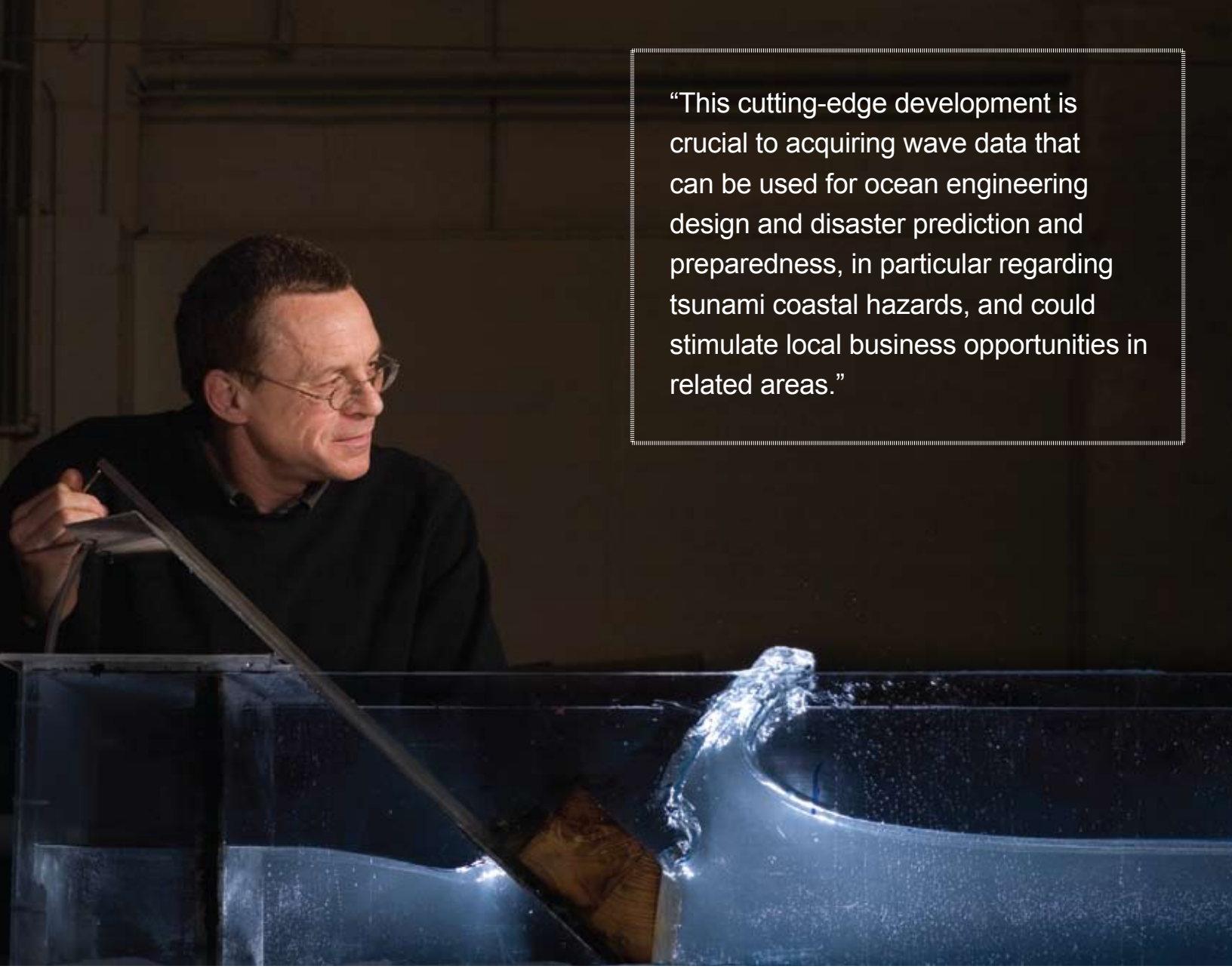
In the past few years, a $160,000 research grant from FM Global, an international insurance company based in Rhode Island, has allowed Grilli to research both distant transoceanic earthquakes and landslide tsunami sources and their impact on the East Coast. “In essence,” he says, “recreating a realistic history of potential tsunami events, allows us to estimate 100-year and 500-year return period events and their impact. This work not only prepares insurance companies to qualify their rates for the designated areas, but also informs policy surrounding disaster preparedness.”

