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## Research & Innovation for 2010-2011

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# RESEARCH & INNOVATION

2010-2011

THE  
UNIVERSITY  
OF RHODE ISLAND

DIVISION OF RESEARCH &  
ECONOMIC DEVELOPMENT



**MULTI- AND INTERDISCIPLINARY RESEARCH**



DAVID M. DOOLEY, Ph.D.  
President

As indicated by Vice President Peter Alfonso, this edition of Research and Innovation outlines the contributions that the University of Rhode Island is making to a wide variety of important and challenging issues that face Rhode Island and the world. The challenges we face frequently demand the versatility and the ability to work at the intersections of multiple disciplines. Faculty at URI have established themselves as leaders in such endeavors and have forged a rich variety of partnerships and collaborations, both within URI and with many other institutions, organizations, and companies. Their efforts and achievements are truly worth promoting and celebrating.

Since World War II, America's research universities have led the world in discovery and innovation. The international leadership of our research universities has been an indispensable component in the competitiveness and growth of the American economy and in building our quality of life. As we all recognize, the difficult economic climate we now must confront will require thoughtful choices and continued investment in the engines of prosperity, job creation, and sustainability. As this report cogently demonstrates, the faculty and students of URI are deeply engaged in creating a better future for all of us. We hope that you will join them by supporting their work here at the University of Rhode Island and in making the case for renewed investment in America's research universities.

Sincerely,

David M. Dooley, Ph.D.  
President



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

Welcome to the 2011 edition of Research and Innovation, the research magazine of the University of Rhode Island. The mission of the University of Rhode Island's research enterprise is twofold: first, to engage in a wide range of disciplines to seek solutions to a host of critical issues that not only affect our state but also our region, nation, and the world; and second, to enhance economic development in our state by the commercialization of the products, technologies and processes that stem from our research. Indeed, we are doing exceedingly well on both of these accounts. The \$105 million in research grant and contract awards received by URI in fiscal year 2010, which represents a 22 percent increase over fiscal year 2009, and a 52 percent increase during the past three years, set an all time record for our institution. 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 \$178.5 million, which represents new money to the State that we would not have otherwise and in turn creates additional jobs and additional state and local taxes. And these numbers do not include the revenue and resultant economic impact that will accrue with the commercial enterprise that stems from URI research generated inventions.

The theme of this year's magazine is partnerships of various types that are often formed to solve the increasing complexities associated with contemporary problems and issues by employing equally complex scientific approaches and technologies. Indeed, collaborative teams of scientists, which are now more common than single investigator based research, have themselves evolved. The earliest collaborative approaches were either multidisciplinary or interdisciplinary. In the former, researchers from specific disciplines, biology for example, collaborate to address a common problem. In the latter, researchers from specific disciplines collaborate to create new knowledge or a hybrid discipline that did not exist previously. More recently, transdisciplinary teams consist of researchers who do not represent any particular discipline but rather possess the common knowledge associated with a particular problem. While the definitions of these and other collaborative approaches can vary across fields, the main point here is that URI faculty are seeking these and other novel ways to engage in a variety of partnerships to solve the most pressing issues of our days.

I trust that the 2011 edition of Research and 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



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# THE IMPACT OF URI FUNDED RESEARCH ON THE RHODE ISLAND ECONOMY IN FISCAL YEAR 2009

By Leonard P. Lardaro, URI professor of economics

The numerous and varied contributions that the University of Rhode Island (URI) makes to Rhode Island's economy are seldom quantified. That is unfortunate, since the benefits provided by URI have become increasingly critical to our state's long-term economic success. At the present time, Rhode Island's economy is at a crossroad, where it must not only continue to evolve into an economy that possesses the elements vital for its success in the post-manufacturing era, it must also generate levels of growth sufficient to satisfy its varied requirements. Funded research at URI was one of the few elements of Rhode Island's economy that expanded in fiscal year 2009 (FY09). As such, it made significant contributions in terms of both providing Rhode Island's economy with economic momentum and further enhancing its post-manufacturing environment.

## THE RHODE ISLAND ECONOMY IN FY09

FY09 was a bleak year for Rhode Island's economy. Rhode Island found itself mired in recession, with rapidly declining economic activity levels. A host of economic indicators pointed to an economy that was very distressed, and still continuing its decline. The table below provides key economic indicators for both FY08 and FY09, showing changes over this period.

KEY RHODE ISLAND ECONOMIC INDICATORS				
	FY08	FY09	chg	% chg
Payroll Employment (thous)	488.3	470.7	-17.6	-3.6%
Retail Sales (bil \$)	12.1	11.6	-0.5	-4.3%
New Home Construction (units)	1,101.0	722.0	-379.0	-34.4%
Construction Employment (thous)	21.3	18.9	-2.4	-11.3%
Manufacturing Employment (thous)	49.6	44.8	-4.8	-9.7%
Manufacturing Workweek (hours)	38.9	37.8	-1.1	-2.8%
Employment Service Jobs (thous)	9.2	7.6	-1.6	-17.2%
Labor Force (thous)	574.3	568.0	-6.3	-1.1%
New UI Claims (thous)	52.3	65.8	13.4	25.7%
Benefit Exhaustions (thous)	17.5	27.8	10.4	59.6%
Unemployment Rate (%)	6.2	9.4	3.2	50.7%

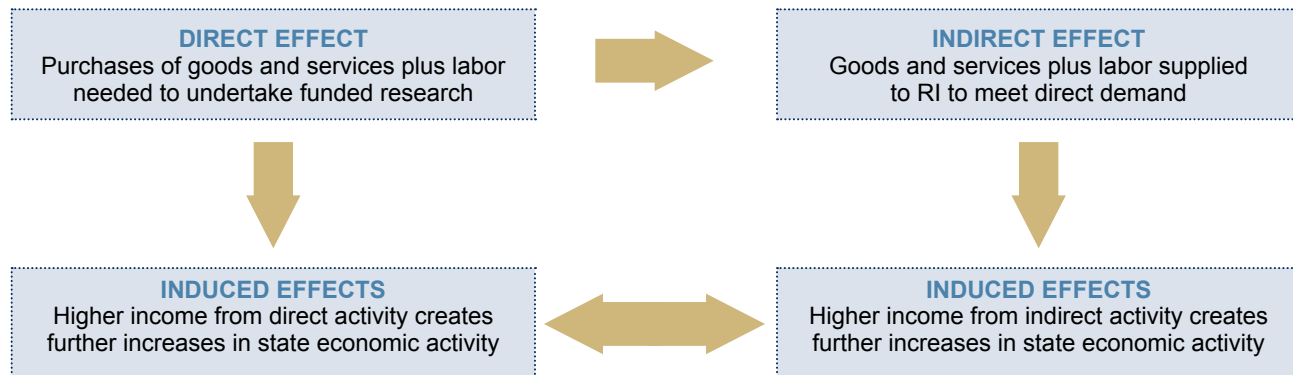
The severity of Rhode Island's economic woes should be apparent from this table. Employment fell an additional 3.6 percent in FY09, while Rhode Island's goods producing sector saw dramatic declines in both its manufacturing and housing sectors. Along with these, weak retail sales, layoffs (new unemployment insurance (UI) claims) and long-term unemployment rose sharply (benefit exhaustions), producing a 50 percent rise in our state's unemployment rate accompanied by a greater than 6 percent drop in our labor force, as some unemployed dropped out of the labor force.

Could things get any worse? Had it not been for the economic contributions of the \$86 million of funded research by URI, employment, income, and tax revenue would indeed have been significantly worse than their actual levels in FY09.

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

## AN OVERVIEW OF THE ECONOMIC IMPACTS OF FUNDED RESEARCH

The economic impact of funded research at URI consists of several elements. The first is the direct impact, which is derived from the purchases of goods, services, and labor required to undertake the funded research. Based on this emerges indirect effects, which occur as firms supplying this research purchase goods, services, and hire persons in Rhode Island to satisfy this direct demand, which also touches other suppliers and their employees. Both of these create further income, which results in greater state economic activity in terms of spending, employment and taxes. These are induced effects.



## THE ECONOMIC IMPACT OF FUNDED RESEARCH AT URI IN FY09 ON THE RHODE ISLAND ECONOMY

- For every \$1 in funded research URI received in FY09, it created \$1.7 in terms of total output, based on the direct, indirect, and induced impacts of this research.

