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RESEARCH & INNOVATION

2011-2012

THE
UNIVERSITY
OF RHODE ISLAND

DIVISION OF RESEARCH &
ECONOMIC DEVELOPMENT

Bringing URI Ocean Research to Bear on Rhode Island Economic Development

DAVID M. DOOLEY, Ph.D.
President

This issue of *Research & Innovation* features the productive, wide-ranging, and internationally prominent research done at the University of Rhode Island done in the areas of marine and coastal science, engineering and policy. It is an excellent time to emphasize both our past success and our potential for even greater success in the coming years. I am sure you will agree that the URI community, our partners, and the state of Rhode Island, should all be proud of the work of our faculty, students, and staff in advancing our understanding of, and appreciation for, the world's oceans and coastlines.

However, there is another aspect of this report that I find equally important. If you read closely, I think you will see multiple ways in which scholarship and teaching across the campus impacts our local and larger communities and the wider world. As a research university, the University of Rhode Island is engaged in scholarship that spans the entire range of human endeavor and our search for understanding. URI continually contributes new ideas, new vision, new analysis, and new creative works in the humanities, the social sciences and the arts. Hundreds (maybe more) of our undergraduates are involved in the rich scholarly and creative work of these essential parts of the University of Rhode Island. I hope you will join me in supporting and celebrating the enormous contributions of URI faculty and students in research, scholarship, and creative work – across the entire university.

David M. Dooley, Ph.D.
President

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

Welcome to the 2012 edition of *Research & 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. External grants and contracts to URI have increased nearly 40 percent during the three-year period 2009-11 for an average annual yield of $95.6M compared to the previous six-year period 2003-08 at an average annual yield of $68.6 million. The corresponding economic impact of these dollars is increasingly significant. An economic analysis of the $105 million in awards received in fiscal year 2010 estimates an economic impact of $174.7 million, which represents new money to the state that we would not have otherwise and in turn creates an additional 1,742 jobs and $33.9 million in federal, state, and local taxes. And these numbers do not include the revenue and resultant economic impact that accrues with the commercial enterprises that stems from URI research generated inventions.

The theme of this year's magazine reflects URI's status as a Land Grant university in our nation's Ocean State; namely, the wide variety of work under way at URI and in conjunction with our partners in the private and public sectors that is in support of the planet's oceans and coasts. Ranging across research programs in fish and fisheries, ocean engineering, marine biology, oceanography, marine law, coastal management, tourism and recreation, aquaculture, marine archeology, tsunami and general weather prediction, renewable and sustainable energies from the oceans, our researchers are engaged in a myriad of ways to sustain our planet and enrich our lives.

I trust that the 2012 edition of *Research & Innovation* will convey that the research enterprise at the University of Rhode Island is definitely on the move, and that our multiple research programs bring resources to bear on the problems facing Rhode Island, our country, and the world.

Sincerely,

Peter Alfonso, Ph.D.
Vice President for Research and Economic Development

THE 2011 - 2012 ISSUE OF **RESEARCH & INNOVATION** IS DEDICATED IN MEMORY OF PROFESSOR SCOTT NIXON 1943-2012

TABLE OF CONTENTS

THE UNIVERSITY OF RHODE ISLAND
DIVISION OF RESEARCH & ECONOMIC DEVELOPMENT

ACKNOWLEDGEMENTS

THE UNIVERSITY OF RHODE ISLAND

David M. Dooley, Ph.D., President

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THE IMPACT OF THE UNIVERSITY OF RHODE ISLAND

FUNDED RESEARCH ON THE RHODE ISLAND ECONOMY IN FISCAL YEAR 2010

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

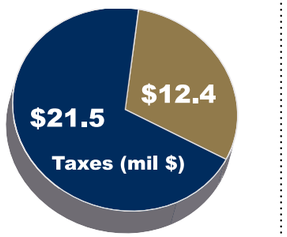
The contributions the University of Rhode Island (URI) makes to Rhode Island's economy continue to be highly significant. Yet the magnitudes of these contributions are seldom quantified. That is unfortunate, since the benefits provided by URI have become increasingly critical to the economic success of Rhode Island as it continues to evolve beyond the fundamental structural change that occurred 25 years ago, when it made the transition from being a manufacturing-based economy to a service-based economy. Not only did this structural change alter the "rules" of the economic game, it requires that Rhode Island continually adapt to the types of activities and endeavors that define success in the information age.

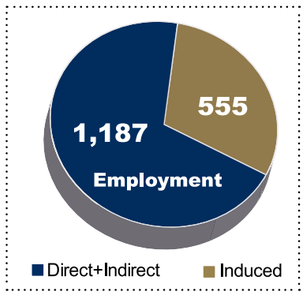
In recent years, that progress was interrupted by a very long and deep recession. One of the few bright spots for Rhode Island over this period was funded research at URI. This research costs the taxpayers of Rhode Island nothing. Yet it generates very significant increases in the levels of income, employment, and tax revenue.

It is important to keep in mind that while this study focuses only on the overall impact of URI funded research on Rhode Island's economy, the very substantial amount of non-funded research that regularly occurs at URI also has a significant impact on Rhode Island and its economy. The economic values reported should be viewed as being somewhat conservative estimates of the positive influence that the total amount of research undertaken at URI has on the Rhode Island economy.

THE ECONOMIC IMPACT OF FUNDED RESEARCH AT THE UNIVERSITY OF RHODE ISLAND IN FY10 ON RHODE ISLAND'S ECONOMY

- In total, every $1 in funded research URI received in FY10 created $1.7 in terms of total output, the combined result of the direct, indirect, and induced impacts of this research on the Rhode Island economy.
- While the economic benefits of URI's funded research extended to all of Rhode Island's counties, the primary beneficiaries (in order) were Washington County, Kent County, and Providence County.
- In FY10, URI's $105 million of funded research generated an increase in output of $174.7 million. The gain in employment associated with this was 1,742 jobs, which is highly significant given the fact that during this same period, Rhode Island's payroll employment fell by an additional 12,900 from its already-depressed level in FY09 (an additional 2.7 percent). The employment stimulated by this research generated a total increase in labor income for Rhode Island of $106.7 million.
- The majority of the jobs created by funded research resulted from the direct and indirect impacts of this research (1,187). The income created from these generated further income and spending (induced spending), which resulted in an additional 555 jobs. The average income of all the jobs created was $61,190, a value well above Rhode Island's median income. The labor market effects of this research alone were therefore highly significant and helped to moderate the severity of the job loss Rhode Island experienced during FY10.



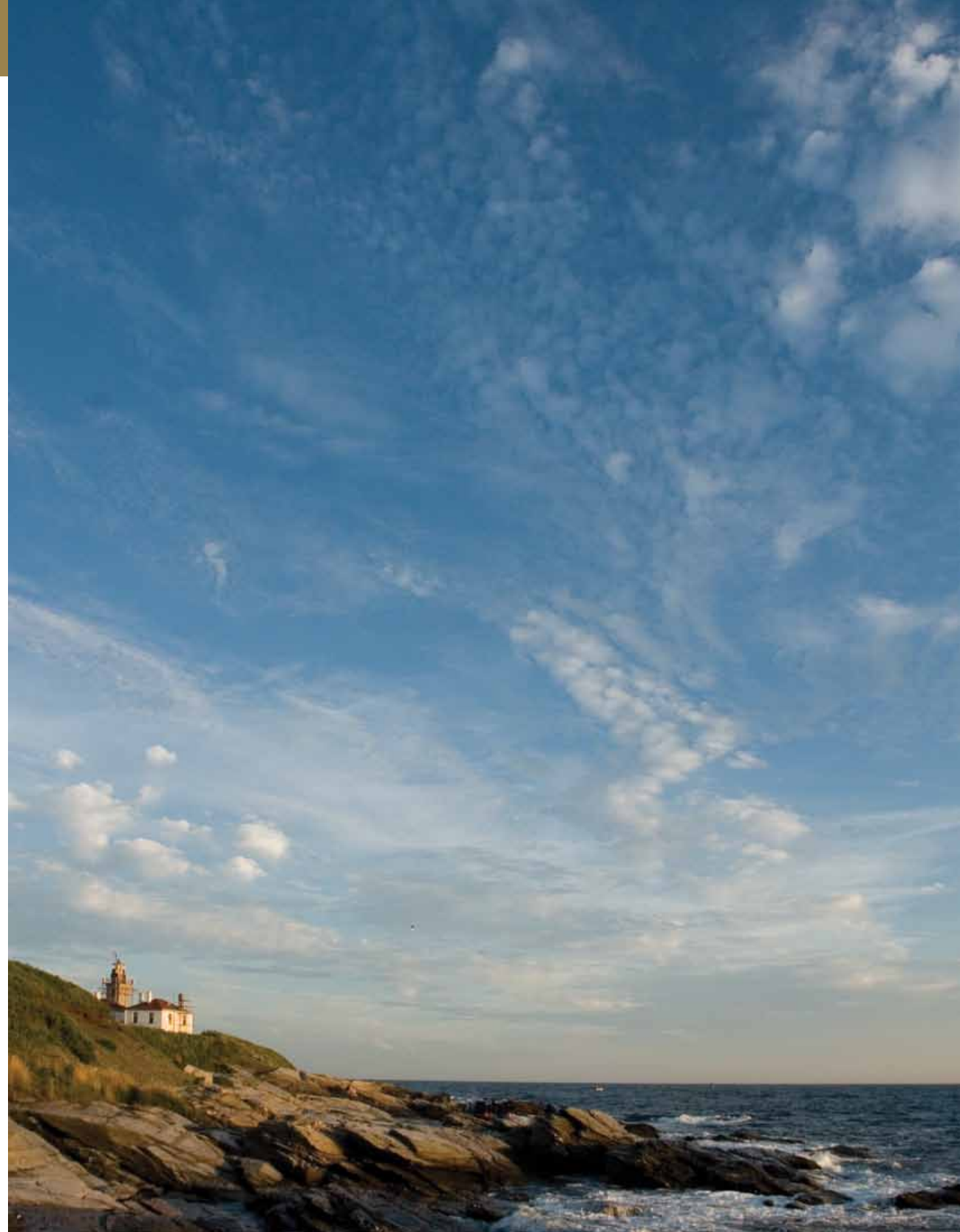


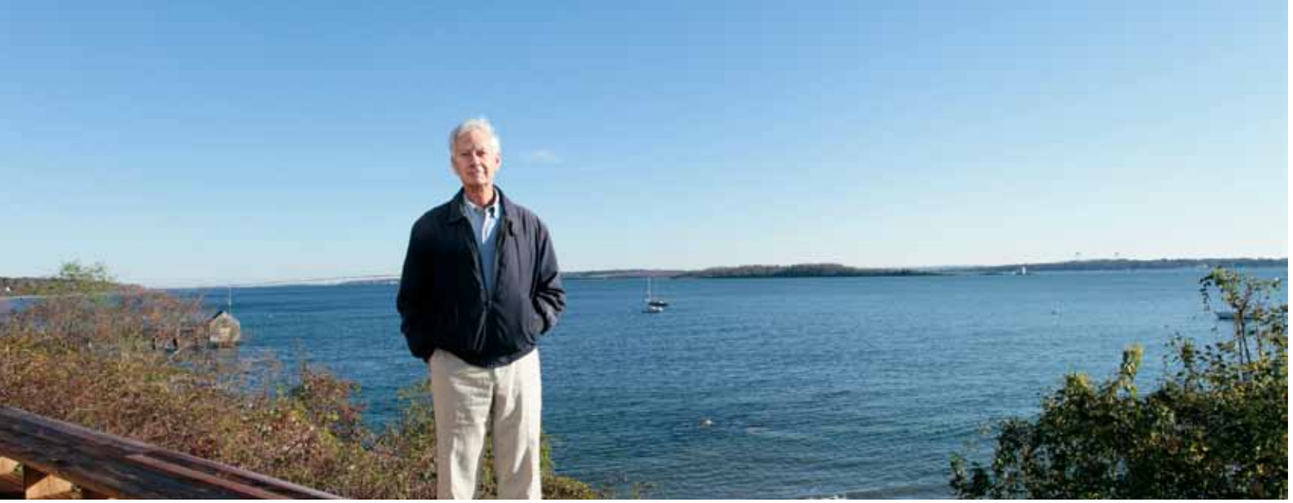
- Rhode Island is a small business state. According to the Rhode Island Department of Labor and Training's most recent Quarterly Census of Employment and Wages, as of March 2011, 81.9 percent of Rhode Island's private sector employers had labor forces of from five to nine workers, while 90.4 percent employed 19 or fewer persons. Relative to these figures, the employment gains resulting from URI funded research in FY10 would have generated sufficient employment to staff either 349 five-person employers, 249 seven-person companies, or 194 nine-person firms. However, unlike the actual earnings for the employees of these firms in FY10, the value of labor earnings averaged over the total number of jobs created by URI funded research, a proxy for average earnings, was significantly higher, equal to $61,190.
- This funded research resulted in substantial increases in the amount of taxes paid by individuals and businesses in FY10. The total of all new tax revenue generated was $33.9 million, of which $12.4 million was for state and local taxes, while $21.5 million was for federal taxes.

The overall contribution made by URI funded research in FY10 was very substantial. It made a significant and desperately needed contribution to Rhode Island's economy as it began to work its way out of the recession. The employment effect of the $105 million in funded research alone, the result of the direct, indirect, and induced effects of this research, was an employment gain of 1,742 jobs. It is important to keep in mind that this occurred as overall employment in Rhode Island actually fell by 12,700, or 2.7 percent that fiscal year. Thus, had it not been for the funded research at URI, in FY10 payroll employment would actually have declined by approximately 14,600, which would have meant an even-larger percentage decline in employment for that fiscal year, equal to 3.1 percent.