After the Indonesian tsunami in 2004, Grilli co-organized an international team of 27 scientists who traveled to the region for a 17-day research expedition to study the sea floor near the epicenter of the earthquake that triggered the devastating Indian Ocean tsunami. The expedition was filmed by the Discovery Channel and broadcast in 2005.

Using remotely-operated vehicles and other techniques, scientists found



Possible tsunami effects of February 27, 2010 Chile earthquake



> "This cutting-edge development is crucial to acquiring wave data that can be used for ocean engineering design and disaster prediction and preparedness, in particular regarding tsunami coastal hazards, and could stimulate local business opportunities in related areas."

geologic evidence of disturbances on the seafloor that triggered the tsunami wave, and surprisingly fewer underwater landslides and less widespread disturbance than expected given the size of the earthquake. One major underwater landslide they examined probably occurred more than 1,000 years ago. However, in an area they called The Ditch, Grilli's expedition team found large vertical displacements of the seafloor that were very fresh and almost certainly the result of the December 26 earthquake.

Scientific findings during the expedition enabled Grilli to refine his tsunami model to better predict the next one, in time for inclusion in the Discovery Channel broadcast. In it, Grilli applied his updated model to the Cascadia fault off the Oregon coast where seismologists have long predicted a large earthquake, possibly up to 9.0 in magnitude, could occur. His preliminary model results predicted that an earthquake of that size could generate tsunami wave run-ups of up to 20 meters (66 feet) in some locations along the Pacific Northwest coast – almost three times higher than previously predicted – and significant waves could reach as far away as Japan and Russia.

The documentary led to worldwide exposure of Grilli's research, awareness of tsunami hazards and the importance of developing models for tsunami prediction. It also helped to place tsunamis higher on the research agenda of a variety of funding agencies. Grilli was subsequently awarded a $175,000 three-year grant by NSF to improve the modeling of tsunamis generated by large earthquakes and the resulting coastal impact.

In the Pacific Northwest, where there is an anticipated tsunami risk, NOAA's Tsunami Hazard Mitigation Program (NTHMP) has provided financial support in recent years to scientists. They have developed more accurate tsunami source scenarios, such as the Cascadia fault, as well as the detailed coastal inundation and evacuation maps which were just released. Grilli is hoping to receive similar NTHMP funding to establish similar maps for the East Coast.

Tsunamis may be few and far between, but when they occur the impact is often devastating. URI Professor Stephan Grilli is an international leader in tsunami prediction technologies that will one day lessen the tremendous cost of tsunamis, not only in dollars but in human lives.

An International Program Engineered with Global Business and Industry in Mind

The International Engineering Program (IEP) at the University of Rhode Island has become the "gold standard" for global preparation of American engineering students. Unique at its inception, the five-year dual-degree program leads students to degrees in both engineering and a foreign language. It is built on partnerships with private business and industry and is designed to respond to industry needs for engineers with cross-cultural communication skills and international work experience. It has become a model for international engineering programs across the United States.

URI German Professor John Grandin conceived the program in 1987 along with former engineering dean Hermann Viets, and has served as director since its inception. His vision and leadership have made the program an overwhelming success, evidenced by tremendous private and public support, its near 100 percent job placement rate, and the fact that it continuously attracts and enrolls top students from Rhode Island and across the country.

Rhode Island companies including General Dynamics, Raytheon, Pentair, Supfina, and Hexagon (formerly Brown & Sharpe) all value and regularly hire URI international engineering graduates. Alfred J. Verrecchia, Chairman of the Board at Hasbro, Inc., is convinced of the economic value of the program. "Vital to our current and future success is a strong and talented multinational workforce. Engineers are a critical component of that workforce. Having a global engineering presence with the associated language and cultural knowledge is a huge advantage as we work to grow our global markets" he said.