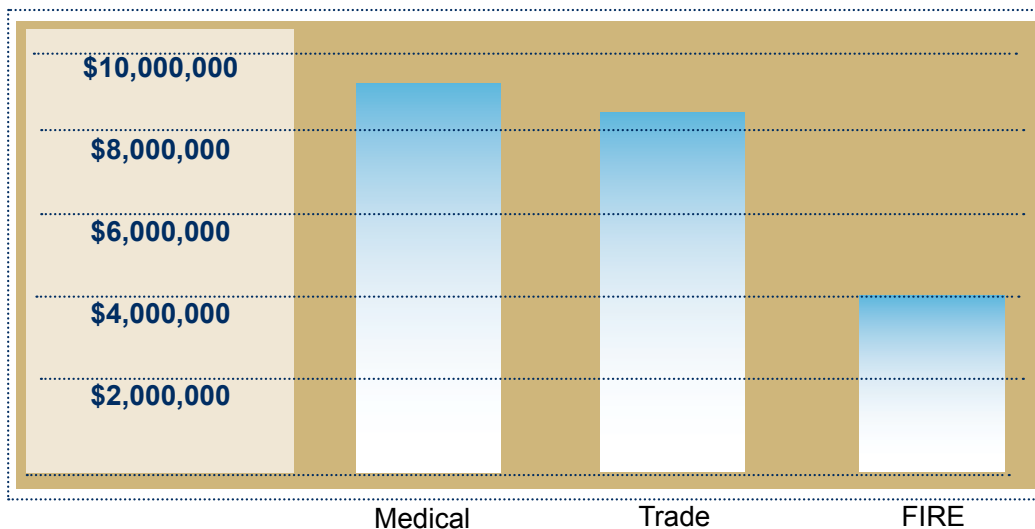
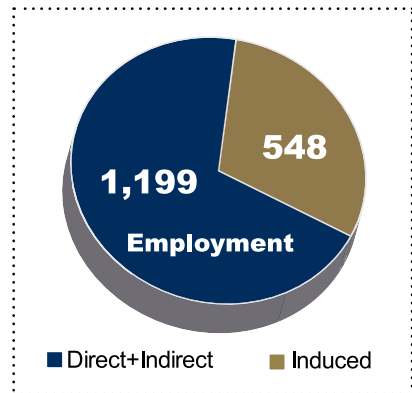
- While the economic benefits of URI's funded research extended to all of Rhode Island's counties, the primary beneficiaries (in order) were Washington County, Kent County, and Providence County.

- In FY09, the \$86 million of funded research at URI resulted in an increase in output of \$144.8 million. The associated gain in employment was 1,747 jobs. By contrast, during this same period, payroll employment for Rhode Island fell by 17,600. The employment stimulated by this research generated a total increase in labor income for Rhode Island of \$98.7 million.

- The majority of the jobs created by funded research resulted from the direct and indirect impacts of this research (1,199). The income created from these generated further income and spending (induced spending), which resulted in an additional 548 jobs. The average income of all the jobs created was \$56,505. So, the short-term effects of this research were highly significant, based on their overall employment and labor market impacts, which helped to offset the severe job loss Rhode Island suffered in FY09.

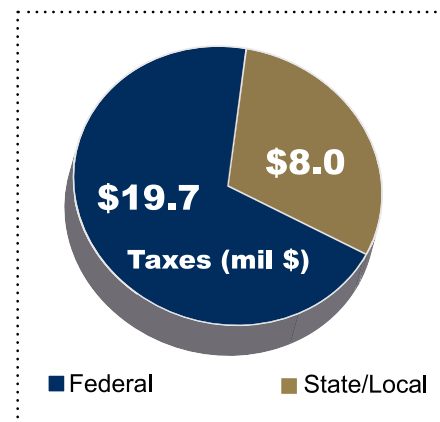
- RI is a small business state. According to the Rhode Island Department of Labor and Training, as of March 2010, 82 percent of Rhode Island's private sector employers had 10 or fewer employees, while 90.4 percent employed fewer than 20 persons. If we consider a five-person firm to be "typical," the employment gains resulting from funded research at URI in FY09 would have added 350 such companies. But, unlike the actual earnings that existed for such firms, the average earnings for the jobs created by URI's funded research was \$56,505.

- The leading sectors of Rhode Island's economy that were impacted by URI's funded research in FY09, in terms of the value of output created, were medical-related fields (\$9.3 million), Rhode Island's trade sector (retail and wholesale trade, \$8.8 million), and finance, insurance and real estate (FIRE, \$4.1 million).



- This funded research resulted in increased taxes paid by individuals and businesses in FY09. The total of all new tax revenue generated was \$27.6 million, of which \$8.0 million was for state and local taxes, while \$19.6 million was for federal taxes.

Even with the unusual circumstance of the economic recession, the University of Rhode Island's FY09 \$86 million externally-funded research clearly made a substantial contribution to Rhode Island's economy. A year from now, this economic impact will prove to be significantly greater as a result of the 22 percent increase in FY10 externally-funded research to \$105 million. URI is thinking big and contributing enormously to economic renewal in the Ocean State.



# NANOTECHNOLOGY SOLVING BIG PROBLEMS IN HEALTH, ENERGY AND THE ENVIRONMENT

The study of extremely tiny particles known as nanoparticles may one day solve such practical problems as how to stop crystal deposits from forming on the inside of heating pipes.

Ten thousand times smaller than the diameter of a human hair, nanoparticles may also help scientists develop a safer dispersant to use during oil spills like the massive British Petroleum spill that fouled the Gulf of Mexico's waters in 2010.

Arijit Bose, distinguished professor of engineering at the University of Rhode Island (URI) chemical engineering department, is on the forefront of nanoparticle research, and with a recent \$1.25 million grant from the National Institute of Standards & Technology, he is positioning Rhode Island to become competitive in the field.



*Arijit Bose*

The grant was awarded to the Rhode Island Consortium for Nanoscience and Nanotechnology, which Bose founded and co-heads. The money will be split between URI and Brown University to pay for equipment and personnel that is necessary if Rhode Island wants to be a player in nanoscience research, Bose said.

"The goal of this grant is to develop Rhode Island's infrastructure and train personnel to meet nanoscience and nanotechnology needs for the state and the

country in the areas of health, energy and the environment," Bose said.

URI is buying an X-ray diffractometer, which can determine phases of novel nanoparticles being deployed for applications such as catalytic converters in cars. This is a work-horse instrument for anyone doing nanoscale research, and will be located at URI's Kingston campus.

Brown University, meanwhile, plans to add an electron spin resonance spectrometer, a sophisticated instrument used to study chemicals that have one or more unpaired electrons. Often referred to as free radicals, these solo electrons have been linked to serious diseases in people. By sharing the money and having different equipment, researchers at both universities will gain access to instruments that are beyond the scope of single investigators. The spirit of cooperation is in keeping with URI's as well as Brown's tradition of interdisciplinary and multidisciplinary research.

"The whole idea is to encourage more collaboration," Bose said. Thus, some of the funds will also provide support for several joint projects between the two universities. "I have been very fortunate to have had excellent collaborators throughout my professional life, and I strongly believe that this is the only way to make substantial progress in science."

Under a separate \$260,000 grant from the National Science Foundation (NSF), and funds from BASF which was again shared with Brown University, Bose and his URI students along with his collaborators at Brown have been trying to crack the problem of the crystal deposits that form on the inside of heating pipes. This problem, which diminishes heat flow, thereby boosting fuel costs, has been challenging scientists for years, Bose said.

The solution that has been devised to date has been to add a treating agent to the water to delay the scale formation. However, a fundamental understanding of how these agents work is lacking, impeding the development of new, more effective treating agents. To overcome this problem, Bose deploys a time-resolved cryo-imaging technique he

helped to develop.

"The rapid cooling process vitrifies the solution, and traps every structure within the solution in its native configuration. Once vitrified, these nanoscale structures can be examined using an electron microscope," Bose explained. By observing how different additives affect these structures at short times, Bose is able to provide important direction on developing new ones.

A third multidisciplinary research project Bose is overseeing came in direct response to this year's oil spill in the Gulf of Mexico. In partnership with Vijay John, Tulane University, professor of chemical and biomolecular engineering, Bose received a \$150,000 grant from NSF to study different dispersants that can be used in oil spill cleanups. The project involves the study of nanoparticles of carbon as an emulsifier, which Bose said may prove to be more benign to the environment than the chemicals used to clean up the Gulf. In addition, these carbon particles can absorb the very toxic aromatic hydrocarbons in the oil. Keeping them in the water column long enough for bacteria to 'eat' the oil will prevent these toxic materials from arriving on shore.


"We're looking at conceptually different dispersants to manage deep sea oil spills," he said.

In collaboration with his colleague Geoffrey Bothun, URI professor of chemical engineering, Bose is developing liposomes that have magnetic nanoparticles embedded in their membranes. When a radio-frequency field is applied, the liposomes become leaky. Being able to control the release of internal liposome contents using an external stimulus is a huge advantage. These magnetoliposomes have utility in targeted drug delivery.