Along with added employment, this funded research also raised both personal income and tax revenue in Rhode Island. So, absent this FY10 funded research, Rhode Island's personal income growth would have been less, retail sales would have been even weaker, Rhode Island's unemployment rate would very likely have been higher, and the FY10 deficit would have been larger than it actually was.

For the full report please see the following website: http://www.uri.edu/research/tro/reports2/





Scott Nixon (1943-2012)

A World Leader in the Study of How Coastal and Estuarine Ecosystems Work: Using Narragansett Bay as His Laboratory

When policymakers began to talk about developing a wind farm off the coast of Rhode Island, scientists like Scott Nixon, a professor of oceanography at the University of Rhode Island (URI), saw the need for better understanding of Block Island and Rhode Island Sounds.

The sounds are transitional waters separating Rhode Island's Narragansett Bay and coastal lagoons, or salt ponds, from the open continental shelf and deep Atlantic Ocean beyond.

Research into the sounds was long overdue, notes Nixon, who co-chaired the Science Advisory Task Force for the research, which resulted in the nation's first Ocean Special Area Management Plan (SAMP). Rhode Island's Coastal Resources Management Council adopted the SAMP in October 2010.

Even though two world-renowned oceanographic institutions — Woods Hole Oceanographic Institution and URI's Graduate School of Oceanography — are located relatively close to both sounds, they had been largely unexplored because small research vessels tend to work close to shore, while the larger ones go further out into the ocean.

"The sounds fell through the crack," says Nixon.

An internationally recognized expert in estuarine ecology and oceanography, who came to URI in 1969, Nixon researched phytoplankton for the Ocean SAMP. Phytoplankton are single-cell plants that form the basis of the food chain. Local fishermen helped Nixon to collect samples, which showed, among other findings, that the phytoplankton blooms that take place in the sounds are not synchronized with blooms in Narragansett Bay. In addition, Nixon found phytoplankton to be more abundant in Rhode Island Sound than in Block Island Sound.

"We learned a lot more about Block Island Sound and Rhode Island Sound in the last two years," said Nixon.

In addition to marine biology, scientists studied the underwater archaeology of the sounds for the SAMP, among many other factors, creating a blueprint that will guide the state as it continues to consider the development of wind farms for Rhode Island's offshore waters. This has the potential to be an economic boom for the state.

Usually, Nixon's innovative research focuses on estuaries, lagoons and wetlands with a special emphasis on the primary production of these ecosystems. Primary production refers to plant life, a subject Nixon has studied in the Providence River estuary, Narragansett Bay, and South County's salt ponds, among other Rhode Island locations.

But no one can really say where one body of water ends and one begins, making research into so-called "green water" — where phytoplankton and other plant life is abundant — relevant to researchers who study "blue water" — the deep ocean beyond the continental shelf where primary production is much lower, Nixon noted. Because of this interconnectedness, ecologists and other scientists need to take a broad view of environmental science, one that considers not only present conditions and what has created them, but also the past, he said.

Indeed, Nixon has a particular interest in the history of ecosystems, a subject he says he studies for fun. He can tell you how the eelgrass used to flourish in upper Narragansett Bay and in 1997, he published a paper called, "Prehistoric Nutrient Inputs and Productivity in Narragansett Bay." But, in general, his research focuses on more recent cycling of nutrients through coastal ecosystems and their impact on primary production. Humans have dramatically changed the global nitrogen cycling process in the last 50 years, multiplying nitrogen deposits in rivers and estuaries by the use of inorganic nitrogen fertilizers, among other factors. The negative environmental and economic impacts to Rhode Island of this increase have been well documented: loss of fish and shellfish habitat, hypoxic and anoxic events and increased phytoplankton blooms, among other repercussions.

In a 1996 study that looked at the nitrogen cycle of the entire North Atlantic Basin, including contributing watersheds, Nixon and his research colleagues found that fossil fuel combustion was adding to the problem of nitrogen pollution. That study was funded by a number of international organizations, among them the United Nations Environmental Program, the World Meteorological Organization and the Andrew W. Mellon Foundation.

"We are clearly not just dealing with sewage, but with agricultural practices and atmospheric sources," Nixon said when the study was published in the journal, *Biogeochemistry*.

"We will need more large-scale discussion and assessment of how to deal with this nitrogen problem," he said.

But Nixon also understands that problems can develop if there is too little nitrogen production. In one study, he linked a decrease in fisheries landings in the Mediterranean with the construction of Egypt's Aswan Dam, which effectively stopped the flow of nutrients carried from the Nile River into the sea. He has been unafraid to buck conventional thought when it comes to blaming nutrients for everything that can go wrong in an ecosystem.

"Nutrients are not bad stuff per se. Without nutrients, we wouldn't have fish or animals in the sea," Nixon said.

In Rhode Island, Nixon has been involved in eelgrass restoration, at one time running an eelgrass nursery. He also served for 16 years as the director of the Rhode Island Sea Grant College Program. Outside of the state, he has served on several National Research Council committees, which have studied the restoration of Florida's Everglades and Louisiana's coast, among other problems. Since 2004, he has held the UNESCO-Cousteau Chair in Coastal Ecology and Global Coastal Assessment at URI.

Editor's Note: The university was deeply saddened to learn about the passing of world-renowned marine ecologist professor Scott Nixon. This issue of Research & Innovation is dedicated to his memory.

Creating a blueprint that will guide the state as it continues to consider the development of wind farms for Rhode Island's offshore waters. This has the potential to be an economic boom for the state.

The Business of Saving Lives

It has long been Walt Besio's dream to use medical research and innovation to save lives and now he is poised to do just that.

With the help of a $200,000 grant from the Rhode Island Science and Technology Council, Besio, with clinical guidance from John Gaitanis of Rhode Island Hospital and Brown University and business guidance from Michael Sullivan of Astro-Med Inc., has developed a new electronic sensor which can detect brain signals that are four times weaker than those currently picked up by popularly used EEGS, or electroencephalograms.

Called a tripolar concentric ring sensor, the device will enhance the ability of doctors to diagnosis and treat epilepsy and other neurological disorders, said Besio, an associate professor of electrical, computer, and biomedical engineering at URI. It has significantly better signal quality than the sensors used now because of the novel addition of rings around a disc, and is slated for commercial production and sale.

"This is our first effort to commercialize technology to help doctors," said Besio, who earned his Ph.D. in biomedical engineering from the University of Miami in 2002 and came to URI in 2008.

But how does a scientist take an invention from the drawing board to the manufacturing plant? Besio won a $50,000 Innovation Corps (I-Corps) grant from the National Science Foundation (NSF) to help him learn how to commercialize his sensor. He was one of only 21 scientists from around the country, the only one from an Experimental Program to Stimulate Competitive Research (EPSCoR) state, selected by the NSF for a prestigious I-Corps grant. The grant enabled him to attend an eight-week program at Stanford University in the fall of 2011 that introduced him to several business models and immersed him in business practices such as contacting potential customers and business associates.

"It was fun, eye-opening, and a ton of work," said Besio, who traveled to and from Stanford and made video conference calls every week while keeping his teaching schedule at URI.

Besio likened the program to a crash course in business, which has helped him to develop and vet a business model. He is now writing a business plan which he intends to enter into the Rhode Island Business Plan Competition. James Petell, URI's associate vice president for intellectual property management and commercialization, worked closely with Besio on forming a business plan and developing the start-up company.

Epilepsy is a brain disease that affects more than 1 percent of people worldwide, three-quarters of them in developing countries. Not only will the concentric ring sensor improve diagnosis of the disease but also, in laboratory experiments involving rats, it has proven to be a non-invasive alternative therapy for seizure control.

"My vision is to use technology to save lives and to prevent disease and suffering," Besio said.

The state of Rhode Island supports this vision, hoping to create a new knowledge-based economy, which will depend on innovations like Besio's to reinvigorate the state's economy.

Big Discoveries Big History

Professor Robert Ballard's quest to enable anyone — and everyone — to enjoy the wonders of underwater exploration has become a reality since he's joined the faculty at the University of Rhode Island (URI).

A world-renowned oceanographer, who is probably best known for discovering the *Titanic* in 1985, Ballard has always combined groundbreaking technology with ocean science. Before coming to URI, he helped to pioneer the use of submersible robots and deep-diving submarines to explore ocean depths hitherto off limits to man. In the process, he discovered the German battleship *Bismarck*, the USS *Yorktown* and what is believed to be the remains of John F. Kennedy's *PT-109*, among other historically significant wrecks.

As a scientist with the Woods Hole Oceanographic Institution, he was also part of a French-American team, which in 1974 explored an underwater mountain range called the Mid-Atlantic Ridge and, in particular, its central rift valley. That expedition, called Project FAMOUS, was the first to document seafloor spreading, the process that results from the shifting of tectonic plates deep below the ocean's surface.

"No one had actually gone to the boundary of creation where the Earth creates its outer skin," Ballard said.

Man was going to the moon, but hadn't thought to explore the Earth's largest feature, said Ballard, sounding a favorite theme of his — that the world's oceans are vastly unexplored and thus deserving of research dollars.

Robert Ballard

Later in the 1970s, working in the Galapagos Islands, Ballard and his team discovered hydrothermal vents in the Pacific Ocean, which were replete with exotic life forms never seen before. These creatures, which live in and around the deep–sea vents, derive their energy from the earth, not from the sun, and are among the most fascinating sights he has observed in his long career, Ballard said. That's saying a lot considering Ballard has been on 130 underwater expeditions. They include red-tipped tube worms that can expand to 10 feet long and foot-long mussels and clams.

"We made a tremendous series of discoveries," said Ballard.

And yet, that was only the first phase of Ballard's career. What happened next has taken underwater exploration to another level entirely and has made URI's Graduate School of Oceanography even more world-famous than it already was. According to Ballard, it began one day in 1981, when he was walking down a hallway at the National Geographic Society in Washington, D.C. He had a vision of a deep-sea robot exploring the ocean floor and sending images, via satellite, to observers on land enabling them to participate in the exploration in real time.

"I just envisioned it," said Ballard, pulling out a graphic he made back then to illustrate the concept.

"I said that's the future."

National Geographic Magazine published a story in its December 1981 issue about Ballard's futuristic dream, which for the scientist and educator tied together his deep love for underwater exploration and his desire, just as deep, to share it with everyone. He once described his goal this way: "Why not take people who will never go there themselves to this world and let them see these wonders of the underwater world and help protect them for future generations."

So began a quest that took 28 years to realize, but which came to pass at URI in June 2009, when the Inner Space Center opened its doors on the university's Narragansett Bay Campus. Part of a new, $15 million Ocean Science and Exploration Center, which includes the Pell Marine Science Library, the Inner Space Center plays a key role in Ballard's vision by using "telepresence" technology to enable scientists from around the world — and teachers and school children — to watch underwater exploration as it is taking place.

"The university and the people of Rhode Island really embraced this adventure," said Ballard. They are critical players who "stepped up to the plate."

"It's been an uphill battle, but we pulled it off," said Ballard, as he sat one day last fall in the Inner Space Center, overlooking a command center, much like NASA's, which is covered wall to wall with video screens.

As Ballard spoke, a remotely operated vehicle was picking up a rock from the seafloor off the coast of Spain — in real time. The Exploration Vessel *Nautilus*, one of two exploration ships at Ballard's command, was directing and filming the robot's movements, then sending the images back digitally to the Inner Space Center, which posted them on the NautilusLive.org website for the world to see.

A battery of international scientists, called Doctors-on-Call, stand by to interpret new findings as they happen and to help direct the movements of Hercules and Argus, the two remotely operated robots. This way, the expedition can expeditiously enhance the ship's discoveries, essentially giving the whole endeavor more bang for its buck, Ballard explained.

Ballard dates his passion for oceanography to his youth in San Diego, California, where he loved exploring tidal pools.

"I've always been interested in the bottom of the ocean," he said.

He joined the faculty at URI's Graduate School of Oceanography in 2002, founding the university's Institute for Archaeological Oceanography in addition to launching the Inner Space Center. Rhode Islanders approved bond issues to help build the center and for their support, Ballard is grateful. He estimated that the cost of the whole project, including the two exploratory vessels, at $100 million, much of which comes from the U.S. National Oceanic and Atmospheric Administration.

"The university and the people of Rhode Island really embraced this adventure," said Ballard.

They are critical players who "stepped up to the plate."

The Inner Space Center

There's no such thing as a typical day for Dwight Coleman, director of the Inner Space Center, at the University of Rhode Island's (URI) Graduate School of Oceanography.

So many responsibilities come with his title — from supervising the Inner Space Center audio and video production facility, to giving tours of its impressive mission control room, to joining in on underwater expeditions himself — that no two days look alike for this URI trained oceanographer.

"A lot of my work is organizing data collection and video satellite communication," said Coleman, who works closely with the Inner Space Center's founder, world-famous oceanographer Robert Ballard.

Indeed, massive amounts of data flow into the Inner Space Center on a 24-hour basis, when the Exploration Vessel *Nautilus* is out at sea, which it has been for about four months a year for the past two years. Another research vessel, the National Oceanic and Atmospheric Administration Ship *Okeanos Explorer*, also explores the ocean floor, streaming live video and other data back to the Inner Space Center, which provides shore-based support for the expeditions.