Unlike students at other schools, URI's IEP students are not only working towards their engineering degree, but are also double-majoring in the language and culture of Germany, France and Spain, or minoring in Chinese and Asian Studies. The students also travel abroad for a full year to study at one of the university's partner institutions in Europe, Latin America or Asia, and intern at an overseas engineering firm.

In the fourth year of the five-year program, students spend a full year abroad. "Ours is the first program in the nation to offer a complete language degree, a complete engineering degree, and a year abroad, all in five years," said Grandin. "It has become a model that many other universities have followed."

URI is educating more bilingual and cross-culturally competent engineers than any other university in the country. The impact of this program can be seen at the state level when graduates go on to work for Rhode Island companies such as General Dynamics/Electric Boat, a design and construction facility in nearby Quonset Point that employs over 10,000 people. Students are also employed by international companies in Rhode Island such as Raytheon, Hexagon, Supfina, American Power Conversion and Pentair Electronic Packaging in Warwick, a global provider of engineering solutions.

In high demand by global companies, URI graduates are working in the US, Asia, and Europe for well-known companies such as Boeing, Johnson & Johnson, Siemens, Sensata Technologies, Continental, General Electric and BMW.

Grandin is always looking for ways to keep the International Program current. In cooperation with colleagues in engineering and the biological sciences, and with a $2.4 million five-year Partnership in International Research and Education (PIRE) grant from the National Science Foundation, URI developed a joint research program and dual-doctoral degree with the Technical University of Braunschweig in Germany. The goal is to graduate high-level researchers with the capability to work effectively on cross-cultural global teams.

In 2007, the generous support of Sensata Technologies, the Max Kade Foundation, and ZF Friedrichshafen AG, URI dedicated its new Texas Instruments House, adjacent to the Heidi Kirk Duffy Center for International Engineering Education. Together, the two buildings house about 80 international engineering students in a unique living-learning community that provides an enriching opportunity for students in the same discipline to live, study and collaborate together.

Thomas Wroe, president of Sensata, a 1972 URI alumnus, and Donna Kimmel, senior vice president, serve on the IEP Advisory Board. The Pawtucket-based Hasbro Inc. and its CEO, Alfred J. Verrecchia, a University of Rhode Island graduate and honorary degree recipient, have also been generous supporters of the program.

Grandin, who will retire this June after 40 years at URI, has received numerous awards for his work combining languages and engineering, including the Federal Cross of Honor from the Federal Republic of Germany, the Award for Educational Innovation from ABET, and the Michael P. Malone Award for Excellence in International Education from the National Association of State Universities and Land Grant Colleges.

Grandin's legacy will not retire with him. URI's International Engineering Program is still one of a kind and soon will be ably led by Dr. Sigrid Berka, who recently joined the IEP from the MIT Germany Program. The IEP is a model that other universities emulate. Its graduates are working successfully at engineering companies locally and globally.

"Vital to our current and future success is a strong and talented multinational workforce. Having a global engineering presence with the associated language and cultural knowledge is a huge advantage as we work to grow our global markets."

Alfred J. Verrecchia, Chairman of the Board, Hasbro, Inc.

Combining French with Other Disciplines Proves Magnifique!

Alain-Philippe Durand, Professor of French, English, and Film Media and Head of the French and Francophone Studies Program, has developed exchange programs with two universities and a business college in France, and has developed joint programs with the College of Pharmacy and with the Department of Textiles, Fashion Merchandising and Design. In 2007, he was awarded France's highest teaching honor, the Ordre des Palmes Académiques, originally established by Napoleon.

Professor Durand is so committed to the study of the French language that his mantra is: "The B.A. in French - don't leave URI without it!" More and more students are heeding his advice, making URI's French program one of the largest in America.

Over the last decade, the number of undergraduates majoring in French has quintupled from 30 to 160, surpassing even Harvard University. Durand is excited by the program's expansion and the students' response. "My colleagues and I are constantly working to develop a true sense of community. Our program is demanding, but it is also a lot of fun. The opportunities for both French students and graduates are endless," he says.