Educated at the Indian Institute of Technology in Kanpur, and the University of Rochester, where he received a Ph.D., Bose holds four patents, has published his work in over 120 publications and has more than 10 years of experience in the cryo-imaging field. He has twice received the College of Engineering's Vincent and Estelle Murphy Award, as well as URI's Outstanding Intellectual Property Development Award.

In 2007, with \$250,000 in seed money from the state of Rhode Island's Slater Technology Fund, he co-founded Vitrimark, Inc., a RI based biotech company that uses nanoscale cryo-imaging to develop biomarkers that can help detect disease and also be used in pharmaceutical development.

The following year, at the suggestion of Bose, URI launched a new undergraduate program of study in pharmaceutical engineering. Students in the program take the traditional chemical engineering curriculum in their first two years, but then add pharmacy courses in their junior and senior years. The course brings together the expertise of URI's nationally recognized College of Pharmacy with its chemical engineering department and better prepares students for careers in the biotech and pharmaceutical industries.



## Multidisciplinary Research

Galen Johnson has always been intrigued by the merging of multiple disciplines.

A professor of philosophy at the University of Rhode Island (URI) who specializes in the field of aesthetics, he has examined the relationships between literature and art and aesthetics and philosophy in four books, the most recent of which explores the concept of beauty and how it has been neglected in modern philosophical thought.

Titled *The Retrieval of the Beautiful: Thinking Through Merleau-Ponty's Aesthetics*, Galen's latest work, which was published in 2010, attempts to revive beauty from the dustbin, where it had been tossed by modern artists and writers, who have viewed the concept as too weak and feminine.

To do that, he examines three major artists, the painters Paul Cézanne and Paul Klee and the sculptor, Auguste Rodin, through the lens of the late French philosopher Merleau-Ponty, whose aesthetic celebrated the beautiful and life, not the mortality and anxiety highlighted by Jean-Paul Sartre and other existentialist thinkers.

Johnson's multidisciplinary research was partially funded by the National Endowment for the Humanities and the American Philosophical Society Franklin Research Grant.

Art history is not his field, Johnson is quick to admit, noting he has taught himself about art as a means to understanding aesthetics. He traveled to Europe to view the works of the artists featured in his book. He also lived in France to acquire the French language and in 2008 gave his first research paper in French at the prestigious Ecole Normale Supérieure in Paris.

He is currently exploring the philosophical thought of a number of French writers, among them Marcel Proust, while also researching the philosophy of nature as it was expressed by the American writer and philosopher Henry David Thoreau in the classic text, *Walden*. "I want to find out what paintings Thoreau was looking at when he was writing *Walden*," said Johnson.

The intersection of art and writing excites him and has been the cornerstone of much of his research, Johnson said.

Less lofty perhaps, but just as important to Johnson, have been his efforts on behalf of URI's Center for Humanities and its Honors Program. Johnson served as the director of the Honors Program from 1996 to 2006, helping to build the Honors Colloquium and bring to the public an array of speakers who have talked on subjects that have ranged from the Vietnam War to India's culture and history.

In 1996, when he took over the Honors Colloquium, the series was not as well known as it could have been, said Johnson. His goal was to reinvigorate it and, in the process, to highlight URI's academic excellence, which at the time tended to be overlooked. "I wanted the university to have a much more prominent face academically," Johnson said.

The *Providence Journal* helped Johnson to achieve this goal by co-sponsoring the series, he said.

Along the way, in his 34 years as a URI professor, Johnson has team taught with professors in French studies, political science, psychology, and comparative literature. He dedicates himself to inspiring the "B" students "who don't know how good they are," helping them to realize their greatness with his own infectious love of learning.

"For me, a good day still feels like being in first grade," he said.



# EVERYONE BENEFITS FROM THE MERGING OF ART AND SCIENCE



For Judith Swift art and science have never been mutually exclusive disciplines.

At the University of Rhode Island (URI), where she is a professor of theatre and communication studies, as well as director of the university's Coastal Institute, Swift has written a number of songs about science, which she has presented in musicals such as "Oceanics" and more recently, "A Coastal Cabaret."

Combining disparate disciplines, such as art and science, enhances the learning process, Swift maintains, because the arts access the left side of the brain, giving scientific information an "emotional stickiness," which can help students better retain right-brain material.

This emphasis on interdisciplinary learning helped URI win a competitive \$3.2 million grant from the National Science Foundation (NSF) to create a graduate education program which combines hands-on problem solving of real coastal issues with immersion in a multidisciplinary academic and professional environment.

Called the Integrative Graduate Education and Research Traineeship (IGERT), the program has awarded two-year fellowships to 23 Ph.D. candidates over the past five years, all of whom were required to work with peers, professors and professionals in other disciplines to solve challenging coastal issues.

Why is this interdisciplinary approach necessary?

Because the real world is interdisciplinary, and today's environmental problems are too complex for any one group of scientists or professionals to solve, Swift said. Scientists usually work side-by-side with government agencies and nonprofit groups to address coastal issues, so the sooner students learn to work collaboratively, and appreciate the perspectives and lexicon of others, the better trained they will be, she said.

"We bring the students together and they create a team," said Swift, who has been overseeing the IGERT program in conjunction with Peter August, a URI professor of natural resources science and the lead investigator on the Coastal Institute IGERT Project. "This was Pete's brainchild," says Swift, "and it was the best thing I ever experienced at URI."

Noting that every discipline has its own jargon, which can serve as a barrier to communication, Swift said the team approach breaks down these barriers by creating an "acronym-free zone," where people can understand each other.

URI professors from fields as diverse as philosophy and resource economics have joined together to create a curriculum for the IGERT fellows. The result is a far-ranging course of study that includes everything from ethics and leadership to the collection of scientific data and environmental policy-making.

URI's strong tradition of interdisciplinary research and practice helped



the university to win the NSF award; of 550 applicants who applied for the funding, only about 20 were chosen, according to NSF. This same tradition has helped URI become a national leader in the environmental sciences, as Rhode Island's then-Governor Donald Carcieri noted when the IGERT grant was announced.

"Part of the reason for the university's success in the environmental field is because it is an active partner working with local, state and federal agencies, as well as nongovernmental organizations, to use science to identify solutions to coastal issues," Carcieri said.

"It does an excellent job of pooling its intellectual resources with legislative leaders and officials from the Department of Environmental Management, the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, the National Park Service, the Nature Conservancy and elsewhere," the governor continued.

The Coastal Institute, itself, which has locations on URI's Kingston Campus and Narragansett Bay Campus, is an example of URI's interdisciplinary philosophy in action. Founded in 2000, its mission is to bring together all who have a stake in the future of New England's coastal ecosystems – from government agencies to research scientists to the public at large – to share information and to work collaboratively to address the many threats to the coastal environment.

Among the institute's programs has been a series of regular meetings between government regulators, fisheries scientists and

Rhode Island's fishing community to discuss declining fish stocks. Another project has been working with the Rhode Island Department of Environmental Management to provide scientific support for emergency response planning.

Still another Coastal Institute initiative – the coordination of the North Atlantic Coast Cooperative Ecosystem Studies Unit, a regional partnership between government agencies and academia to solve environmental problems on federal lands – received a national excellence award.

The idea, said Swift, is to provide a neutral forum for the exchange of ideas. Public outreach is also important and as a communications professor as well as the institute's director, Swift said one of her jobs is to make sure scientific information is presented to the public in an accessible, understandable way.

"Scientists are trained to be more focused on uncertainty than certainty," and they often can't provide the public with the quick, easy "sound bite" answers they demand, Swift noted. Her job – and the institute's – is to help facilitate this communication in a way that moves the discussion forward. The Coastal Institute's list of partners is lengthy, but this is the way it should be, said Swift. "One of the things that enriches the university is having these kinds of interdisciplinary partnerships," she said. They make for better collaborations between the State of Rhode Island and the university.



## \$20 MILLION GRANT REVEALS SMALL STATE RICH IN BRAIN POWER

*Jennifer Specker*

In her career as a professor and researcher at the University of Rhode Island (URI) Graduate School of Oceanography, Jennifer Specker has studied such topics as the early development of flounder and how to anesthetize fish so they can be transported safely, a question of significant economic importance to the aquaculture and seafood industries.

But these days, at the request of the university's Vice President for Research and Economic Development, Peter Alfonso, Specker has taken on a new administrative role: She is serving as the associate project director of the new \$20 million Rhode Island National Science Foundation (NSF) EPSCoR Cooperative Agreement that was awarded to URI in 2010 to promote research at nine institutions of higher education in the state.