Trained in geology as well as oceanography, Coleman's research interests lie in ocean exploration and underwater archaeology and what the ocean can tell us about prehistoric peoples and cultures. He has studied the southern New England continental shelf off Block Island for its prehistoric archaeological potential as well as the Black Sea, among other places. He has also written extensively about the methods for conducting underwater archaeological surveys.

"What we know about the deep sea is very little," said Coleman.

Noting that a small percent of the ocean floor has been mapped and less than 1 percent has been seen by the human eye, he added, "We know more about the surface of other planets than we do about our own planet."

But the Inner Space Center is working to correct this deficiency. Using telepresence technology that was envisioned by Ballard (see article on page 8), who discovered the lost *Titanic* in 1985, the Inner Space Center receives live streams from remotely operated vehicles exploring the ocean floor, which are then posted on the Nautilus Live website. This website enables the public to be with the oceanographers on an expedition, broadening the reach of an activity which, until now, had been reserved for a relatively small group of scientists.

"We have quite a following," said Coleman. He called the website's fans "citizen scientists."

The Inner Space Center opened in 2009 and takes up a portion of two floors of the new $15 million Ocean Science and Exploration Center on URI's Narragansett Bay Campus. Coleman called it "one of a kind."

"It's unique in that we handle real-time activity," he said.

The exceptional nature of the Inner Space Center's technological capabilities, which are manifested in a cavernous mission control room on the Inner Space Center's lower floor, brings scores of visitors to the Ocean Science and Exploration Center on a daily basis. In addition to international tourists, classes of Rhode Island students, and students from other states, a considerable number of journalists have made the trip to Narragansett, among them film crews from CBS's *60 Minutes* and National Geographic Television.

It's Coleman's job to take care of these visitors, in addition to managing the flow of the data streaming into the Inner Space Center, planning for future expeditions, and overseeing the Inner Space Center's state-of-the-art production facility.

"I work mostly with students," said Coleman.

As he spoke, Nautilus Live producers Jessica Harrop and Melissa Salpietra were busy preparing a podcast to update people, who had logged on to Nautilus Live, on the exact whereabouts of the *Nautilus* and what the ship was finding. The website had 232,094 visits from 115 countries and territories during the four and half months that the *Nautilus* was deployed in 2010.

Students are the "engine" of the Inner Space Center, Coleman said.

One goal of the telepresence technology — and the Inner Space Center, itself — is to create educational programs that will encourage students from around the globe to consider a career in underwater archaeology, geology, exploration or some other facet of marine science. This same goal inspired Ballard to create the JASON Project in 1989, which provides interactive science curricula for middle school students. Rhode Island schools that have been involved in the Inner Space Center programs include Narragansett, Smithfield, East Providence, Newport, and Westerly.

In a similar vein, the data received by the Inner Space Center are used in the Nautilus Educator Program, which enables teachers to join the expeditions and help choose the content shown on www.NautilusLive.org. Meanwhile, on shore, selected educators monitor special consoles, which receive the live data. These consoles are located in schools, select Boys & Girls Clubs, the Mystic Aquarium and URI, among other places. A pilot program to incorporate live feeds from the ocean exploration programs into middle and high school classrooms and curricula has been ongoing in partnership with the Smithfield, RI school district. Teachers from Narragansett public schools have also participated using the technology directly at the Inner Space Center.

Dwight Coleman

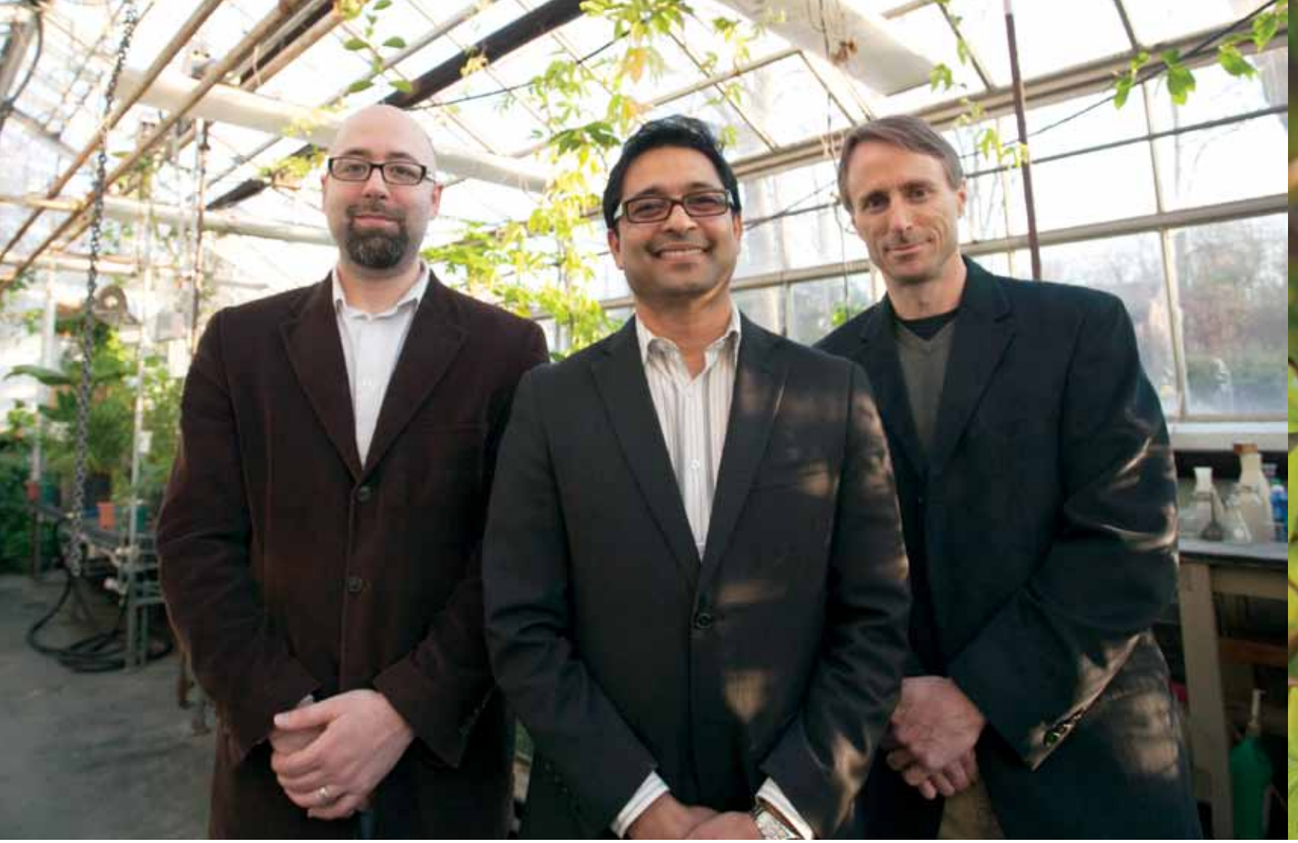
Other outreach projects which benefit from the Inner Space Center are Immersion Learning, an after-school program affiliated with the Boys & Girls Clubs of America, and the JASON Project. The Inner Space Center also hosts a "Doctors-on-Call" program, which enables scientists from around the world to participate in the underwater discoveries as they are happening and share their observations.

The Inner Space Center also has other potential to use its technology to support other scientific and engineering projects, and could be a valuable resource for economic development potential. The mission control facility can be used to connect users to remote locations in real time using high bandwidth satellite and Internet streaming. The video production and broadcast facility can be used to communicate the results of URI's research to vast audiences in real time. Coleman looks forward to partnering with other researchers at URI and throughout the state and elsewhere to further enhance the outreach of the Inner Space Center.

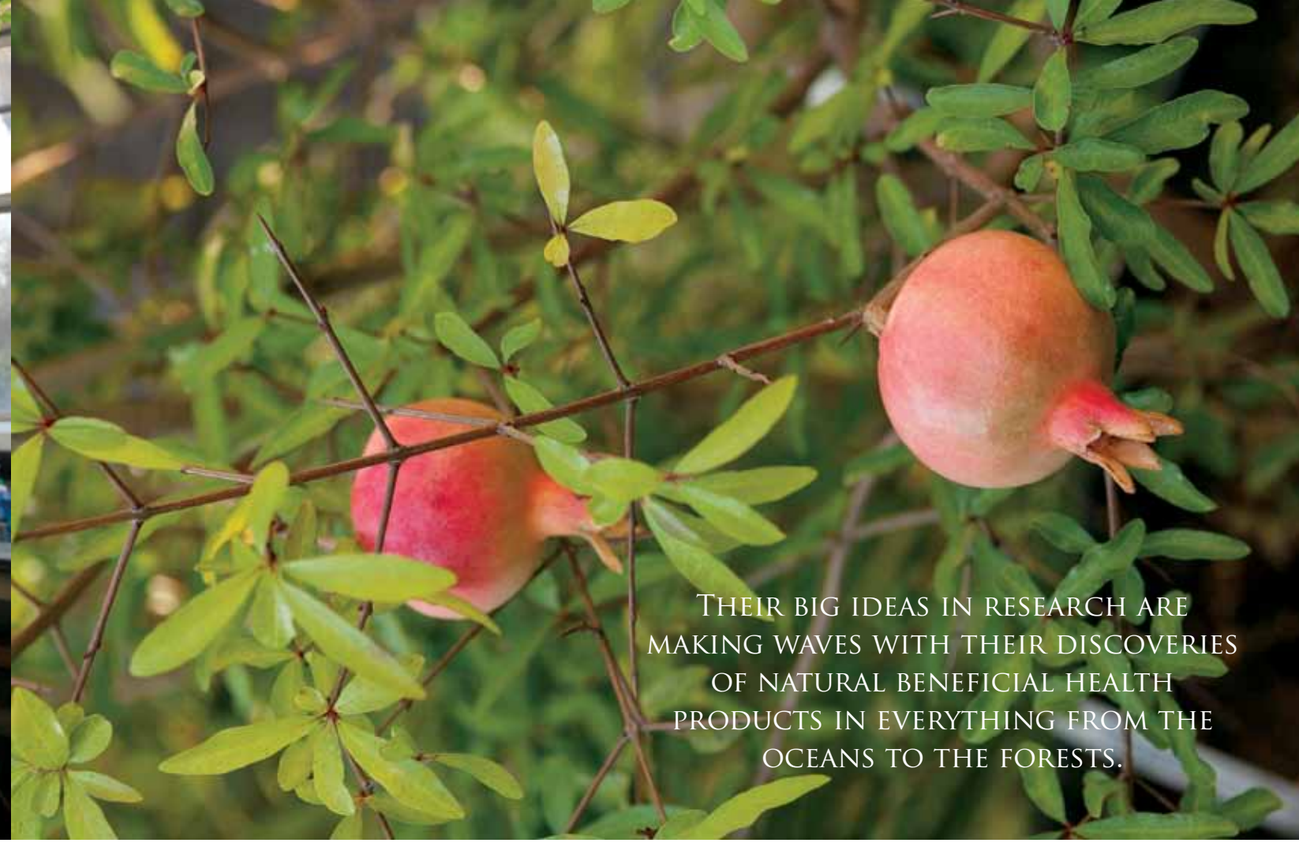
All of these projects keep Coleman busy and, judging by the Inner Space Center's plans for the years ahead, he will be even busier. He hopes to have both the *Nautilus* and the *Okeanos* out to sea for six months at a time, back-to-back, by 2013. Plans also call for increasing the number of educators on board each expedition and adding to the number of Doctors-on-Call to help interpret the findings. All of this is fine with Coleman, who believes the sea and its treasures contain the answers to many of the world's unsolved puzzles.

Noting that there's still a huge debate over where the first Americans came from, Coleman said, "The answer is underwater."

One goal of the telepresence technology – and the Inner Space Center, itself – is to create educational programs that will encourage students from around the globe to consider a career in underwater archaeology, geology, exploration or some other facet of marine science.



Daniel Udwary, Navindra Seeram and David Rowley



Their big ideas in research are making waves with their discoveries of natural beneficial health products in everything from the oceans to the forests.

NATURAL PRODUCTS GROUP

In the world of science, new frontiers can sometimes be found ready-made, right in the natural world around us. At least this has been the case for a group of scientists in the University of Rhode Island's (URI) College of Pharmacy, their big ideas in research are making waves with their discoveries of natural beneficial health products in everything from the oceans to the forests – they are exploring marine microorganisms to maple syrup. Their hands-on innovation can change the pharmacological world and hopefully lead to new economic strides in the health care industry.

Discovering medicinal substances in marine and terrestrial plants and other natural sources is called pharmacognosy and URI has been known for its research in this field since 1957, when the College of Pharmacy opened. But in recent years, the university has intensified its commitment to this branch of pharmacy with the addition of three passionate professors, who are taking URI's reputation for natural products research to a whole new level.

They call themselves the Natural Products Group and they represent three very different, yet very complementary, facets of pharmacognosy.

David Rowley, an associate professor of biomedical and pharmaceutical sciences, looks to the ocean as a source for new drugs. Specifically, he studies marine microbes in the hopes of creating new healing agents, following a tradition at URI that dates back to 1966, when the College of Pharmacy partnered with URI's Graduate School of Oceanography to launch a "Drugs from the Sea" research program.

"We've been isolating microbes from deep sea mud, with the hope that we can develop new antibiotics," said Rowley.

The idea behind ocean pharmacognosy is to find disease-fighting agents in previously unexplored environments, which is why the mud Rowley is studying comes from a remote region of the South Pacific. So far, preliminary results are promising, he said, noting that the microbes he has discovered are "perhaps unlike any others that have been investigated."