Through a unique interdisciplinary partnership between URI's language and international engineering programs, URI is educating more bilingual and cross-culturally competent engineers than any other university in the country. URI also offers dual programs combining French with more than 45 majors offered on campus.

Lars Erickson, Director of the French IEP, stated that students ask why they should study French with engineering. "France is one of the strongest economic forces in Europe, with a highly trained workforce," Erickson tells them. "There are huge French investments in the US, as well as American investments in France, and the IEP has proven a clear demand for American trained engineers with good French skills."

Many students choose US based employment with varying degrees of cross-cultural interaction and foreign travel, and have been selected for management and leadership-track opportunities here and abroad. They are seen as a unique resource to hire for local businesses with ties to companies around the globe. URI's dual-degree program has given graduates an important edge during these difficult economic times.

Improving the Quality of Teacher Education has an Impact in Rhode Island

No Child Left Behind. Standardized test scores. Teacher quality. Transforming teacher education is an important issue and the University of Rhode Island is in the midst of it all, providing leadership and innovation for an important national issue. The goal is simple, its impact is significant – give the best training possible to the next generation of teachers, so they can offer the best teaching to future generations of Rhode Islanders.

The University of Rhode Island has designed and implemented an innovative, statewide project aimed at reforming teacher education. Improving the quality of teacher education is the goal of the Rhode Island Teacher Education Renewal (RITER) project – a $7.5 million Teacher Quality Enhancement Partnership grant from the US Department of Education.

The five year RITER project is led by two teacher training innovators, URI professors David Byrd and Peter Adamy. “Research has consistently found teacher quality to be the most important factor in how successful students are in school,” says Adamy. He and Byrd are intently focused on improving teacher quality by improving subject matter knowledge, integrating technology into teaching, and strategies for teaching diverse student communities, as well as improving strong mentoring programs for new teachers and non-traditional certification in high-need areas.

Through this grant URI has established valuable partnerships with several other Rhode Island institutions of higher education, including Brown University, Johnson and Wales University, Providence College, Rhode Island School of Design, Roger Williams University, Rhode Island College and Salve Regina University. These eight approved teacher preparation programs have achieved immense success throughout the course of this project.

“We have formed a partnership with all of the teacher education programs in the state, which has allowed us to have increased and sustained communication regarding teacher education policy and practice in Rhode Island at an unprecedented level,” says Adamy. Both Byrd and Adamy also point out that partnering with other teacher education programs increases the amount of resources available to the schools involved.

The grant partnership also includes three high-need Rhode Island school districts – Central Falls, Newport and Pawtucket. It also includes two state education agencies, the Rhode Island Department of Elementary and Secondary Education and the Rhode Island Office of Higher Education.

Adamy cites the partnership between the statewide higher education institutions, school districts and education agencies as integral to

> "Preparing educators is one of the best things Rhode Island can do for a prosperous economic future."

developing and implementing new teacher education strategies. "This partnership has allowed us to work more closely with these school districts. The grant funding has provided resources for training and equipment that might not have been there without it."

One of the transformative aspects of this project has been the interdisciplinary collaboration at the University of Rhode Island. Aspiring teachers at URI's School of Education are required to choose a second major in an Arts and Sciences discipline, such as history, economics, mathematics, English, language, sociology, art, and classical studies, to name a few. "This way," Adamy states "we are able to ensure that they will have expertise in a content area, as well as the experience and skills that come from an in-depth study in one area."

Students are also paired with teachers in partner school districts who serve as advisors and mentors. URI's curriculum and instructors are excellent, but Adamy says, "The most valuable learning comes from having hands-on experiences and opportunities to apply the technical and theoretical knowledge they are getting at the university."

The success that Byrd and Adamy have had with the RITER project has led them to develop and submit another proposal to the US Department of Education for $8.3 million to fund a more intensive partnership with four high need districts: Providence, Pawtucket, Woonsocket, and Central Falls.

Preparing educators is one of the best things Rhode Island can do for a prosperous economic future. "Without good schools and without good teachers, the economy cannot develop," Byrd says.

The RITER program is working. In 2004-2005, its inaugural year, prospective teachers had a pass rate of 91 percent on national teacher exams. By 2006-07, pass rates had risen to 98 percent.