EPSCoR stands for Experimental Program to Stimulate Competitive Research. Congress has authorized seven federal departments and agencies to fund these programs to assist states that have historically received a small proportion of federal R&D funding. At first, Rhode Island wasn't eligible for these programs, but U.S. Senator Jack Reed helped to correct that omission, enabling Rhode Island to receive its first NSF EPSCoR grant in 2006.

The new 2010 five-year \$20 million Rhode Island NSF EPSCoR grant is the largest single grant award in URI's history. Alfonso, the project director, points to the projects funded by this grant as an ultimate example of multi- and interdisciplinary collaborations across the state. It will enhance research infrastructure throughout the state, making Rhode Island more competitive in life science research and development. The five-year grant will also provide training and jobs for hundreds of students, lab technicians and others, with one of its goals insuring equal opportunities in science education for all Rhode

Island students.

Persuaded that the Rhode Island NSF EPSCoR project is vital to the state's economic growth, which is in turn dependent on workforce development, the Rhode Island Economic Development Corporation is matching the \$20 million grant with \$4 million over five years. Christine Smith, executive director of Rhode Island's Science and Technology Advisory Council, works closely with Rhode Island NSF EPSCoR to insure that its goals conform to those planned by the state.

Indeed, in addition to the amount of the NSF grant, the fact that it brings together nine colleges and universities involved in collaborative, interdisciplinary research and research training makes it particularly noteworthy. URI is leading the grant, working with a network that includes Brown University, Rhode Island School of Design (RISD), Bryant University, the Community College of Rhode Island, Providence College, Rhode Island College, Roger Williams University and Salve Regina University.

The original 2006 grant helped to establish three shared research facilities: the genomics and marine life science centers located at URI and the proteomics center at Brown University. It was also used to establish the Rhode Island EPSCoR Academy, which is dedicated to enhancing science education for students and teachers throughout the state, thereby promoting Rhode Island's workforce development.

In addition to creating the EPSCoR Academy and shared research facilities, the federal funds have been used to complete the Marine Life Science Center at URI's Narragansett Bay Campus, where investigators are researching the effects of environmental change on an array of organisms. According to Specker, the first Rhode Island NSF EPSCoR grant created a platform to launch the work envisioned

by the larger award. "We can now expand the infrastructure we acquired from the first grant and build the research and research training capabilities of all of the participating institutions while, at the same time, capitalizing on what they have to offer," she said.

Specker said she plans to use the partnerships among the schools as a way to strengthen all of them. "They all bring different and valued strengths to the table."

RISD, for instance, will be working on new approaches to imaging data and communicating science through its "Making Science Visible" initiative, which uses two- and three-dimensional modeling and mapping to explain science. RISD also plans to host a series of events in which researchers and students in science and design will explore complex scientific and societal problems together.

"Additionally, one of the Rhode Island NSF EPSCoR's goals is to promote diversity in science education," said Specker. This means making sure Rhode Island's disadvantaged students in the state's urban high schools not only get a good science education, but are also exposed to science and technology careers. This aspect of the Rhode Island NSF EPSCoR grant is important to Specker. "It's something I care about deeply," she said.

A professor at heart, Specker said she agreed to oversee the Rhode Island NSF EPSCoR Cooperative Agreement because she believes in its goals of enhancing collaboration among Rhode Island's colleges and universities and of making an education in science an opportunity for everyone.

The new five-year \$20 million Rhode Island NSF EPSCoR grant is the largest single grant award in URI's history...It will enhance research infrastructure throughout the state, making Rhode Island more competitive in life science research and development. [It] will also provide training and jobs for hundreds.



#### Norbert Mundorf & Pam Rubinoff, What's a Rhode Islander to do?

Scientists predict the sea level along Rhode Island's coastline will rise 3 to 5 feet or more over the next century as a result of global warming. An increase in the number and intensity of erratic, fierce storms is also expected with the potential for flooding, downed power lines and other storm-related damage. This heightened storminess will affect all of the state, not just people living near the coast, so what's a Rhode Islander to do?

That's the question fueling the Climate Change Collaborative, a three-year research project at the University of Rhode Island (URI), which includes Norbert Mundorf, professor of communication studies, and Pam Rubinoff, associate coastal resources manager at the URI Coastal Resources Center (CRC). The collaborative is bringing together scientists from a number of different fields making this a vast multi- and interdisciplinary collaboration to help prepare policy makers, as well as Rhode Island residents, for the potentially damaging impacts of climate change.

Funded with a \$300,000 grant from the Rhode Island Sea Grant Program, the collaborative is composed of researchers from the departments of communication, oceanography and behavioral science. Together, they are working to develop surveys, models for behavior change and communication strategies to help Rhode Islanders cope more effectively with the environmental changes coming our way.

"What we're trying to do is apply the Transtheoretical Model of Behavior Change," said Mundorf. Developed in the 1970s by James Prochaska, professor of psychology, director of URI's Cancer Prevention Research Center, and member of the collaborative, the transtheoretical model states that behavior change is a process with five stages. In order to get people to change, it is essential to develop communication tools precisely targeted for each stage and to move toward maintaining behavior change, for example, by re-grading their property or purchasing a sump pump to reduce the impacts of flooding.

To that end, the collaborative has developed a survey to determine the ways Rhode Islanders are preparing for climate change consequences of accelerated sea level rise and increased storminess, said Rubinoff, who leads the collaborative. Keeping up on the latest science is a critical component of the contribution from URI's Graduate School of Oceanography, particularly professor of oceanography, Isaac Ginis and student assistants. Taking the science and translating it for the public is where team member Judith Swift, professor of communication studies and director of the URI Coastal Institute, steps in as she develops communication strategies based on different stages of behavior change to train scientists and civic leaders on how to use those strategies.

According to Rubinoff, the goal is not only to encourage changes that benefit individuals, but also those that benefit society as a whole. This is where Rubinoff and team member Virginia Lee of the CRC will link with other leaders in the state as well. That means in addition to getting flood insurance for their property, residents and leaders alike will be encouraged to engage in civic activities, support public policy and programs that address climate change, or find other ways to help their communities adapt to changing conditions.

Rubinoff and Mundorf said the interdisciplinary nature of the project is critical to its success. It has also provided the researchers with another benefit: "The interaction among us has really educated us and advanced our own work both individually and collectively," Rubinoff said.

# HOW DO SUCH TINY ORGANISMS HAVE SUCH A BIG IMPACT ON THE ENVIRONMENT?

Diatoms are intensely beautiful, but few people ever see them. A microscopic algae, they are part of the drifting plankton community in the surface ocean, where they play a strategic role in the environment by helping to take carbon dioxide from the atmosphere and converting it into something useful, like microscopic food.

With climate change an urgent concern, and excessive atmospheric carbon dioxide (CO<sup>2</sup>) linked to human activity, suddenly the tiny diatom is getting a whole lot of attention these days from research scientists like assistant professor Bethany Jenkins. Jenkins studies diatoms and other microbes in her laboratory at the University of Rhode Island (URI) in the department of cell and molecular biology and at the Graduate School of Oceanography (GSO). Her multidisciplinary research spans field sampling aboard ships to analyzing genome data on large computer networks in her laboratory.

Jenkins has several funded projects from the National Science Foundation (NSF) and the Department of Energy's Joint Genome Institute to study the genomes of diatoms with an eye towards understanding how diatoms change in response to the availability of other nutrients in their undersea world.

"In order for diatoms to grow, they need other elements besides CO<sup>2</sup>," said Jenkins.

Iron is one of those elements. So what happens if there is too little iron in parts of the ocean to sustain diatoms, or their growth is constrained by the unavailability of other nutrients? "How do diatoms respond to different nutrient concentrations in different locations?" Jenkins asked.

To answer this question, Jenkins and her colleagues from URI, as well as the Woods Hole Oceanographic Institute (WHOI) are varying the amounts of phosphorous, iron and other important nutrients diatoms may need. They are looking to see which genes of the diatom are activated by nutrient limitation and nutrient feeding and which proteins are produced as a result.

Eventually, this same analysis will be performed on diatom species collected from various locations in the world's oceans, where there are varying nutrient concentrations. Jenkins and a colleague on the research project, assistant professor Tatiana Rynearson of URI's GSO, have already collected diatom samples for this next phase of the project

from the northern Pacific Ocean, among other places.

The two scientists from WHOI are associate scientists Mak Saito and Sonya Dyhrman. Each has a different area of expertise in the study of diatoms.

In addition to becoming part of the food chain, diatoms can form "blooms" that sink deep into the ocean, carrying their carbon along with them. The CO<sup>2</sup> they "fix" originates in the atmosphere, where industrial processes are currently churning out more carbon dioxide than the planet can safely handle.