Rowley is also researching the chemistry of bacteria that promote disease-resistance in oysters and other organisms of interest to the aquaculture industry.

Rowley's research has been funded by grants from the National Oceanic and Atmospheric Administration, the National Science Foundation and the Rhode Island Science & Technology Advisory Council. Additionally, Ocean Spray Cranberries, Inc., has funded work Rowley is doing into the beneficial agents found in cranberries. But terrestrial research is not the norm for Rowley.

"Most of my work is marine-related," he said.

Not so with College of Pharmacy assistant professor Navindra Seeram, whose research into pomegranates, berries and, most recently, maple syrup has generated considerable excitement in the field of pharmacognosy.

"I work with plants that people eat," said Seeram, who came to URI four years ago from UCLA after earning a doctorate in natural products chemistry from the University of West Indies, Jamaica.

He became interested in the medicinal properties of plants as a boy growing up in Guyana, South America, where there were few doctors and even fewer pharmacies, Seeram said. He watched his grandmother treat ailments with plant-based, traditional medicines and it piqued his interest into what he calls "Nature's Pharmacy," a growing medicine cabinet whose potential is just being tapped.

"You can't be a better chemist than nature," said Seeram.

By now, most people know that berries contain powerful antioxidants, which can help to prevent cancer. Seeram contributed to this discovery with his research into pomegranates, a subject he co-edited in a book titled *Pomegranates: Ancient Roots to Modern Medicine*.

More recently, he has made some interesting findings about the health benefits of maple syrup. Pure maple syrup from Canada, which Seeram studied in his Bioactive Botanical Research Laboratory at URI, contains 54 beneficial compounds, five of which are new molecules, Seeram and his research colleagues discovered.

"Maple syrup is becoming a champion food when it comes to the number and variety of beneficial compounds found in it," Seeram has said.

The compounds have anti-inflammatory and antioxidant effects, among other beneficial properties. Working with professor Chong Lee from URI's College of the Environment and Life Sciences, Seeram has learned that some of the compounds in maple syrup inhibit enzymes that are important to the management of type 2 diabetes, one of several chronic diseases, which stands to benefit from his research.

Seeram's research into maple syrup was supported by grants from Canada's agriculture agency. Excited by the findings, he sees a whole new world of potential natural product discoveries in the trees of New England. Why not harvest fall leaves, reduce them to a nutraceutical extract and put "fall in a bottle" he asks.

The third professor who makes up the Natural Products Group, Daniel Udwary, researches the DNA of microorganisms to see how naturally occurring compounds are made. "How the bugs make the drugs," is how he put it. An assistant professor of pharmaocognosy, who joined the College of Pharmacy faculty in 2007, Udwary uses technology to read the genome sequences of bacteria, a process called bioinformatics.

Udwary is also in the process of cataloging and comparing the massive number of microbial genomes that have been identified. As he spoke, a computer behind him was sifting through data to find the genes in bacteria, a process that has become cost-effective to perform only in the last decade or so.

"What we're trying to do is look at everything," said Udwary, who earned his Ph.D. in bio-organic chemistry at Johns Hopkins University.

Bacteria are a rich source for natural products and the more that is known about them, the more useful they can be in fighting disease, he said.

Our overall goal is to make new medicine.

Richard Brown

Discovering Greener
Solutions to Corrosion Control

As almost any Rhode Islander can tell you, the benefits of living near the ocean are abundant; the Ocean State has some of the most beautiful beaches in New England – for sailing, fishing and just sheer physical beauty, nothing beats the splendor of Narragansett Bay.

But, there is a price to pay for living close to the ocean. Those same salty sea breezes that soothe the spirit can corrode aluminum and other metals. How to prevent corrosion is the question Richard Brown, professor and chair of the University of Rhode Island's (URI) chemical engineering department, has been studying for 30 years, becoming an internationally recognized expert in the field of corrosion control.

Corrosion is a big problem, says Brown. It affects not only homeowners, but also the military and maritime industries, which necessarily must be concerned about the durability of the metals they use in shipbuilding. Similarly, architects and contractors need to know that the steel beams they use to support high-rises, bridges and other structures won't weaken, which they will if they are exposed to water without proper corrosion protection. It is a safety concern as well as an economic concern.

With funding from industry, state and federal agencies, Brown has developed a newer, safer coating for aluminum alloys to replace the more hazardous chromate-based coatings, which have been used in the past. Chromate is a carcinogenic compound linked to lung cancer and other health problems. Instead of chromate, Brown uses titanium, a material that is so safe it is often used to make artificial hips.

The titanate ion was chosen for its many similarities to chromate, and electrochemical testing in URI's Corrosion and Surfaces Laboratory indicated that the titanate ion would prevent corrosion in the same way as chromate. "It's very successful," Brown said.

Brown's innovative research on the titanium-based coating has been funded by the Office of Naval Research in Washington, D.C. He holds several patents on his work. The laboratory he oversees at URI conducts additional research on the effects of marine exposure to adhesive bonding, degradation of composites by marine exposure and hydrogen embrittlement in addition corrosion and corrosion-assisted fatigue.

Currently, the lab is comparing different corrosion resistant surface treatments for steel, such as galvanized zinc or metalized zinc coatings, to promote corrosion resistance and paint adhesion. This research is being funded by Rhode Island's Department of Transportation.

The health hazards of chromate exposure was the subject of the 2000 film *Erin Brockovich,* where residents' groundwater had been contaminated by chromates and other toxins. In 2009, the U.S. Department of Defense ordered the phase-out of chromates in paints and other products, accelerating an effort in research laboratories to find safer alternatives.

Brown has been in the forefront of this push to find greener environmentally friendly solutions. In addition to removing chromate, the titanate coating process he developed in conjunction with researchers from Newport's Naval Undersea Warfare Center (NUWC), there are other environmental benefits of the process, among them eliminating the use of cyanide-based chemicals in the coating process.

Additionally, Brown worked with Sze Cheng Yang, a chemistry professor at URI, in developing a new group of nontoxic conductive polymers to replace chromates in paints and other coatings. Instead of acting as a barrier to water, the double-strand polymer fosters a self-healing layer, which can resist scratching and other forms of damage. The polymers can be added to paints at a relatively low cost, and are soluble in solvents and water-based epoxies.

"The interest in corrosion control is growing because it affects the viability of long-term structures, and is an increasing economic cost factor," notes Brown who holds patents with Yang for the double-strand polymers.

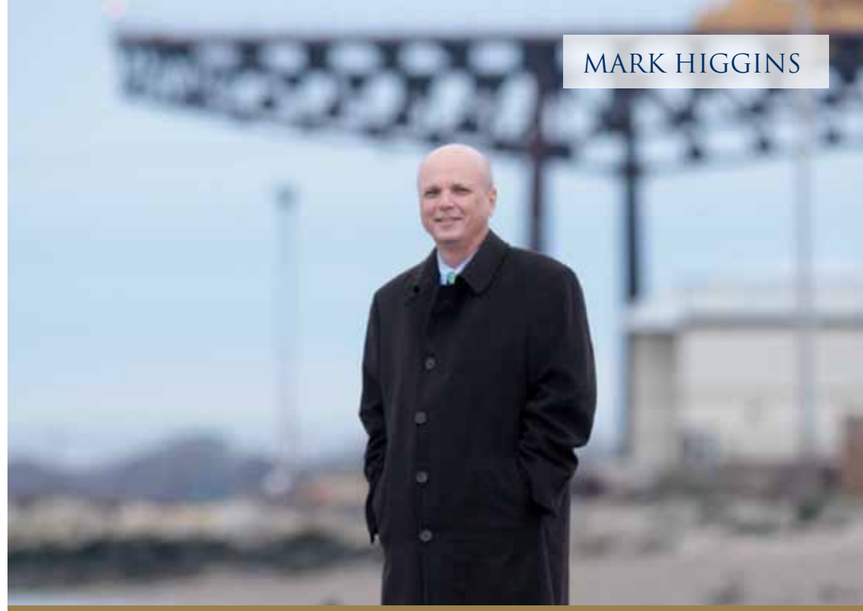
"The interest in corrosion control is growing because it affects the viability of long-term structures, and is an increasing economic cost factor."

The potential uses by industry of this type of corrosion control include the coating of aluminum and steel used by the auto industry and aluminum alloys used to build planes and other aircraft. In addition, it can be used to coat the metal bars that reinforce concrete bridges and highways. The polymers have also been proven to prevent the buildup of electrostatic charges that can interrupt work in surgical wards and the so-called clean rooms where computer chips are made.

Brown earned his Ph.D. from Cambridge University in England, where he is originally from. He came to URI in 1981, and recently, in addition to coatings to prevent corrosion, he is working with Arijit Bose, a professor of chemical engineering at URI, to investigate the potential corrosion resistant properties of self-healing concrete using nanotechnology to stop corrosion damage. He is engaged in fuel cell research as well. Currently, his fuel cell work involves using methanol instead of hydrogen, and reducing the amount of platinum, he said.

Brown said he finds the subject of corrosion interesting because it involves both theoretical and fundamental research and can have numerous, practical applications.

In July 2011, a joint URI/NUWC symposium about the latest in corrosion research was organized by Brown and held at the URI Bay Campus. It was the third in the series. The event attracted experts from government agencies, academia and industry. His big ideas are making a big impact for those in the Ocean State who use the sea for business or recreation.



MARK HIGGINS

The Business of the Port of Providence

The Port of Providence, one of only two deepwater ports in New England, is one of Rhode Island's most underdeveloped economic assets, says Mark Higgins, dean of the University of Rhode Island's (URI) College of Business Administration.

Frequently consulted by policymakers about how to improve Rhode Island's economy, Higgins said that other coastal cities, such as Savannah, Georgia, and Charleston, South Carolina, have created vibrant commercial ports without driving away tourists, and Providence can too. Careful, long-term planning is needed to balance the imperatives of business with the need to protect the sensitive ecology of upper Narragansett Bay.

"We have a great port in Providence," said Higgins.

Located at the mouth of the Providence River, just south of the city's downtown, the port covers more than 100 acres and is home to about a dozen businesses. City and state officials want to expand its operation and in 2010, won a $10.5 million federal grant to help do that. The grant will be used to purchase two large cranes, enabling the port to offload cargo ships.

But issues such as how to protect the famed beauty of upper Narragansett Bay, while encouraging industrial waterfront development, continue to be debated. According to Higgins, it remains to be seen what the Port of Providence will look like in the future.

URI's College of Business Administration has assisted the state before in researching port issues. Notably, associate professor Douglas Hales recently led a research team that looked at the potential impacts, both environmental and economic, of developing wind energy businesses at the Davisville Port at Quonset Point. This research helped the state win a $22.3 million federal Transportation Investment Generating Economic Recovery (TIGER) grant to upgrade the infrastructure at Quonset to support wind businesses.

If, in fact, the state realizes the development of offshore wind farms in the years ahead, as it hopes, most of the remaining space at Quonset will be taken up by wind-related businesses, Higgins noted. This is, on its face, a good thing. But as a result, the potential for future development will necessarily shift to the Port of Providence, and policymakers need to be prepared.

"The problem with Rhode Island is it's very much 'Not in my back yard,'" Higgins said. "We want the jobs but we don't want what comes with them."

Beauty alone cannot sustain an economy, says Higgins, who in addition to serving as dean of the College of Business Administration holds the Alfred J. Verrecchia-Hasbro, Inc., Leadership Chair in Business at URI. Rhode Island has to continue to work on other issues that are important to business, he said. To that end, Higgins recently served on an advisory body that solicited ideas about reforming the state's pension system. He also helped craft significant changes to the state's income tax structure, which the state's General Assembly passed in 2010.

As Rhode Island's "flagship university," URI stands ready to work on issues that affect all Rhode Islanders, Higgins said. The big ideas coming out of URI will change Rhode Islanders' lives for the better.

The Dynamic Connection Between Art and Science and the Ocean: Sea Grant Visual Arts Program

Not every university appreciates the dynamic connection between art and science, but the University of Rhode Island (URI) does. Since 1988, URI has awarded grants to visual artists and curators, who convey some aspect of the marine environment in their work under the Visual Arts Sea Grant Program. The program was created by URI oceanography professor Scott Nixon.

Not a lot of money is awarded each year – just $3,000, in fact. But for a group of professionals, who traditionally struggle to support themselves, the money can be helpful, noted Barbara Pagh, a professor of printmaking and two-dimensional art in URI's department of art and art history, who administers the program with her colleague, Gary Richman.

Gary Richman and Barbara Pagh

"It is, I think, an important grant," said Pagh.

Not only is the subject matter important, given the threats posed to Rhode Island's coastal environment from climate change and other factors, but the encouragement it provides artists is significant, especially in these times of limited opportunities, she said.

Over the years, the award has been given to artists working in a broad array of media, everything from photography to textiles to sculptures and installations. A panel of one faculty member from URI and two outside artists and/or curators select the winners, said Pagh, noting the panel reviews the art without knowing the artist.

In 2010, two artists split the award; Marguerite White of Newton, Massachusetts, who teaches at the DeCordova Museum School and Worcester's College of the Holy Cross, and Mary Giehl of Syracuse, New York, a part-time professor of textile and fiber arts at Syracuse University.

White's work includes an installation entitled "Cargo," which will be viewed June 20 through July 18, 2012, in Nantucket. The installation used light and drawing in an historic sea captain's house to explore commercial objects lost at sea. White's work is generally inspired by the harbors of the Northeast and their related economies and ecosystems, Pagh noted.