The University of Rhode Island is one of only 11 institutions nationwide recognized by the National Council for Accreditation of Teacher Education for its exemplary teacher education program reports. URI had a standard basic skills test for teacher candidates 10 years before the state required it.

When it comes to educating Rhode Island's future teachers, the University of Rhode Island has positioned itself strategically to help create a prosperous economic future as well as serving as a possible model for education programs nationwide.

URI Enhances Statewide Biomedical Research and Training Network

In May 2009, the University of Rhode Island was awarded one of the largest research grants in its history – a five-year, $18 million grant called RI-INBRE. The project is entitled the "Rhode Island Network for Excellence in Biomedical and Behavioral Research" and is funded under the National Institutes of Health (NIH) Institutional Development Award (IDeA) Network of Biomedical Research Excellence (INBRE) Program. Add to this big grant another $1.3 million award in 2009 from the American Recovery and Reinvestment Act, a $16 million IDeA Network grant from NIH in 2004, and an $8 million IDeA grant in 2001, and you could say the University of Rhode Island's biomedical research and training program is doing big things in the Ocean State.

The research opportunities and educational resources made possible by the RI-INBRE Program have positioned Rhode Island to be a leader in biomedical education and research. According to the University of Rhode Island President, David M. Dooley, "Awards like the RI-INBRE are especially important because they build institutional capacity in both facilities and core personnel. These become the foundation for building a stronger and larger research enterprise at URI. The work of our faculty and staff who made this award possible will make a substantial contribution to the University for years to come."

The program has resulted in serious work enhancement in Rhode Island's overall biomedical research capacity. In fact, RI-INBRE participants are preparing and educating the state's next generation of scientists for high-wage jobs, enhancing statewide economic development in the biomedical and biotechnology industries, and significantly increasing education, research and ultimately employment opportunities in the state.

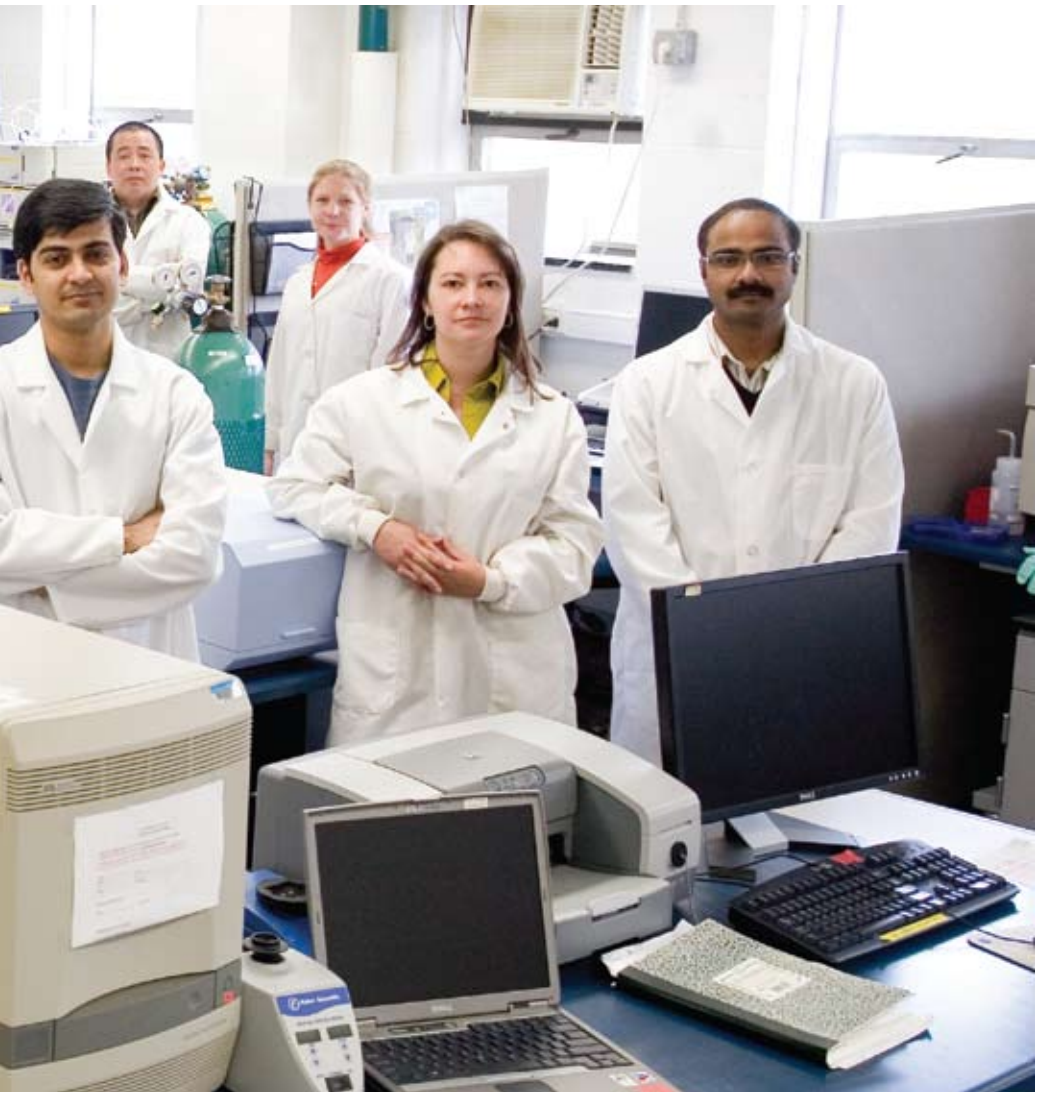
It is all being led by URI Pharmacology and Toxicology Professor Zahir Shaikh, who is also Director of the Center for Molecular Toxicology in the URI College of Pharmacy, Principal Investigator of the grant, and Program Director since the inception of the program. RI-INBRE is leading unprecedented statewide cooperation and collaboration through a research network consisting of Brown University, Rhode Island College, Providence College, Roger Williams University, and Salve Regina University in three research areas – molecular toxicology, cell biology, and behavioral science. The program also reaches out to the Community