"They balance the CO<sup>2</sup> in the atmosphere," said Jenkins.

On land, the rain forest does much of this work, but in the ocean, this important job falls to diatoms and other photosynthetic plankton, she said.

Given their importance to the environment, Jenkins said it's important to learn more about diatoms, but she is also studying bacteria, specifically those that transform nitrogen compounds, to determine how they help to keep the world in ecological balance. Her multidisciplinary research includes working with Scott Nixon, a professor at URI's GSO, Robinson Fulweiler, an assistant professor at Boston University and Anne Gibling, a senior scientist at the Marine Biological Laboratory's Ecosystems Center, Jenkins is looking at the ability of bacteria to manipulate nitrogen in the marine environment.

"Bacteria can take nitrogen compounds and convert them to other nitrogen compounds," noted Jenkins.

They can take nitrogen out of the environment, via a process known as denitrification, which converts nitrates into inert nitrogen gas. This is useful where humans have injected excessive nitrates into the water by using fertilizers on farms and lawns. Conversely, it's also possible that bacteria are producing more nitrogen in the marine environment by converting nitrogen gas into biologically available nitrogen, which is another aspect of Jenkins' research.

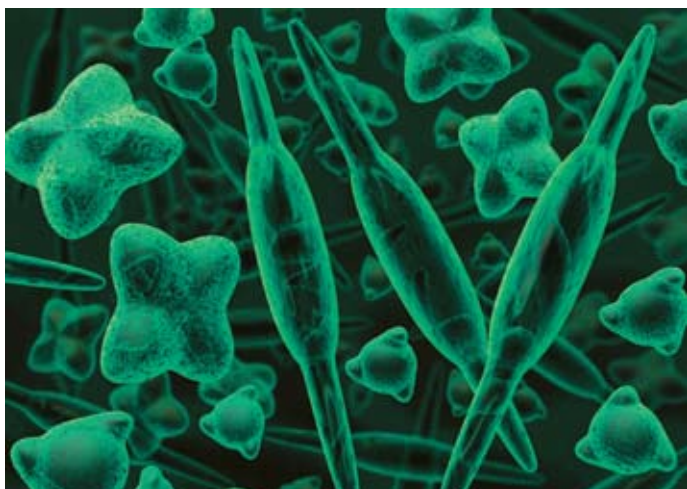
"What's really cool about bacteria is that they evolved early on our planet and have had a lot of time to come up with interesting metabolic functions," said Jenkins.

These metabolic functions form the backbone of her research, which relies frequently on gene sequencing and other genomic methods to study nitrogen fixation, carbon fixation and other biochemical capabilities in microscopic marine organisms.

"My group has developed methods to detect genes active in nitrogen fixing," she said.

She has also studied a species of diatom that produces a toxin that can be harmful to humans through her work with Mark Wells, a professor and marine chemist at the University of Maine.

Jenkins is one of several women researchers who came to URI through the ADVANCE Faculty Fellows program. Funded by NSF, the ADVANCE program supports research by women scientists on college and university campuses and the recruitment of female science professors. She earned her Ph.D. from the University of Oregon and did her postdoctoral research at the University of California at Santa Cruz.





Bethany Jenkins

# EFFECTING CHANGE TO DO SOMETHING BIG



If only people would stop smoking, exercise and eat more fruits and vegetables. This lament is commonplace in the medical profession, where every day doctors see a direct link between poor diet, smoking and lack of exercise with an increase in diabetes, obesity and other life-threatening diseases.

But how do you get people to change their high-risk behaviors? Should you try to change just one behavior at a time? Or is there a link between unhealthy behaviors that makes it more effective to treat them all together?

These questions fuel the research of Bryan Blissmer, an associate professor in the University of Rhode Island (URI) kinesiology department and a member of the research faculty at URI's Cancer Prevention Research Center (CPRC).

With funding from the National Cancer Institute (NCI) and the National Institute on Aging, among other sources, Blissmer has been involved in a series of studies over the past decade, which together explore the most effective and efficient ways to motivate and sustain behavior change.

Traditional thinking has been to focus on changing just one behavior at a time, but this doesn't reflect reality, Blissmer said. The reality is that most



*Bryan Blissmer*

people who smoke are also likely to have poor nutrition and to not exercise on a regular basis, a pattern called multiple risk behavior co-occurrence.

If having multiple risk behaviors is the reality – and studies have shown that it is – doesn't it make sense to learn the best ways to intervene with people, who engage in more than one unhealthy behavior? Blissmer thinks so and with a \$589,000 grant from the American Cancer Society, he is studying new intervention strategies to help people change more than one behavior at a time.

"Now we have a buffet-style approach to intervention," said Blissmer.

People are given information on individual problems, but seldom receive advice on how to make lifestyle changes that integrates their health issues, he said.

But this "modular approach" fails to take into consideration the fact that one behavior might beget another, said Blissmer. It also ignores the fact that factors such as economics and emotions can also play a role in behavior change, making a new, more holistic model of intervention worth studying, he said.

The goal is cancer prevention, said Blissmer, a disease that is still the number one health concern of Americans and which has been proven to be caused, in some instances, by smoking and other unhealthy behaviors. To that end, Blissmer frequently collaborates with James Prochaska, CPRC co-director, who co-created the world-renown Transtheoretical Model of Behavior Change, which says changing behavior is a psychological process involving several stages.

"In essence, all my work is interdisciplinary," Blissmer said.

The CPRC, and URI in general, has given him the opportunity to do high-level, quality research on behavior change, which is a multidisciplinary science by definition since it involves so many different areas of expertise, he noted.

Blissmer's previous studies have included Project Health, which compared computer-based intervention programs to treat people who engage in three high-risk behaviors. On this project, which was funded by the NCI, he worked

with Wayne Velicer, a psychology professor at URI and co-director of the CPRC.

Project Health led to Project Raise, which involved creating a digital coach, known as a "Relational Agent," who uses pre-recorded scripts to help people change their habits regarding sun exposure and exercise. The Relational Agent is a "lifestyle change coach" with a different script for every day of the year. Blissmer is working with researchers from Northeastern University on Project Raise, which was also funded by the NCI.

Another study has used more conventional methods of communication, such as a printed newsletter and telephone interviews to encourage 1,200 elderly residents in East Providence, RI, to stay physically active and eat a healthy diet. Called the Study of Exercise and Nutrition in Older Rhode Islanders (SENIOR), this study also utilized a different approach to behavior change that encouraged the older participants to choose what works best for them, rather than being told what to do.

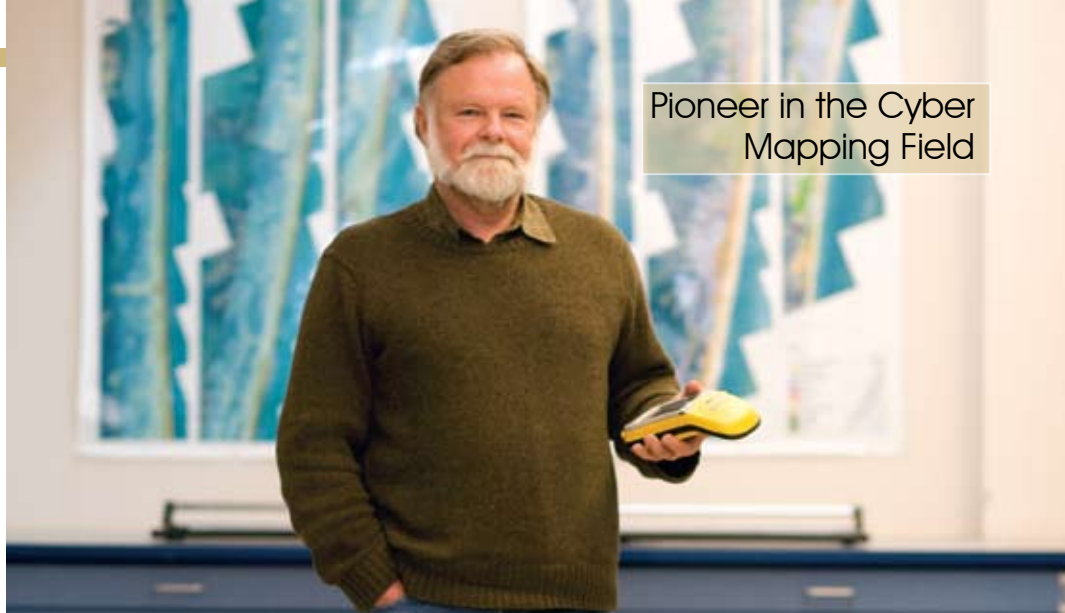
"We don't dictate," said Blissmer.