The other winner, Giehl, used fiber to recreate two strains of microscopic algae that produce harmful toxins and have been linked to a host of environmental problems, including beach closures. She uses a wet felting process to reproduce the algae, which are presented on a painted wall installation.

In total, the program has awarded grants to 38 artists since it began. An exhibit is being planned for 2013 to celebrate the program's 25th anniversary that will showcase a selection of these artists, Pagh said.

One goal of the program as it moves forward is to include more URI students in the process. To that end, last year saw the start of a Visiting Artist program, which asked award winners to spend a day at URI with students in the university's art programs. And this year is the first time a spin-off competition has been opened up to URI students, with a prize of $500 for the winning artist.

Since 1988, URI has awarded grants to visual artists and curators, who convey some aspect of the marine environment.

Carlos Garcia-Quijano

What "invasive species" means to Rhode Island

Carlos Garcia-Quijano, an assistant professor of anthropology at the University of Rhode Island (URI) studies fishing communities in Rhode Island to better document fishermen's knowledge of the marine ecosystems. In the past, this local knowledge was often overlooked and undervalued by policymakers because it did not come from professional scientists. But in an age of declining fishing stocks and numerous threats to the world's oceans, policymakers ignore this wealth of information at their own peril, he said.

Development pressures have been felt by the Rhode Island fishing communities of Galilee and Jerusalem, Garcia-Quijano noted. To that end, he is part of a research group that is interviewing the state's lobstermen to document what they know about Rhode Island's coastal waters and, more specifically, the lobster's habitat.

The group consists of research scientists from URI and the state's Department of Environmental Management, who recognize that the state's lobstermen still play an important role in Rhode Island's culture and economy.

"The whole idea is to take their knowledge and put it in a quantifiable form so it can be used by resource managers," said URI's Kathleen M. Castro, a co-leader of Rhode Island Sea Grant's Fisheries Project.

The project comes at a time when the New England Fisheries Management Council maintains that lobster stocks in Rhode Island waters are near collapse, but the state's lobstermen tell another story.

"We desperately need more knowledge about what's going on," said Garcia-Quijano.

It only makes sense to seek answers from the people who work with lobsters every day. "They're the experts. We're just tapping their knowledge," Garcia-Quijano said.

Now in his third year at URI, Garcia-Quijano said his research on invasive species is applicable to Rhode Island, which has seen its share of introduced species. Before deciding to eradicate a new arrival, policymakers need to look at each species individually and plan a response based on evidence, not emotion or misinformation, he said.

Say the phrase "invasive species" and most people respond with fear about the newest plant or animal that has arrived in their ecosystem. But "introduced," "alien," or "invasive" species are labels created by people, and in many cases reflect cultural and aesthetic values and rather than specific negative ecosystem interactions. People have been introducing species to new locales for at least 24,000 years. Depending on the case, introduced species can have competitive or even facilitating interactions with components of their new host ecosystems.

In a research project funded by the San Juan Bay Estuary Consortium, Garcia-Quijano, along with colleagues from Penn State University, and the University of Puerto Rico at Cayey, recently studied the interactions between the green iguana, a relatively new arrival to Puerto Rico, and the host ecosystem. Since the green iguana was introduced to the island, its population has exploded, making it a frequent topic of media stories, some of them misinformed, and a source of concern for government agencies.

"The issue is really complex because ecosystems and human societies are complex," said Garcia-Quijano.

Working Hard to Protect
Rhode Island Waters

When more than a million juvenile menhaden fish suddenly washed up dead on the shore of Greenwich Bay one hot August day in 2003, the question was why?

Candace Oviatt, a professor of oceanography at the University of Rhode Island's (URI) Graduate School of Oceanography (GSO), helped to determine the cause.

Lack of oxygen, or hypoxia, was the reason for the disturbing fish kill, Oviatt said. In the days leading up to that August day, when the baby menhaden blanketed the shores of Greenwich and Apponaug coves, tests showed oxygen levels had plummeted in Greenwich Bay.

In addition to menhaden, hypoxia can be lethal for other fish species and clams as well. The economic consequences of a fish kill can be devastating. To better understand this phenomenon, Oviatt has led a research project since 2005, which has examined nutrient pollution, water circulation patterns and other factors that can deplete Rhode Island's coastal waters of its vitally important oxygen supply.

Funded with $2.5 million from the National Oceanic and Atmospheric Administration's (NOAA) Coastal Hypoxia Research Program, the study used a 3-D computer model to track how water moves in and out of Narragansett Bay. Oviatt's team also examined cores of sediment to determine the Bay's historical oxygen conditions as well as the role stratification (layering) plays in hypoxic events.

"All of us at URI have worked hard to improve the Bay over the years," said Oviatt, whose office in the Marine Ecosystems Research Laboratory (MERL) on the University's Bay Campus overlooks Narragansett Bay.

Clean Rhode Island waters, whether it's Narragansett Bay or the ocean beyond, are essential not only for the state's fishermen, but also for the thousands of residents and tourists, who use the Bay for economic and recreational purposes, she said.

After the Greenwich Bay fish kill, Rhode Island passed a law which substantially reduces the amount of nitrogen large wastewater facilities can discharge into the Bay. Nitrogen pollution, like stratification, is believed to be a factor in fish kills. In part, as a result of that law, the health of Narragansett Bay has improved in recent years, a significant development for the state's shell fishermen.

But, at the same time, climate change has caused the Bay to become warmer, which has impacted the traditional life cycles of Bay organisms, such as plankton. Additionally, new invasive species are competing with the Bay's native creatures for existence, according to Oviatt. Then there's hypoxia, which is now a regular problem in Chesapeake Bay, Lake Erie and Puget Sound, in addition to Narragansett Bay, according to NOAA's Coastal Hypoxia Research Program.

Oviatt's research team on the NOAA study included scientists from Brown University, the University of Connecticut, Avery Point, and the Virginia Institute of Marine Science, as well as colleagues from GSO. In addition to better understanding hypoxia, their goal was to develop a new model to predict low oxygen events.

Oviatt has also worked on a Bay monitoring program which involves routinely testing water from 13 sites in the Bay for oxygen, salinity and temperature. Called Bay Window, the project is a collaborative effort to monitor the Bay's ecological condition involving NOAA, Brown University and Roger Williams University, as well as URI scientists and the state's Department of Environmental Management.

Results from the sampling have been encouraging. "The lower bay is becoming less nutrient rich," Oviatt observed.

Monitoring the health of the Bay is nothing new for Oviatt. The first female student to graduate from GSO, she has been teaching biological oceanography at GSO from 1990 to 2009 and has conducted research at the MERL on the Bay Campus since the laboratory opened in 1976. MERL is notable for 14 fiberglass tanks known as mesocosms, which are located on a dock adjacent to the laboratory. In these tanks, Oviatt has observed ecosystems impacted by enhanced nutrients, sewage sludge, and other factors over the years.

Oviatt also helped to produce the Ocean Special Area Management Plan (SAMP), which was adopted by the state in 2010 and will serve as a blueprint for the development and protection of Rhode Island's offshore waters. A member of the SAMP's Science Advisory Task Force, she measured phytoplankton production in Rhode Island and Block Island Sounds.

Candace Oviatt

Ben Anderson

The Limitless Inspiration of the Ocean

Ben Anderson is an assistant professor in the University of Rhode Island's (URI) department of art and art history, whose sculpture has been collected by Boston's Museum of Fine Arts, among other places.

Anderson frequently takes to the water, either with a friend who is a commercial fisherman or on his own skiff, to experience the feeling of openness that comes with being near the sea and the "definite mystery" he finds in the concept of limitless horizons.

"I'm just drawn to that," said Anderson, a graduate from the Rhode Island School of Design (RISD), who teaches Three Dimensional Art and Sculpture to URI students.

The same sense of space has long drawn artists to New Mexico and other southwestern states, Anderson noted. But, on the East Coast, it can only be found near the water, whether it's Narragansett Bay or the Atlantic Ocean beyond, which is why this 51 year old artist and teacher keeps a studio in Warren, Rhode Island and often finds artistic inspiration in the shells, old bottles, unusual rocks, spider crabs and other items he finds near the shore.

"I collect shells from all over," says Anderson, who usually works in ceramic and wood using plaster molds he makes from the objects he finds.

"For me, it's about the texture, not the object," he says.

When he first graduated from RISD, Anderson made money as an architectural mold maker, scaling buildings in downtown Providence to replace cornices and other historic features that had worn down with time. Then, after earning his MFA from the University of California at San Diego, he began to teach in colleges and universities throughout Rhode Island, including RISD, all the while making his own naturally drawn art.

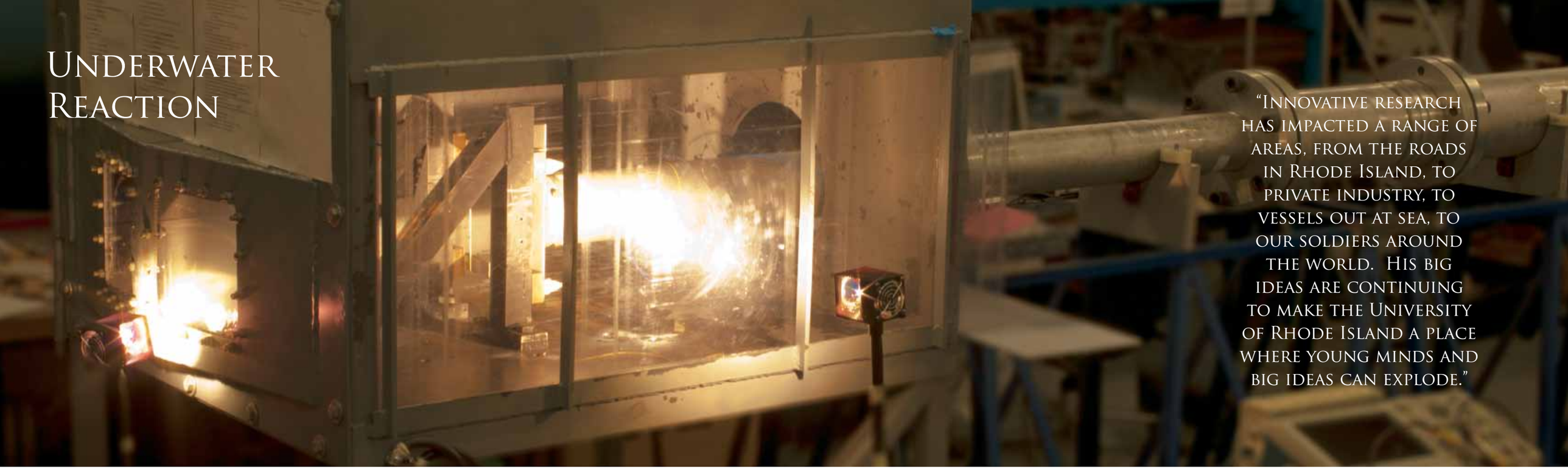
At first, he made molds of various fish species, and combined them on a surface to tell a story. Over time, these narratives, which Anderson noted are not literal in the sense of ordinary storytelling, grew increasingly complex, eventually evolving into freestanding sculptures that combine a variety of natural shapes and forms. His goal is to make viewers think of the "connection" between objects and to combine them in a new and interesting way.

A recipient of numerous grants and awards from the Rhode Island State Council on the Arts, among other sources, Anderson uses glazes derived from copper, cobalt, iron and magnesium because they have "naturalistic tendencies" which complement the nature-inspired themes of his work. Also, there's a little bit of chance involved with these glazes and he likes the mystery of that, he said.

"I think in accepting emerging techniques, new materials, hybrid methodologies and cross boundary activity, the sculptural field is expansive," Anderson notes.

His role as a teacher is to be a "guide" through these possibilities, and at times teaching can be really dynamic, he said. But, at the same time, his students often guide him, he said, noting, "Sometimes I get some of best ideas when I work around them."

Underwater Reaction



"Innovative research has impacted a range of areas, from the roads in Rhode Island, to private industry, to vessels out at sea, to our soldiers around the world. His big ideas are continuing to make the University of Rhode Island a place where young minds and big ideas can explode."

It is not unusual to hear fireworks coming from Wales Hall, the home of the University of Rhode Island's (URI) department of mechanical, industrial and systems engineering. In fact, explosions occur on a regular basis in a laboratory on the first floor, where Professor Arun Shukla and his students blow things up to better understand how materials, such as composites and other advanced materials, react to blast loadings from explosives.

He has developed materials to better withstand explosives, such as a polymer coating for glass, and sandwich composites materials, which uses foam between two skins of polymer to help absorb shock waves. The study of wave propagation, including underwater reaction (explosion and implosion), is another research interest of Shukla's. He has published more than 300 papers and held a Simon Ostrach Endowed Professorship at URI for 10 years.

Some of this research is taking place underwater in collaboration with Newport's Naval Undersea Warfare Center.

His innovative research focuses on the cracks and other damaging mechanisms that spread in advanced materials and concrete, glass, and other building materials following an earthquake, blast, or other high-impact events that are Shukla's specialty. It is a research field he has led for 30 years in URI's Dynamic Photomechanics Lab with funding from the National Science Foundation (NSF), the U.S. Department of Homeland Security and the U.S. Air Force and Navy, among other sources.

If tools make the mechanic, as it has sometimes been said, then among Shukla's most important tools are super high-speed cameras which can capture the physics of things breaking apart far better than the human eye is capable of doing. One of the cameras, an Imacon 200, can take 200 million frames per second. It was purchased with a $457,000 Major Research Instrumentation Grant from the NSF.