College of Rhode Island to recruit students for research training during the summer. NIH funding has created this opportunity for statewide cooperation and collaboration between the institutions and their faculty that did not exist before.

RI-INBRE primarily makes significant financial support available to junior faculty for establishing their own research programs. They are matched with senior faculty who assist in publishing their research findings, obtaining independent grant research funding, and creating sustainable research programs that would provide opportunities for student training into the future. In addition, student training is supported in the laboratories of more established faculty. The Undergraduate Research Fellowship Program provides summer research opportunities for students who are considering careers in the biomedical sciences.

As part of the initial funding, the University of Rhode Island became home to a Centralized Research Core Facility, a fully staffed, $3 million research equipment facility that is the only one of its kind in the state and is utilized by researchers from all participating institutions. Network wide, the RI-INBRE has already supported 20 new faculty hires, 74 individual research projects, and research training of over 600 undergraduate and graduate students, and post-doctoral fellows. As a result, participating faculty have made nearly 500 presentations at scientific meetings, placed over 150 publications in peer-reviewed journals and received more than $14 million in additional extramural funding.

Ronald P. Jordan, dean of the College of Pharmacy, says the program and its accompanying grants are playing a key role in accelerating biomedical research in Rhode Island. “This sector of our economy will bear more fruit in the next several years as the state moves toward a knowledge-based economy that will leverage this research, our highly qualified Rhode Island health delivery institutions, and new information and biological technologies emanating from multiple colleges at URI and our partner institutions. The newest grant ensures that the underlying workforce and intellectual development needed in these areas will continue. It positions our College of Pharmacy to play a key role in advancing the State’s agenda.”



Nanoparticle Research on a Big Problem

Radha Narayanan, assistant professor of chemistry, has some very big ideas about something very small. She’s doing research about how gold nanoparticles can be used to solve the growing global problem of environmental pollutants in water. Her innovative idea is to build a handheld biotechnology lab that can detect trace pollutants like bacteria or chemical toxins in water.