Usually, study participants are told to eat a certain number of fruits and vegetables a week and how often they need to be active and then the researchers check up on them to see how they do. But with the SENIOR study, the participants choose their own behavior changes based on their individual needs and goals, such as increasing sociability and mobility. A second phase of the study has been focusing on how to help older people maintain positive changes, an even bigger challenge than getting them to change in the first place, Blissmer said.

With both phases of the SENIOR study, Blissmer has worked on a team that includes Phillip Clark, director of URI's Program on Gerontology; Geoffrey Greene, URI nutrition and food science professor; and Deborah Riebe, chairperson of the URI department of kinesiology. Working as an interdisciplinary team has taken research on behavior change to a new level in the realm of public health, said Blissmer.

"It's an effective way to do something big," he said.

People are given information on individual problems, but seldom receive advice on how to make lifestyle changes that integrates their health issues.



## Pioneer in the Cyber Mapping Field

### Peter August, Mr. Map

If you want to know where something is in Rhode Island – or anywhere for that matter – the person to see is Peter August.

A professor of landscape ecology in the University of Rhode Island (URI) department of natural resources science (NRS), August began his career at URI teaching vertebrate biology with a particular focus on bats and rats. But in 1985, he came across a fledgling field, which he has since helped to develop into a source of pride for the state's flagship university, and in which he is now regarded as an expert.

That field is Geographic Information Systems (GIS). In other words, mapping with computers.

"In '85, I realized that GIS was going to be fundamental to science and resource management because my ecology work required me to use maps on a regular basis," August said.

As an ecologist, one of August's interests has been to design a network of conservation areas to protect biodiversity. If people don't know where wetlands and other fragile ecosystems are, how can they protect them? Performing even simple measurements on maps, for example calculating areas of complex shapes or lengths of curvy lines, can be tedious and inaccurate by hand. GIS systems are able to do these complex measurements almost instantly.

In 1985 – long before students carried laptops and millions of families had personal computers in their homes – August and NRS colleagues, Arthur Gold and William Wright, applied to Rhode Island's Department of Environmental Management for a grant to build a GIS system for the state. At that time, GIS technology was brand new, making them pioneers in the cyber mapping field.

"The first thing we had to do was put the basics into the system," recalled August.

The basics included such information as the location of the state's aquifers, groundwater and other natural features as well as man-made features such as town and state boundary lines. From the outset, the URI team made a commitment to creating an open database that could be accessed by anyone in Rhode Island. This was a key decision very early in the evolution of GIS. Now, the database is a community resource where all major state and federal agencies, and many communities, contribute to the database and draw from it as their needs require.

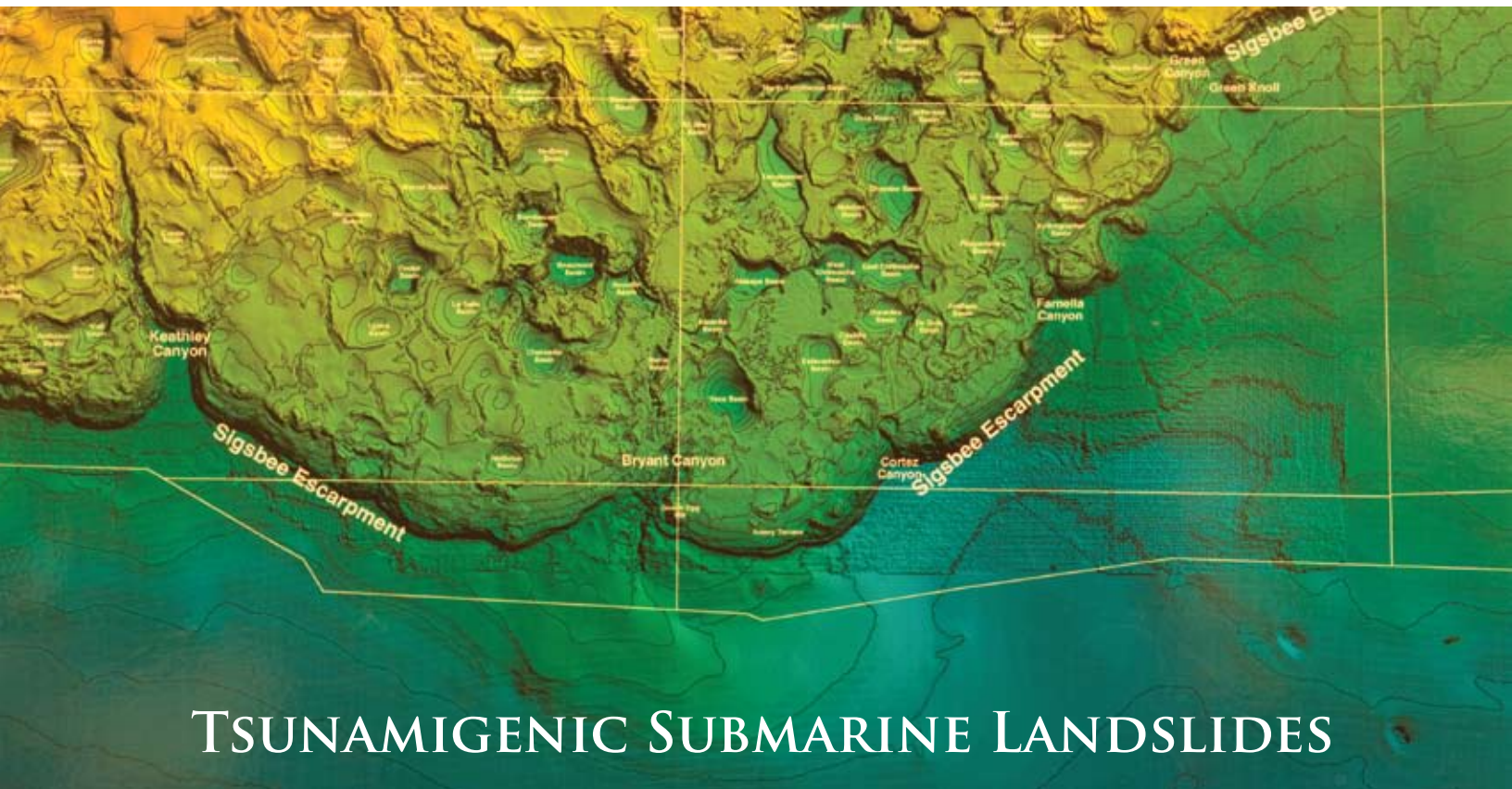
"It took us a long time to create an information resource that would serve everyone's needs," said August. "Now it is one of the most comprehensive GIS databases in the country." The database has a significant number of multi- and interdisciplinary research and scientific uses. Last year over 800 Gb and 350,000 data files were downloaded from the Rhode Island Geographic Information Systems (RIGIS) website from users all over the state and region.

That the URI team accomplished this goal can be seen by the fact that all communities in Rhode Island use the state's RIGIS system for planning purposes. The state, too, has relied on the system, at one point hiring URI to find 10 locations in Rhode Island where the state could place another central landfill.

These days, the RIGIS system operates in the Environmental Data Center at URI, where GIS experts work on projects as diverse as helping the National Park Service predict which parks could be at risk from sea-level rise to helping assess suitable sites for offshore wind farms to creating an online digital atlas of Rhode Island's environmental and cultural resources. It's a long way from rats and bats to August, but he's pleased with the trail his career took 25 years ago.

"I get a lot of gratification when the maps we make result in protecting the environmental assets that make Rhode Island a special place," he said.





## TSUNAMIGENIC SUBMARINE LANDSLIDES

Mudslides in California usually make the nightly news, with all the costly destruction they cause; million-dollar homes cascading down hillsides, gigantic trees toppling over as if they were twigs.

But there are other landslides most people never hear of because they take place deep in the ocean. Yet these submarine landslides, as they are called, have much to reveal not only about the geological history of Earth, but also about the risk of similar landslides occurring today.

Submarine landslides have also been linked to tsunamis: As the sand falls away during a submarine slide, it creates a depression, which in turn can generate a giant wave like the one that devastated several countries in Southeast Asia in December 2004. In contrast, the tsunami that recently hit Japan in March 2011 was caused by movement of the Earth's crust due to an earthquake.



Christopher Baxter

Christopher Baxter, joint associate professor of ocean engineering and civil and environmental engineering, studies these submarine landslides in his laboratory at the University of Rhode Island (URI) Narragansett Bay Campus. The goal, he said, is to determine the various conditions that existed when the underwater slide occurred to predict when a landslide might happen again.

Of particular interest to Baxter is a submarine

landslide that occurred off the continental slope in the Atlantic Ocean approximately 80 miles due east of Long Island. By studying cores of sediment extracted from the site, Baxter will be able to determine when the slide occurred.