"We are not interested in things that happen slowly," Shukla wryly observed.

The other "multi-spark" camera is more unique. It, too, is very high-speed; it is able to capture up to 900,000 frames per second. But it can also be set to record 20 images of a dynamic event at pre-specified times, enabling Shukla and his students to see how explosives affect materials, nanosecond by nanosecond. This capacity has earned URI a national reputation – and a segment on NBC's *Today Show* – in the field of dynamic studies.

Much of the time, Shukla's cutting edge research is funded by the U.S. military, which is responsible for protecting underground weapons silos and bunkers, among other vital tasks. He has helped to improve the body armor soldiers wear in combat and to test the resistance of Kevlar bulletproof vests. But the civilian sector has also tapped his skills; Rhode Island's Department of Transportation, for instance, has awarded him grant money to study the "strength" of the state's highway bridges, asphalt and high-performance concrete. And he has worked with private industry at times.

"We interact with industry to help them develop new materials for better blast and ballistic protection," he said.

After the terrorist bombing of the USS *Cole* in 2000, the cruise ship industry and the military around the world wanted to find better materials with which to build their ships, Shukla noted. The result is a sandwich composite material he developed for hulls that is better than the material the Swedish Navy is using in its new Visby class of stealth ships.

"All of the sandwich composite research we are doing started after the *Cole* was hit by the blast," he said. That attack killed 17 U.S. sailors and injured several more.

Currently, Shukla is continuing his research into crack propagation, focusing on how different materials respond to not only explosions, but also extreme damage that takes place in combined extreme environments. For instance, with funding from the Air Force Office of Scientific Research, he is looking into the well-publicized problem of aircraft losing their heat shields when they re-enter the Earth's atmosphere. He is also working with the Navy to see how extreme temperatures affect sandwich composite materials.

"Our objective is to see how differently they behave and how to improve it," he said.

Another research project that is currently funded by the NSF involves using nanoparticles (carbon nanotubes) as trace sensors to study the damage from dynamic loading.

After earning his Ph.D. from the University of Maryland, Shukla came to URI in 1981 and began his research into crack propagation immediately. Although he has had several opportunities to leave over the years, he said he stayed because the administration at URI has been so supportive of his work. He takes pride in the fact that 80 graduate students have passed through his lab during the past 30 years, all of them moving on to significant positions in government, academia and industry.

"That's remarkable for any university anywhere," he said.

Shukla's innovative research has impacted a range of areas, from the roads in Rhode Island, to private industry, to vessels out at sea, to our soldiers around the world. His big ideas are continuing to make the University of Rhode Island a place where young minds and big ideas can explode.

Arun Shukla

A Legacy of Researching
Rhode Island Waters with Rhode Islanders

The innovative research interests of Arthur Gold cover a broad swath in the field of ecological management.

A professor in the University of Rhode Island's (URI) department of natural resources science, Gold explores such local questions as how a suburban community can protect a beloved stream from pollution to working with scientists from around the world to develop techniques for tracing nitrogen.

The latter project, which is funded by the United Nations, brings scientists from developing nations together with scientists from the United States and other industrial countries to share their knowledge about water pollution sources and how best to control them. Gold, a senior advisor to the project, said the scientists share a common goal, but the solutions they discuss necessarily differ because every country is different.

"The science needs to be tailored to a specific area," Gold said.

For instance, scientists in the U.S. have the technology to use stable isotopes to trace nitrogen as it travels through the environment, but scientists from developing countries typically aren't as fortunate, he said. So the goal becomes helping them to adopt "natural tracers" to detect nitrogen activity in their watershed regions.

"Nitrogen is very interesting," said Gold.

Arthur Gold

With the advent of new inexpensive nitrogen fertilizer and improved seeds in the 1950s, which spawned the so-called "Green Revolution in Agricultural Production," humans have altered the natural nitrogen cycle by greatly adding to the amount of nitrogen released into the environment, he said. Among the well-publicized results of this nitrogen release have been hypoxic dead zones in the world's oceans, algae blooms in coastal waters, and the production of nitrous oxide, a damaging greenhouse gas.

But though the problem of nitrates and other source contaminants usually manifest themselves in the water, they start on land, which is why Gold, a professor of watershed hydrology and management, has focused much of his research career on understanding watersheds. He is particularly interested in communities that lie between cities and rural areas, where residents can still enjoy a sense of their natural surroundings, but too much development can threaten their quality of life.

"Is there a way to soften the ecological footprint of new development and do that in a strategic fashion?" he asks.

Is there a way to make people more aware of their natural environment and, thus, involve them in efforts to protect it?

In Rhode Island, these are critical questions since most of the state lies between urban and rural areas, Gold said. In order to sustain this "non-urban" population, the state has to be smart about development, and the people development most affects have to be involved, he said.

To that end, Gold started a nationally recognized program called URI Watershed Watch, now led by Linda Green and Elizabeth Herron, which relies on trained citizen volunteers in Rhode Island to monitor the streams, lakes, reservoirs and ponds in their neighborhoods. The program, which is funded by a combination of grants from the state, local communities, the federal government and URI, has 300 Rhode Island volunteers, who routinely provide the state with valuable water quality data.

Launched in the late 1980s, URI Watershed Watch has become a model for other states, which have created similar programs.

"The idea was to empower people and give them ties to their local communities," said Gold.

That's one success story, one that grew out of Gold's commitment to URI's status as a Land Grant College with Cooperative Extension programs for the public.

Another success story is the group of research scientists Gold has assembled at URI to develop technologies and methods to help homeowners minimize their ecological footprint in vital watershed areas. This group has been instrumental in developing solutions to two major problems related to Rhode Island's watersheds: septic systems and well water.

Since 1994, the New England On-Site Wastewater Training Center, led by George Loomis, has provided technical assistance in siting, installation and maintenance of on-site wastewater systems. Additionally, the training center oversees research in the development of alternative septic systems and guides communities in the development of wastewater management ordinances. Over 40 Rhode Island private businesses and organizations have developed products and services for the center, which is one of 12 regional training centers of its kind in the country.

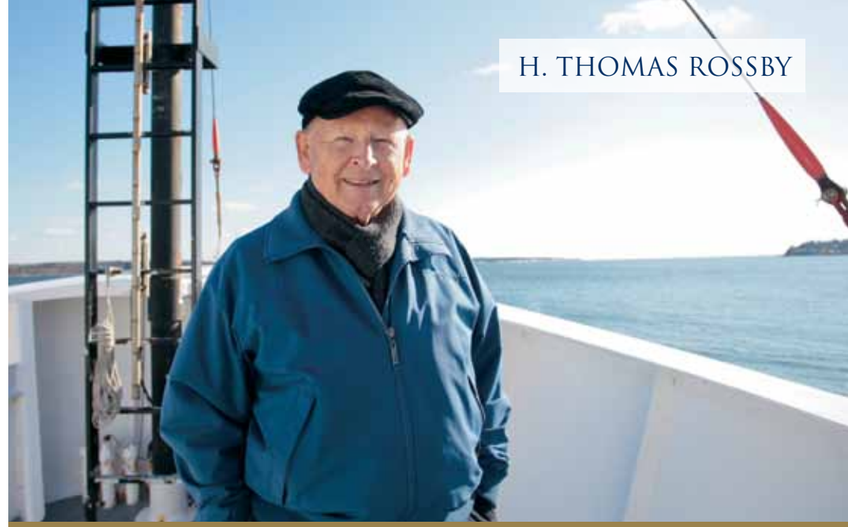
The center also conducts research into various aspects of wastewater management. With a $3 million grant from the federal Environmental Protection Agency, it helped the communities of Charlestown, Block Island and South Kingstown develop and expand their wastewater management programs. Another project replaced 25 failed septic systems in the troubled Green Hill Pond watershed with alternative septic systems.

For homeowners who rely on private wells for their drinking water — and a surprising number of Rhode Islanders fall into that category — Gold helped to create URI Home*A*Syst, a Cooperative Extension program led by Alyson McCann that provides information on testing and maintenance of wells. Like Watershed Watch, the Home*A*Syst program empowers citizens to become aware of their environment. It is a voluntary residential pollution prevention program, which encourages homeowners to have their well water tested and educates them about potential contaminants.

"By and large, the bulk of our programs trickle down to the homeowners," said Gold.

Rhode Islanders are fortunate to live in a state that retains a "sense of the natural" and it is important for them to learn how to protect it, he said. His big ideas are helping this small state make big impacts on the environment and the economy.

THE PROGRAM, WHICH IS FUNDED BY A COMBINATION OF GRANTS FROM THE STATE, LOCAL COMMUNITIES, THE FEDERAL GOVERNMENT AND URI, HAS 300 RHODE ISLAND VOLUNTEERS, WHO ROUTINELY PROVIDE THE STATE WITH VALUABLE WATER QUALITY DATA.



H. THOMAS ROSSBY

UNDERWATER ENTREPRENEUR

When H. Thomas Rossby looks at the ocean, he doesn't see what most people see. An oceanography professor at the University of Rhode Island's (URI) Graduate School of Oceanography (GSO), Rossby has spent his career studying underwater currents that are barely visible to the human eye, but are hugely important to the climates of the countries they sweep by and to the marine life they ferry along.

"I study the ocean in motion," Rossby says, a slight Swedish accent detectable in his voice.

With a background in engineering, as well as ocean science, Rossby's big ideas have distinguished him from others because he designs instruments and technology that have greatly added to the world's understanding of ocean currents. In honor of his contributions, scientists from all over the world, most of them former students and colleagues, gathered at URI in the fall of 2011 for the "Rossby Symposium," an event that clearly touched the professor's heart.

He considers himself a fortunate man for having been introduced to oceanography at a time when there was still very limited knowledge about ocean currents, Rossby said. That was in the mid-1960s, when Rossby earned a Ph.D. in oceanography from the Massachusetts Institute of Technology. He taught at Yale University before joining URI's faculty in the mid-1970s and even then there was still just an "inkling" about the movement of the world's oceans, he said.

Rossby has invented or made improvements to a series of instruments that helped scientists measure the currents, among them an inverted echo sounder — an acoustic instrument that can measure heat in a water column — the Pegasus profiler (of currents), and the Ranging and Fixing Of Sound (RAFOS) float, which is a long thin glass pipe, which can stay submerged in water at a targeted depth and show how the ocean moves at that depth. The float registers acoustic signals sent from anchored sound sources. With this information, scientists can chart in detail ocean currents. This was impossible before.

"What makes me different from many of my colleagues is that as an engineer by background, I have the ability to see how to build instruments that can help us," said Rossby. This skill, in turn, has enabled him to open up new areas for study, he said. He is an entrepreneur whose inventions have taken advantage of underwater sound to make novel measurements, which is important to the economy of Rhode Island's marine industry. There is much that can be done here, and with the strong infrastructure and active research in ocean acoustics here in Rhode Island (such as Raytheon, Naval Undersea Warfare Center, URI's department of ocean engineering, and FarSounder) there are possibilities here.

Rossby is currently overseeing four projects, one of which involves deploying floats in the Norwegian Sea, which is the Gulf Stream's last stop after it crosses the Atlantic. His goal is to better understand the cooling processes that transform the warm salty waters from the Gulf Stream into the deep dense waters that flow back out into the global deep ocean.

Another project involves "harvesting" data about currents from instruments that have been placed on a ferry that travels from Denmark to Iceland and on a container vessel that operates between New Jersey and Bermuda to monitor the variability of the Gulf Stream over time. These projects are funded largely by the National Science Foundation.

Rossby said he enjoys his scientific research, but he also loves working with URI's oceanography students. "Our mission is to train future generations of marine scientists and we take it very seriously," he said.

Mapping the Ocean Floor

Christopher Roman

Christopher Roman combines robotic platforms, digital cameras and sonar technology to map and photograph one of the world's least known terrains – the ocean floor.

"So little of the ocean floor has been mapped," notes Roman, an assistant professor of oceanography at the University of Rhode Island's (URI) Graduate School of Oceanography.

But Roman's inventive research is working to change that. Working side-by-side with world-renowned ocean explorer and URI professor Robert Ballard, Roman travels around the globe to map underwater landscapes, most of which have never been seen before.

In addition, he and his students have developed the tools needed to accurately depict those deep-water environments, where people are unable to work safely, opening up a whole new world for scientists to explore.

"We're getting out of the manned game," Roman says. With effective underwater robotic platforms, scientists can do more and stay longer, he says.

Looking ahead, robotic monitoring over large areas and longer durations is needed for even the most basic understanding of the ocean, let alone the effectiveness of government regulations, such as no-catch zones, he says.

To this end, Roman has developed a drifting float, which can be positioned anywhere in the water column and take measurements and photographs of the marine environment as it is carried by the currents. It is a variation of a Lagrangian float, which is well known to marine scientists, and is currently being tested in the waters off Rhode Island.

"Lagrangian floats have been used in oceanography for several decades to make observations of global ocean circulation and water column structure," Romans says.

His Lagrangian float differs in that it has been adapted for use in shallow coastal waters and is low-cost and versatile. His challenge now is to enable these floats to also take more photographs over extended periods of time, a task seemingly tailor-made for Roman's expertise.

"I try to work at the intersection of ocean science and ocean technology," he says, noting that the common theme underlying all of his research is how to use state-of-the-art robotics and technology to advance basic ocean science.

Roman earned his Ph.D. in ocean engineering from the Massachusetts Institute of Technology and Woods Hole Oceanographic Institute before joining URI's faculty in 2006. He divides his time between teaching, his own research and working with Ballard on mapping the ocean floor.