She uses a technique called Surface Enhanced Raman Spectroscopy, or SERS for short, which enhances the scattering of molecules absorbed on a rough metal surface. When a drop of tainted water is added, the pollutant molecules bind to the gold nanoparticles and produce an on-the-spot, quantitative readout that indicates the water is polluted.

Her work is so impressive that Narayanan recently received a $40,000 starter grant from the Society for Analytical Chemists of Pittsburgh. The award is presented annually to the junior faculty member considered the best in the nation in analytical chemistry, to encourage high-quality, innovative research.

Radha Narayanan joined the University of Rhode Island in 2008 with an international reputation in the field of gold nanoparticles. “But it is her work applying her expertise to an important environmental program that is the basis for this prestigious recognition,” says URI chemistry chair William Euler.

“We are particularly proud to see one of our junior female faculty members receive this prestigious award,” said Winifred Brownell, dean of the College of Arts and Sciences.

Her idea for using gold nanoparticles for early detection of water pollutants has practical and far-reaching implications. Specifically, it could allow for quick and cost effective remediation efforts by business, utilities and others who are required by law to meet federal Environmental Protection Agency standards as well as state and local health codes.

BOOKS AND ELECTRONIC MATERIALS, PUBLISHED BY UNIVERSITY OF RHODE ISLAND FACULTY MEMBERS, 2009

Compiled by Margaret J. Keefe, Professor, University Libraries

Not all disciplines lend themselves to publishing in book format. University of Rhode Island faculty publications include journal articles, technical reports, performance reviews, etc. For the complete list of Faculty Publication please see:

www.uri.edu/library/faculty_publications/index

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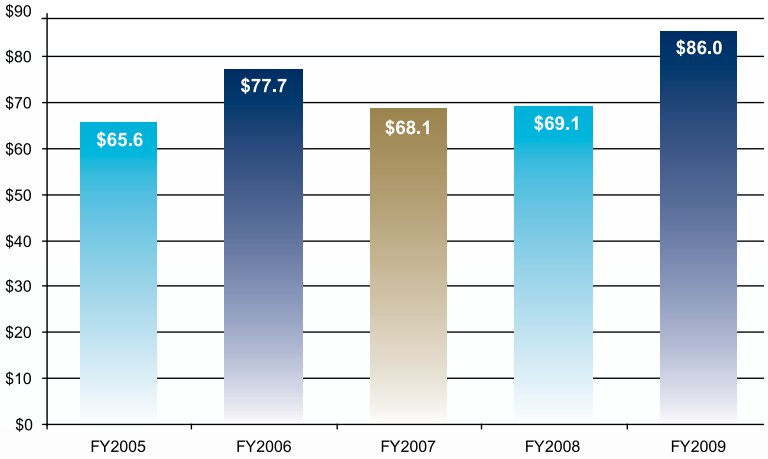
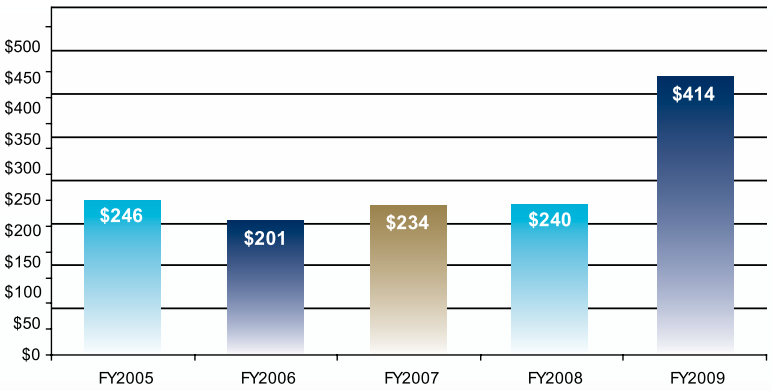
URI'S RESEARCH ENTERPRISE AT A GLANCE