This is important, Baxter added, because if it turns out to have taken place more than 30,000 years ago, it can be placed in a specific geological age, with specific geological conditions. If it is less than 10,000 years old, it is considered still new – by geological standards at least – and therefore the conditions that existed then can help to predict if the world is at risk of a similar occurrence today.

No one is predicting that a tsunami is going to crash onto New England's shoreline anytime soon, Baxter said, noting, "The probability of tsunamis on the East Coast is not big." Nonetheless, given the consequences of nuclear disasters such as those experienced in Japan, the Nuclear Regulatory Commission (NRC) is funding research to assess all possible risks including tsunamis as part of its responsibility to ensure safe siting of nuclear power plants. Specifically, the NRC has contracted the U.S. Geological Survey (USGS) at the Woods Hole Coastal and Marine Science Center, which in turn is funding Baxter's study of the submarine slide in the Atlantic Ocean.

Baxter's multidisciplinary research includes working with Jason Chaytor, a USGS marine geologist on the study. He also works regularly with one of URI's tsunami experts, Stephan Grilli, distinguished professor of ocean engineering.

Using the *R/V Oceanus*, one of three research vessels stationed at Woods Hole, MA, Chaytor led an expedition in June 2010 to the site of the submarine slide, which took place off the continental slope about 6,000 feet under water. Once there, the researchers extracted about 400 feet of sediment by drilling 20 cores, which Baxter began studying when the expedition returned last summer.

Submarine landslides don't happen all the time, noted Baxter. The

oceans are relatively stable. Still, when landslides, earthquakes and tsunamis do occur, the destruction they cause is so devastating, engineering standards have to take the potential risk into consideration, he said.

These engineering standards set the stage for Baxter's other area of research: With funding from the Rhode Island Department of Transportation (RIDOT), he studies soil, and in particular, silt, to determine its susceptibility to liquefaction due to construction vibrations and earthquakes. Liquefaction of silt can cause sudden loss of strength of the soil, and failure of foundations and excavations. There have been several cases of damage to buildings in Rhode Island due to this problem and the behavior is not widely understood. "Silt has unique properties that are unlike other types of soil and can be challenging to work with," said Baxter.

It is also not very common – except in downtown Providence, Cranston, Warwick and a few other coastal communities in Rhode Island. Clay, which is more common in Massachusetts, does not liquefy, but silt can, says Baxter, which is obviously a problem in Rhode Island if engineers are depending on that silt to support a highway or a bridge.

Not as much is known about silt as it is about other soils, which is why he often works with the RIDOT on projects that have included the construction of the new Sakonnet River and Washington bridges.

The nature of his research is often collaborative, and Baxter called it "fabulous" to work with experts in other disciplines. Unlike some other civil engineers with whom he went to school and now work on very traditional projects in inland states, Baxter said his work is more exciting because of URI's proximity to the ocean and all the challenges that brings.

Baxter received his bachelor's degree in civil engineering from Tufts University, his master's from Purdue University, and his Ph.D. from Virginia Tech. He has been a professor at URI for 11 years. Currently he is serving as secretary for the American Society of Civil Engineering (ASCE) Soil Properties Committee, treasurer of the Rhode Island section of ASCE, and is also on the Board of Directors for the U.S. Universities Council on Geotechnical Education and Research.



# MAYBE IT'S NOT THE JUNK FOOD MAKING US FAT

With obesity on the rise – 60 percent of Americans are now considered overweight – and with it a number of weight-related medical problems such as heart disease and type 2 diabetes, the questions of how and why people get fat have assumed new urgency.

In her laboratory at the University of Rhode Island (URI), Angela Slitt, assistant professor of biomedical and pharmaceutical science, is seeking answers to these questions.

With a \$2.1 million grant from the National Institute of Environmental Health Sciences, Slitt is looking at how drug transporters enable chemicals to permeate the body's liver and kidneys and how reducing weight might affect these vital agents. Of particular concern to Slitt is the chemical bisphenol A (BPA), which is found in a number of hard plastic products, including baby bottles. Early exposure to BPA, either as an infant or in the womb, has been shown to affect fat cells, which in turn might explain why childhood obesity is now a national epidemic. In other words, it might not be the junk food.

Genetics, junk food, and a sedentary lifestyle have not been discounted as reasons for obesity, but beginning about five years ago, BPA exposure has also been cited as a possible cause, opening the door to what many consider to be an exciting new line of scientific study.

"It's a relatively new concern," said Slitt.

New, but definitely getting a lot of attention not only in the scientific community, but also in the popular press, where headlines such as "Born to be Big" and "Is Plastic Making Us Fat?" have topped recent articles in *Newsweek* magazine and the *Boston Globe* newspaper, among other mainstream publications.

Studies with mice and rats have shown that when a pregnant mother is exposed to BPA, there's an increased likelihood that her offspring will be obese, Slitt said. In addition, researchers know that the liver and kidneys of obese rodents look different from those of rodents with normal weight. For Slitt, the issue is drug transporters, which she likened to tiny pumps that sit on top of a cell's membrane and regulate the flow of chemicals – in this case BPA – traveling in and out of the cell.

The specific questions Slitt and her research team are trying to answer is what happens to drug transporters if people lose weight. Will they work the same as they did before to control exposure to chemicals such as BPA? Or does weight gain permanently alter this process? Once overweight, are obese people at greater risk of exposure to BPA and other chemicals, or can this process be reversed? "Our goal is to understand whether BPA disposition changes with obesity," said Slitt. The purpose of her research is to find out whether the obese population has a "different body burden."





*Angela Slitt and her son, Benjamin*

To help answer this question, Slitt is involved in multidisciplinary research with Ingrid Lofgen, URI assistant professor of nutrition and food science, who conducted a weight loss study in 2009 involving approximately 35 women. Using samples taken from these women, Slitt is studying their BPA levels to see if there is a link between calorie restriction and BPA. "We know that calorie restriction changes transporter expression," said Slitt. But more research is needed on how BPA and other chemicals that are regulated by transporters are disrupting the endocrine system, she said.

A research assistant professor at URI since 2006, Slitt earned a Ph.D. in pharmaceutical science from the University of Connecticut, which was followed by a four-year post-doctorate fellowship at the University of Kansas Medical Center. As a graduate student, she studied the effects of Tylenol overdoses on the liver, and has continued her research into liver disease at URI.

In addition to her research into BPA, Slitt has received funding from the National Institutes of Health to study the relationship between transporter expression, cholesterol transportation and gallstone

formation and how liver disease and antioxidants variously affect transporter expression.

One of the pleasures of being at URI is collaborating with researchers in other disciplines, she said.

*"Early exposure to BPA, either as an infant or in the womb, has been shown to affect fat cells, which in turn might explain why childhood obesity is now a national epidemic."*

# SELF-DEFENSE AGAINST OBESITY



Obesity is a problem affecting both men and women, but women may face more serious obesity-related consequences, especially as they age.

How to find an exercise that helps older women fight obesity and its associated risks has been the goal of Matthew Delmonico, University of Rhode Island (URI) assistant professor of kinesiology, who is focusing on the ancient martial art of Tai Chi as a potential solution.

Working with assistant professor Furong Xu, a colleague in URI's department of kinesiology, and a Tai Chi expert, Delmonico recently received a \$120,000 CELS CARES (College of the Environment and Life Sciences Community Access to Research and Extension Services) grant from the U.S. Department of Agriculture (USDA) to continue studying the effects of Tai Chi and a balanced diet for weight loss in older women.



*Matthew Delmonico, Ingrid Lofgren and Furong Xu*

Ingrid Lofgren, assistant professor of nutrition and food sciences at URI, is also an investigator on the study.

"It's a very integrated, interdisciplinary project," said Delmonico, adding that he couldn't do it

without the contributions of Lofgren and Xu.

Delmonico's interest in Tai Chi began a few years ago, after discovering that Xu had taught the martial art in China, before coming to URI. More than 400 years old, Tai Chi is characterized by slow, graceful movements that emphasize balance and strength. Like yoga, it has become more popular in recent years, making it a fresh topic for exercise study, Delmonico said.

With a small grant from the Rhode Island Foundation, Delmonico and his colleagues devised a pilot program to determine whether a regular Tai Chi practice can help older, overweight women lose weight, change their body composition, increase their strength and improve their flexibility and mobility.

The term for losing muscle mass with age is sarcopenia, a condition that can lead to decreased mobility and other bodily functions. Because women live longer than men, and have more fat and less muscle in their body composition, they are most apt to end up disabled as a result of sarcopenia, Delmonico said.