The latter assignment takes him on board the *Nautilus*, one of two ships connected to URI's Inner Space Center (ISC) to conduct real-time underwater exploration around the globe. Supported by the National Oceanic and Atmospheric Administration Office of Ocean Exploration and Research, the vessels deploy deep-sea robots to explore depths of up to 4,000 meters, streaming live video back to the ISC for broadcast to scientists and the public on the web.

"Our ultimate goal is to create maps like the water isn't there," he said. A big idea behind accurate mapping is that it can help the aquatic industry in Rhode Island.

The *Nautilus*, with Roman on board, has explored the eastern Mediterranean, Aegean and Black seas for the better part of the last three summers, destinations chosen for their rich history and tectonic complexity. Ancient mariners plied these waters, leaving behind tantalizing glimpses of the past in the form of numerous shipwrecks that lie on the bottom of the seafloor. The *Nautilus* has explored more than 20 shipwrecks in an archaeologically fertile region off the Bodrum and Datcha peninsulas in the Aegean, some of them dating back to the time of the ancient Greeks.

"Seeing a wreck in perfect condition, as an ancient time capsule, is pretty amazing," says Roman.

So, too, are the hydrothermal vent systems, which the *Nautilus* has explored. The vent systems sprout in the ocean darkness, evidencing communities of life where no life was thought to exist before. Roman called them "spectacular" to behold.

Roman's goal on these expeditions has been to create detailed photographic and bathymetric maps showing the texture and shape of the seafloor, using a combination of stereo cameras, multi-beam sonar and structured light laser systems. Working with several robotics groups, he is determining the combination of methodologies and sensors that render the most accurate images with resolutions high enough to be of value to researchers. The result is a picture of what lies at the bottom of these seas, which is useful to scientists from many different fields.

"Developing the tools and techniques to produce these data products is a central focus of the *Nautilus* program," Roman says.

The maps Roman and his colleagues are creating are quite accurate; "at most, they're off by less than a few inches," he said. But, in time, he hopes that the science of underwater mapping will be just as accurate as mapping of land above sea level.

"Our ultimate goal is to create maps like the water isn't there," he said. A big idea behind accurate mapping is that it can help the aquatic industry in Rhode Island.

The University of Rhode Island Scientific Diving Safety Program

The University of Rhode Island's (URI) scientific diving safety program is a multi-faceted enterprise that offers training to professors, staff and students, while insuring that the many dives undertaken by university researchers comply with regulations set by the American Academy of Underwater Sciences. URI research divers span many disciplines and dive in locations around the world.

The only program of its kind in Rhode Island, the scientific diving safety program also provides training and supervision to researchers from other schools who work with URI scientists. The program is considered a critical component which supports research in several colleges whose faculty engage in underwater research. The URI diving program is managed by a Diving Safety Officer and a Diving Control Board made up of URI scientists and students. The URI Diving Control Board, chaired by URI history professor, Ian "Rod" Mather, is the group charged with approving scientific diving expeditions. Anya Watson is the Diving Safety Officer who arrived from the scientific diving program at the Smithsonian Institution. Her position at URI includes training divers, maintaining equipment, and overseeing all diving activities at URI.

The program offers an array of not-for-credit courses and for-credit courses for recreational and professional divers, who take classes at the Tootell Aquatic Center and at popular diving spots along South County's shore. The series of three-credit courses on scuba diving is one of the program's features. The courses include Basic & Advanced SCUBA, Research Diving Methods, and Maritime History and Underwater Archaeology Field School. These courses are more rigorous than the instruction offered at retail dive shops, and are essential if students want to join research professors in the field.

URI has a considerable number of research professors, dozens in fact, who need to dive for their scientific work, said Graham Forrester, professor in marine biology. He estimated the number to be between 40 and 60, with a smaller group who dive year-round. They include marine biologist Brad Seibel, who has taken deep dives in blue water to study the Humboldt squid, and Mather, who frequently explores shipwrecks and other underwater archaeology sites. The diving program also includes research activities on URI's research vessel, *Endeavor*.

For every trip, a dive safety plan must be submitted to the university's Diving Safety Officer and its Diving Control Board, who make sure the plan complies with safety regulations. If a dive is particularly complicated or risky, the Diving Safety Officer will accompany the researcher into the field to provide support. The program also has a portable van, complete with equipment, tools, and compressor, designed to support shipboard operations that is funded by the National Science Foundation. In the future, the URI diving program may consider developing a broader statewide program so that more students and researchers from other universities can take advantage of what URI has to offer, said Mather.

Thanks to URI's Diving Control Board, the university has a good safety track record when it comes to underwater research, Mather said.

The Ocean as Therapy

Anyone who has been fortunate enough to spend time by the ocean knows how soothing and therapeutic it can be. And people who surf, like Emily Clapham, an assistant professor of kinesiology at the University of Rhode Island (URI), seem to possess an even greater belief in the power of the ocean to ease the stress of living in a fast paced, high-tech world.

A native Rhode Islander, who has been surfing since high school, Clapham has taken her passion for surfing and combined it with her professional interests in teaching physical education to children with disabilities.

In 2011, she launched an innovative pilot program at Narragansett Town Beach to teach surfing to children with autism, cerebral palsy, Down's Syndrome and other special needs, a program that was so successful she plans to offer it again in the summer of 2012. The research study calls for giving the children heart rate monitors to record their heart rates before, during, and after surfing to measure stress levels and time spent in the target heart zone. The children will wear accelerometers both before and after surfing to measure activity counts and caloric expenditure throughout the research project. The children and parents complete a self-esteem survey both before and after the research to study mental and emotional benefits of the research. Further, the children will complete a physical fitness test that measures cardiorespiratory endurance, muscular strength, endurance and flexibility. Lastly, the children's balance is measured.

This research is being funded by a URI Human Science and Services Interdisciplinary Research Partnership Grant. Clapham is collaborating with Jennifer Audette from physical therapy and Linda Lamont from exercise science.

"Being in the water has a calming effect and will decrease stress levels, improve muscular strength, muscular endurance, flexibility, cardiorespiratory endurance, balance, self-esteem, daily activity counts and energy expenditure," Clapham said.

Her big idea is changing lives.

Children with disabilities feel more stress than other children, said Clapham, noting that small changes in their daily routines, especially for children with autism, can throw them off-balance emotionally for an entire day. Ocean therapy can help make life more bearable for these children, while providing their surfing instructors, most of whom are undergraduate students at URI, with a once-in-a-lifetime beach experience, she said.

The pilot program at Narragansett Town Beach took place one day in early summer. Clapham, a skilled surfer who aided in founding URI's Surf Club (1998), trained her student instructors, using surf boards rented by Rhode Island surf legend, Peter Pan. The primary roles of the instructors were to provide one-on-one instruction, positive feedback and to make sure the children stayed safe in the water, Clapham said. But, by day's end, a lot more than that had been accomplished with the 20 children who took to the waves.

"It was unbelievable," said Clapham.

Some children were able to stand up on their boards and ride the waves immediately and some children caught waves on their knees and stomachs with a boogie board. The success of the day could be measured by the smiles on the children's faces.

"Everyone was successful in their own way," Clapham said.

In the spring, Clapham and her kinesiology students also teach swimming to children with special needs at URI's Tootell Aquatics complex. In the fall, they offer weight training, fitness, cooperative games and sport skills in the Tootell West Gymnasium and in the Kinesiology Laboratory.

Her research specialty is integrating technology into physical education classes. Before joining the faculty at URI, she designed physical education curriculum for Boston's public schools that included activities measured by pedometers and heart monitors. Urban children, especially, need effective physical education classes because the health risks are higher for minority children and they often lack activities that are available to suburban children, such as soccer leagues and organized activities, she said.

"They can't go out and play after school because it may not be safe," said Clapham.

Additionally, Clapham and Lori Ciccomascolo, URI's associate dean of the College of Human Science and Services, implemented a 10-week program in Providence's public schools designed to increase the activity and self-esteem of young urban girls. The program involved 30 girls in grades three to five from the Sackett Street Elementary School. It took place in the spring of 2010 and combined lessons in communicating, conflict resolution and problem solving with activities in the gym designed to reinforce those lessons.

"Research has shown the activity of girls in middle school plummets," said Clapham. This is due to a variety of reasons including low self-esteem, decreased opportunities for movement, and activity choices in physical education.

To address these issues, Clapham and Ciccomascolo designed a research study called "Effect of a Leadership Curriculum and Physical Activity Program on Fourth and Fifth Grade Girls' Academic Achievement, Self-Esteem and Attraction to Physical Activity." The study was funded with a grant from the URI Foundation.

"It was great fun working with the young girls, and we hope to bring the program to more schools in the future," she said.

Meanwhile, surf's up in Narragansett and thanks to Clapham, Rhode Island has joined states such as Florida and California in pursuing the value of ocean therapy. Noting URI's nearness to several South County beaches, and Rhode Island's moniker as the Ocean State, Clapham said, "We're in the perfect location for this research."

"Clapham has taken her passion for surfing and combined it with her professional interests in teaching physical education to children with disabilities."

Emily Clapham

BOOKS AND ELECTRONIC MATERIALS, PUBLISHED BY UNIVERSITY OF RHODE ISLAND FACULTY MEMBERS, 2011

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 publications please see:

www.uri.edu/library/faculty_publications/index

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THE UNIVERSITY OF RHODE ISLAND
RESEARCH HONORS & AWARDS 2011

Compiled by the College Deans Offices

COLLEGE OF ARTS AND SCIENCES

MARY CAPPELLO, professor of English, was awarded a Guggenheim Fellowship from the John Simon Guggenheim Memorial Foundation. The competition fellowships, awarded on the basis of prior achievement and exceptional promise, went to a diverse group of scholars, artists, and scientists in the U.S. and Canada. Cappello was one of 13 creative artists who won awards in nonfiction.

MAURY KLEIN, professor emeritus of history, was inducted into the Rhode Island Heritage Hall of Fame in recognition of his 16 major scholarly books that examined the industrialization of America and the Captains of Industry who spearheaded that technological revolution, including those who expanded the railroads.

ERIK LOOMIS, assistant professor of history, created a series at Lawyers, Guns, and Money entitled "This Day in Labor History" that won the History News Network's Cliopatria Award in the "Best Series of Posts" category.

BERNICE LOTT, professor emerita of psychology, was awarded the American Psychological Foundation 2011 Gold Medal for Life Achievement in Psychology in the Public Interest for her work on social changes, including pioneering work in the psychology of women and her recent success in creation of a permanent APA committee on issues of social class.

BRETT LUCHT, professor of chemistry, **WILLIAM EULER**, professor and department chair of chemistry, and **YU WANG**, Ph.D. candidate of chemistry, received a U.S. patent for their invention "Thermochromic Indicator Materials with Controlled Reversibility."

IAN RODERICK MATHER, professor of history, was nominated to the Outer Continental Shelf Scientific Committee by Ken Salazar, United States Secretary of the Interior. The committee advises the Secretary of the Interior.

PATRICIA MOROKOFF, professor and chair of psychology and co-chair of the Equity Council, received the Academic and Professional Association Woman of the Year Award for her distinguished professional achievements and her ongoing dedication to equity and the advancement of women.

JAMES PROCHASKA, professor of psychology and director of the Cancer Prevention Research Center, was honored along with First Lady Michelle Obama by the Society for Public Health Education (SOPHE). Prochaska was named a 2011 Honorary Fellow for his lifetime of achievements in improving the theoretical base of the health education field. He was recognized in particular for his development of the Transtheoretical Model for Behavior Change.

YANA RESHETNYAK and **OLEG ANDREEV,** associate professors of physics, and **DONALD ENGELMAN** (Yale), professor of physics, received a U.S. patent for their invention of "Selective Delivery of Molecules into Cells or Marking of Cells in Diseased Tissue Regions Using Environmentally Sensitive Transmembrane Peptide."

PAMELA WARNER, assistant professor of art history, was selected as a scholar in residence at the Deutsches Forum für Kunstgeschichte in Paris, France for the spring of 2011.

PROGRAM AWARDS
The Association of International Educators recognized the University of Rhode Island as one of eight recipients of the 2011 Senator Paul Simon Awards for Campus Internationalization. The award honors URI as "a leader in internationalizing its engineering curriculum and in creating a global environment for students through foreign language learning and connections to companies that are globally oriented." The International Engineering Program is jointly administered by the Colleges of Arts and Sciences and Engineering.

COLLEGE OF BUSINESS ADMINISTRATION

YUWEN CHEN, assistant professor of operations and supply chain management, was honored by the University of Rhode Island Transportation Center in May 2011 as the Researcher of the Year in recognition of his study with James Kroes, a former CBA professor, "*Feasibility Study to Increase Utilization at the Port of Davisville.*"

NIKHILESH DHOLAKIA, professor of marketing and international business, was the featured scholar in *Providence Business News'* "*Five Questions With: Nikhilesh Dholakia on The Big Business of Social Networking*" in September, 2011.

SILVIA DORADO, associate professor of entrepreneurial management and law, was the recipient of a grant from the Strategy Research Foundation (SRF) for her 2011 project entitled "Firm capabilities and poverty alleviation: The role of job design in the control of mission drift in for-profit social enterprises." She is also named as one of the inaugural Strategy Research Foundation Scholars in 2011.