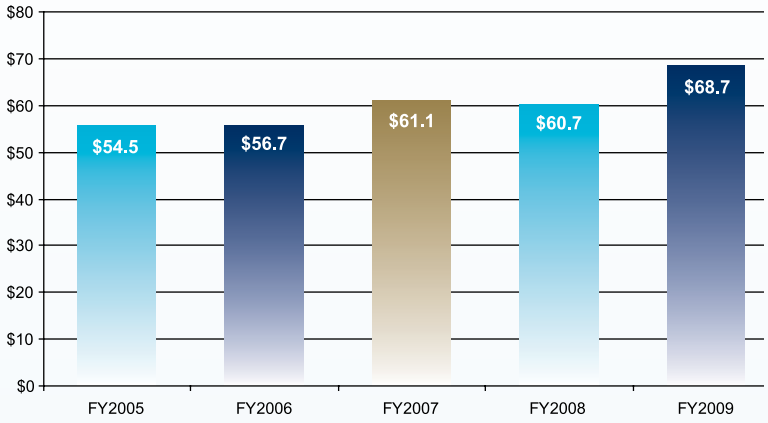
Sponsored Program Awards FY2005 to FY2009
[$millions]



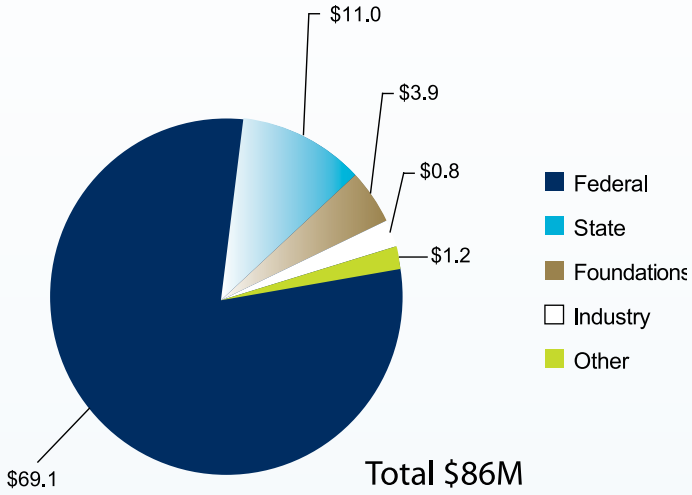
Dollar Value of Proposals FY2005 to FY2009
[$millions]



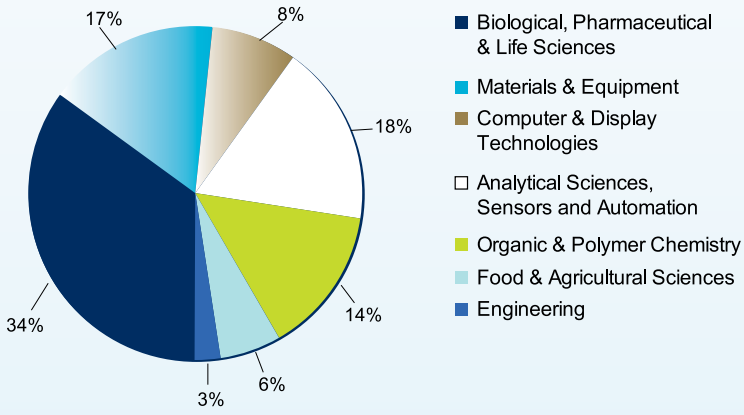
Sponsored Programs Expenditures FY2005 to FY2009
[$millions]



Sources of Grants and Contracts Funding FY2009
[$millions]



Invention Disclosures, 2005 to present



2005 - 2009 PATENT & LICENSING ACTIVITY

	Disclosures Received	US Patent Applications Filed	US Patent Issued	Licenses Generating Royalties
2009	26	21	5	14
2008	17	19	3	9
2007	14	23	4	7
2006	22	29	4	6
2005	11	20	9	7

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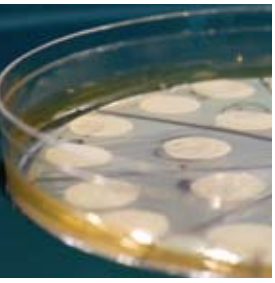

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