KEN G. SMITH, professor of entrepreneurial management and law, received the National Educator Award from the Academy of Management in August, 2011. The Academy of Management, the oldest and largest scholarly management association in the world with nearly 20,000 members, selected Smith for his work developing doctoral students and junior faculty. Professor Smith's book, "Strategy As Action: Competitive Dynamics and Competitive Advantage" (Oxford University Press), coauthored with Curtis M. Grimm and Hun Lee, named one of the top five managerial economics books in 2011 by EconGuru.

ANTHONY WHEELER, associate professor of entrepreneurial management and labor research, won the 2011 Emerald Literati Network Outstanding Author Contribution award for his co-authored article, Brown, M., Halbesleben, J. R. B., & Wheeler, A. R., *Lead for demand and lag for supply: The use of pay level to predict hospital financial performance.* In M.D. Fottler, N. Khatro, and G.T. Savage (Eds.), *Advances in Health Care Management*, 9 (pp. 79-96). Emerald Publishing Group: London, UK.

TONG YU, associate professor of finance and decision science, was the winner of the Early Career Scholarly Achievement Award in August 2011 from the American Risk and Insurance Association (ARIA). This award honors distinguished achievement of risk management and insurance scholars who are within 10 years of award of the Ph.D. degree.

COLLEGE OF ENGINEERING

ARIJIT BOSE, professor of chemical engineering, **JAYASHRI SARKAR, CHRISTOPHER BROOKS, VIJAY T. JOHN** and **GANAPAHIRAMAN RAMANTH,** received a U.S. patent for their invention of "Highly Ordered TiO2 and Pt/TiO2 Nanocomposites for Advanced Catalytic Applications."

JIEN-CHUNG LO, professor of electrical, computer, and biomedical engineering, and **CHUEN-SONG CHEN,** received a U.S. patent for their invention of "Systems and Methods for On-Chip Power Management."

OTTO GREGORY, professor of chemical engineering received a U.S. patent for his invention of "High Temperature Strain Gages" and received a U.S. patent with **MARKUS DOWNEY, STEVE WAUK** and **VINCE WAUK,** for their invention of "Composite Used for Thermal Spray Instrumentation and Method for Making the Same." He also received a U.S. patent with **GUSTAVE FRALICK, JOHN WRBANEK** and **TAO YOU,** for their invention of "Thin Film Ceramic Thermocouples."

YING SUN, professor of electrical, computer, and biomedical engineering, **JIANG WU, JOHN DICECCO** and **ROBERT HILL,** received a U.S. patent for their invention of "Processor Controlled Voltage-Current Analysis of Nerve and Muscle Tissues."

AUGUSTUS UHT, professor of electrical, computer, and biomedical engineering, **DAVID MORANO** and **DAVID KAELI,** received a U.S. patent for their invention of "Resource Flow Computing Device."

QING YANG, professor of electrical, computer, and biomedical engineering received a U.S. patent for his invention of "Cache Architecture for a Processing Unit Providing Reduced Power Consumption in Cache Operation" and received a U.S. patent with **XUBIN HE,** for their invention of "SCSI-TO-IP Cache Storage Device and Method."

COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

PETER AUGUST, professor of natural resources science, won the 2011 Marc J. Hershman Excellence in Mentoring Award from the Joint Ocean Commission Initiative (JOCI). The JOCI is a bipartisan collaborative effort of the U.S. Commission on Ocean Policy and Pew Oceans Commission. The primary goal of the Joint Initiative is to accelerate the pace of change that results in meaningful ocean policy reform. The commission recognizes people for instilling a passion for oceans in students and young professionals. Dr. August exemplifies the legacy of Professor Hershman by educating, training and inspiring students and young professionals to pursue careers in ocean and coastal science, policy and management. He was nominated by a fellow faculty member and received 20 outstanding letters of support from current and past students and professional colleagues. He extends his talent to each of the students, providing enormous value to their education and builds a sense of dignity, excellence and peer support. Dr. August is admired not only by his students but also by his professional colleagues, many of whom credit him as a mentor, teacher, advisor and all-around inspiration.

MARTA GOMEZ-CHIARRI, professor of fisheries, animal, and veterinary science and **DAVID NELSON,** professor of cell and molecular biology received a U.S. patent for their invention of "Delivery of DNA Vaccines into Fish by Immersion."

DAVID E. FASTOVSKY, professor and department chair of geosciences, and colleagues published a paper regarding a nest of the dinosaur Protoceratops andrewsi in the Journal of Paleontology. The nest preserved in stunning detail 15 babies. Their size demonstrated that the babies were not freshly minted neonates, so the find indicated parental care in this genus and, because Protoceratops is a basal ceratopsian, the behavior is likely primitive for the entire group. They were also able to infer about the nature of their death, including what the last few seconds must have been like. The discovery was reported by *Discovery News*, *Fox News*, *National Geographic*, *the Huffington Post*, and distributed globally.

COLLEGE OF HUMAN SCIENCE AND SERVICES

BRYAN BLISSMER, associate professor of kinesiology, was selected as an author for position stands for the American College of Sports Medicine and the American Diabetes Association to contribute his expertise on the promotion and maintenance of physical activity to enhance health and prevent and treat diabetes.

PHILLIP CLARK, professor of human development and family studies and director of the Program in Gerontology, was selected to serve as a visiting professor at the School of Health and Social Care, Bournemouth University, in the UK.

JULIE COIRO, assistant professor of reading in the School of Education, was the 2011 recipient of the Early Career Achievement Award from the Literacy Research Association. This award recognizes the significant contributions she has made to literacy research and education in the early part of her career.

THE UNIVERSITY OF RHODE ISLAND RESEARCH HONORS & AWARDS 2011

DEBORAH RIEBE, professor of kinesiology, known for her expertise on exercise and fitness has been named associate editor of the American College of Sports Medicine's Guidelines for Exercise Testing and Prescription 9th edition, a prescriptive exercise guidebook widely used in medicine, athletics, and fitness programs.

COLLEGE OF PHARMACY

ERICA ESTUS, clinical assistant professor of pharmacy practice, received the 2011 Leadership in Education Award from the American Society of Consultant Pharmacists (ASCP). The award recognized her efforts developing intergenerational programs between URI College of Pharmacy students and older adults at South Bay Manor, Wakefield, RI. It was presented at the ASCP National Spring Conference in Las Vegas, Nevada in May 2011.

KERRY LAPLANTE, associate professor of pharmacy practice and adjunct clinical professor of medicine, was appointed the 2011-12 academic year Infectious Diseases Section Editor for *Pharmacotherapy; The Journal of Human Pharmacology and Drug Therapy*, the official journal of the American College of Clinical Pharmacy (ACCP).

PAUL LARRAT, professor of pharmacy practice, was named a Congressional Health Fellow and served as a health policy and research advisor in the office of Senator Ron Wyden (D-OR) in the United States Senate.

THE GRADUATE SCHOOL OF OCEANOGRAPHY

JEREMY COLLIE, professor of oceanography, was awarded the 2011 Sustainability Science Award by the Ecological Society of America (joint award for 2009 Science paper of which Collie was co-author, "*Rebuilding Global Fisheries*," published in *Science* in 2009.) The Sustainability Science Award is given to the authors of a scholarly work that makes the greatest contribution to the emerging science of ecosystem and regional sustainability through the integration of ecological and social sciences.

BARRY A. COSTA-PIERCE, director of Rhode Island Sea Grant and professor of fisheries & aquaculture at the University of Rhode Island, was elected as a Fellow of the Council of the American Association for the Advancement of Science (AAAS) for "distinguished contributions to global aquaculture and its sustainability and for leadership in marine research, education, and outreach as director of two NOAA-Sea Grant college programs." Each year the Council elects Fellows whose "efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished."

STEPHAN GRILLI, professor of ocean engineering with a joint faculty appointment at the Graduate School of Oceanography, was the recipient of the 2011 URI Foundation Scholarly Excellence Award. Dr. Grilli has served on the URI faculty since 1991. Dr. Grilli has earned an international reputation as a leader and an expert in advanced modeling of nonlinear ocean wave processes and their interactions with coastal and ocean structures, and air-sea interactions. He has published 177 books, chapters, and journal articles and has been awarded more than 50 competitive research grants during his career.

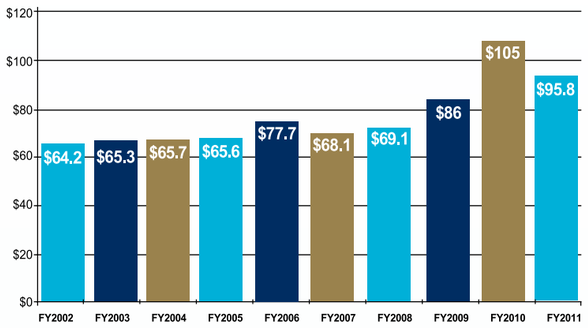
KATHERINE KELLEY, associate professor of oceanography, has been named the recipient of the 2011 Hisashi Kuno Award from the American Geophysical Union. The Hisashi Kuno Award recognizes the scientific accomplishments of junior scientists who make outstanding contributions to the fields of volcanology, geochemistry and petrology.

RAINER LOHMANN, associate professor of oceanography, was awarded an Alexander von Humboldt Fellowship for senior researchers to conduct research at the University of Tübingen. The Germany-based Humboldt foundation promotes academic cooperation between top scientists and scholars from in and outside of Germany.

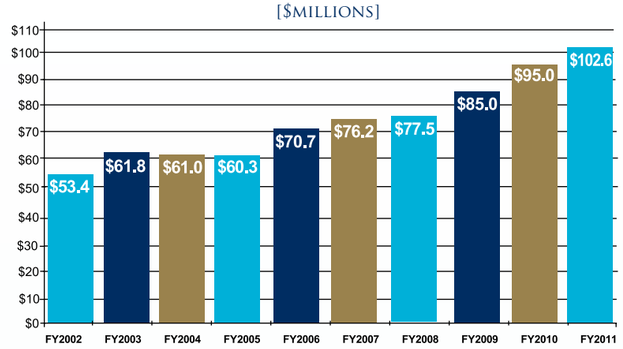
STEPHEN B. OLSEN, director of the Coastal Resources Center (CRC) at the University of Rhode Island's Graduate School of Oceanography, received Rhode Island Sea Grant's Lifetime Achievement Award, only the 6th such award given over its 40-year history, for his outstanding leadership of CRC and contributions to Rhode Island Sea Grant. Under his direction since 1975, CRC has developed a global reputation for innovation and action. CRC has raised over $70 million since 1985 to support programs in coastal resources management on three continents in the developing world as well as in the United States.

THE UNIVERSITY OF RHODE ISLAND RESEARCH ENTERPRISE AT A GLANCE

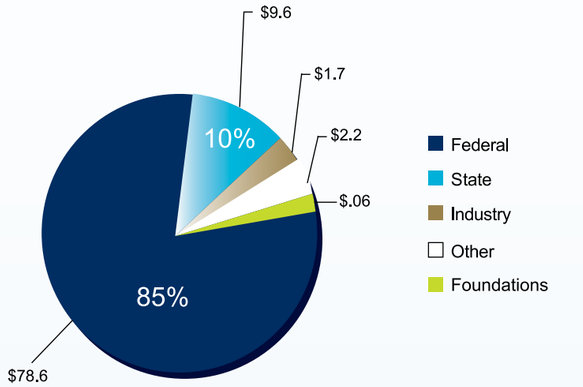
Sponsored Programs Awards FY2002 to FY2011
[$millions]



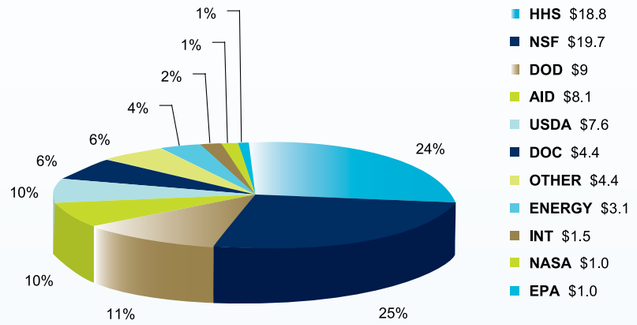
Sponsored Programs Expenditures Reported to the National Science Foundation FY2002 to FY2011
[$millions]



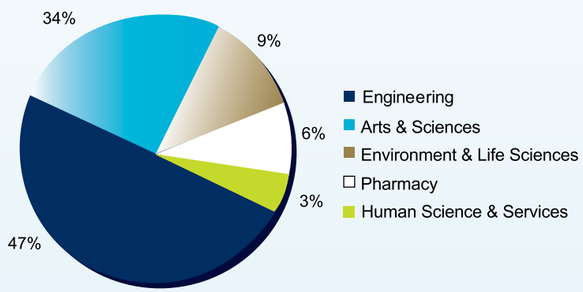
Sources of Sponsored Programs Funding FY2011
[$92.7 million total]



Sponsored Programs Awards by Federal Agency FY2011
($78.6 million total)



Distribution of Issued Patents and Registered Trademarks FY2007 to FY2011



Patent & Licensing Activity, Fiscal Years 2008 - 2011

	Disclosures Received	New Patent Applications[1]	US Patents Issued	Licenses Generating Revenue[2]
2011	17	17	10	27
2010	21	20	4	25
2009	26	5	5	27
2008	17	11	3	25

[1] New category for 2010. First filing of patentable subject matter in world includes US provisional, US non-provisional or PCT designating US.

[2] New category for 2010. Licenses generating revenue (license fee, royalties, etc) does not include research funding or patent expense reimbursement; individual intellectual property in stacked licenses counted separately.

THE
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DIVISION OF RESEARCH &
ECONOMIC DEVELOPMENT

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