The pilot program involved 11 women between the ages of 60 and 79, who met three times a week for 12 weeks in a gleaming new exercise laboratory on the first floor of URI's kinesiology building. They took a one-hour Tai Chi class taught by Xu and received diet and nutrition counseling supervised by Lofgren. Testing before and after the study showed that Tai Chi did, indeed, make the women more limber, though it didn't lead to significant weight loss.



"There were improvements in flexibility and a little weight loss," said Delmonico.

These results were encouraging enough to make the researchers want to continue their inquiry, a goal made possible by the CELS CARES grant, which will finance a new study involving 30 older women. All of them will be placed on a balanced diet for weight loss, and half of them will also practice Tai Chi three times a week for 16 weeks.

"We want to give people more time for weight loss," Delmonico said.

Fulfilling the community access portion of the grant, the researchers will take the combined weight loss/Tai Chi program to senior centers in North and South Kingstown, RI in 2012. In the following year, they will expand the program to senior centers in a more urbanized setting, such as Warwick, RI.

Training students in research procedures is one goal of the project, Delmonico said. The grant will fund three part-time graduate student internship positions for three years. In addition, the researchers hope to publish their results so others can learn from their study and they can hopefully qualify for a larger grant for more research into the benefits of Tai Chi.

"Alternative exercise" programs, such as Tai Chi and yoga, are popular with older people because they can be modified to address an individual's physical condition and they are low-cost, said Delmonico. Tai Chi, in particular, suits the older population because it emphasizes strength and balance, which often diminish in the aged, he said.

Keeping older people fit has been the focus of Delmonico's previous research projects at URI, all of which have also been interdisciplinary in nature. In 2008, he received another USDA-financed CELS CARES grant – this one for \$99,990 – to test the hypothesis that a regimen of resistance training can help older men and women to lose weight.

Phase one of that study involved 30 men and women between the ages of 60 and 75, half of whom worked out with weights three times a week for 10 weeks, while the other half didn't. All of the study's participants were placed on a balanced diet for weight loss supervised by Lofgren. The study showed that the people who combined resistance training with diet lost more fat and less muscle than those who didn't, Delmonico said.

"Those who did resistance training had better body composition," he said.

In the fall of 2009, the researchers took their weight training-weight loss program to the North Kingstown, South Kingstown, Cranston, and Warwick, RI senior centers, enrolling 95 participants for a nine-week study. There was no control group for this phase of the study; all of the seniors worked out with weights twice a week and received counseling from a dietitian. The results were encouraging, Delmonico said, "They did great."

Not only did their physical conditions improve when resistance training was added to their exercise routines, the seniors improved their dietary quality and really seemed to enjoy the program and stuck with it for its duration, he said.

# IT'S A BIG OCEAN ...FISH...CORAL...SEAWEED...ANTIBIOTICS



*David Rowley, second from the left, and students Robert Deering, left, Stephanie Forschner-Dancause, and Christine Dao, right*

As the use of antibiotics to treat infectious disease has become more commonplace in recent decades, scientists, doctors and others in the medical professions have noticed a disturbing development: Some bacteria have evolved to outwit antibiotics, making it necessary to search for newer and more effective drugs to fight disease.

David Rowley is involved in that search. This new area of multi- and interdisciplinary research is called "Marine Pharmacology."

An associate professor of biomedical and pharmaceutical sciences at the University of Rhode Island (URI), Rowley studies the molecules found in marine microorganisms to see if they have potential to become healing agents in mankind's fight against infectious disease.

Medicinal chemistry, to use a layman's phrase.

"I'm interested in molecules that affect microorganisms in one way or another," said Rowley, whose research has been funded by the National Science Foundation, the National Oceanic and Atmospheric Administration and Rhode Island Sea Grant.

What roles do molecules play in the natural environment? Can these same molecules be harnessed pharmacologically to help battle infections and other diseases? These are the questions Rowley concerns himself with in his laboratory at URI's College of Pharmacy.

The development of antibiotics and other disease-fighting drugs from bacteria found in soil and other "terrestrial" sources has been one of the great success stories in all of medicine, Rowley noted. An example is the cancer-fighting drug Taxol, whose medicinal properties originate in the common yew tree.

But now that some of these antibiotics have started to fail, it's time to look to new sources for the world's drugs. To the question of where researchers can find these sources, Rowley has a ready answer.

"We can investigate marine microbes," he said. Which is why his multidisciplinary research leads him to collaborate with URI oceanographers.

To date, Rowley has already discovered new molecules in the marine microbes he studies, an exciting accomplishment for any scientist. As he noted, "That's what keeps us going."

But finding new molecules is only part of the challenge. Getting marine-based medicines to market – or from ocean to bedside, as Rowley puts it – is a long process with several stages. First, there's extracting the potentially useful molecule, then there's cultivating it in sufficient quantities for pharmaceutical use. Finally, clinical trials are required before a new drug can be sold.

Rowley has lectured about these challenges not only to his graduate and undergraduate students at URI, but also to the public during a lecture series at URI's Coastal Institute. He isn't working alone. Carrying on URI's tradition of interdisciplinary research, Rowley works with professors David Smith and Steven D'Hondt at URI's Graduate School of Oceanography and Kerry LaPlante, an assistant professor in URI's department of pharmacy practice, in his pursuit of biomedical applications for molecules found in marine microorganisms.

Using marine microorganisms harvested from as close as Narragansett Bay and South County's salt ponds and as far away as the deep South Pacific and the Arctic oceans, he and Smith discover the molecules. Then LaPlante explores their pre-clinical application at her laboratory at the Veteran Affairs Medical Center in Providence, RI, Rowley said.

"In some cases, we're studying microbes from some of the deepest parts of the ocean," said Rowley.

The idea is to find new environments, which theoretically could harbor new microorganisms.

In addition to researching marine microorganisms for their potential human health benefits, Rowley is involved in a multidisciplinary study of disease pathogens in marine organisms. He is working with his colleague assistant professor Daniel Udway, and professors David Nelson and Marta Gomez-Chiarri from URI's College of the Environment and Life Sciences, on the project, which has as one of its goals the development of disease-resistant strains of marine microorganisms to benefit the aquaculture industry.

The researchers are currently studying the chemistry of bacteria for its potential to fight marine disease in oysters.

"Diseases are very much a factor for farmers trying to bring their products to market," Rowley said.

The project is currently funded by Rhode Island Sea Grant, and closely aligns with the URI program called DIMO – Diseases in Marine Organisms – which is funded by the U.S. Department of Agriculture. It brings together experts from different disciplines to study marine pathogens using genomics, proteomics and bioinformatics.

"Most of my research is collaborative in nature," noted Rowley, who came to URI nine years ago after earning his Ph.D. from the University of California at San Diego.

At URI, he was impressed by the number of talented researchers on campus and the opportunities the university presents for inspired collaboration, he said. Indeed, URI recently hired a number of researchers, who work with natural products to find new remedies. They are part of the university's Natural Product Research Group, which is one of the largest assemblages of natural products researchers on the East Coast.

## Archaeology & "Religiosity"

Ashish Chadha personifies a multidisciplinary approach to learning.

He is a trained archaeologist and anthropology scholar, with a Ph.D. in Cultural and Social Anthropology from Stanford University, but his interest in film and his career as an independent filmmaker is what brought him this past year to URI, where he joined the faculty as an assistant professor of film media.

"I am both a practicing artist and a scholar," said Chadha.

His interests fused together 16 years ago, when he was studying archaeology in a city in the western Indian city of Pune which has an acclaimed film school. Since then, Chadha has made a half-dozen or so short films and one full-length feature, which he has shown at film festivals worldwide, but not widely in his native India, where his films have been debarred by government censors.

"They asked me to make cuts in my films, which I will not do," Chadha said.

His films are experimental, and if they have one dominant theme, it is "religiosity," Chadha said. He explores the rituals and practices of Hinduism, which is the religion he grew up with in Calcutta. While it is disappointing to not be able to show his films to a wide audience in India, he has shown them in smaller venues in his native country despite the lack of a "censor's certificate," said Chadha, who referred to the government requirement as an "old colonial practice."

Though experimental more than documentary in nature, his films do have a narrative, unlike many American experimental films, said Chadha. His most recent film, a full-length feature titled *Shadows Formless* premiered at the Locarno Film Festival in Switzerland in 2007.

As an anthropologist, Chadha's work has focused on how archaeologists produce knowledge, a subject inspired by his work as an archaeologist in India, Italy and Peru. In the past, traditional anthropology has looked at isolated tribes of people, examining their habits and social customs, noted Chadha. His work does the same thing, only he sees archaeologists as an isolated tribe. "They have their own language and culture," he said.

How archaeologists produce knowledge is important since the conclusions they draw about the past can have a wide-ranging impact, sometimes a political one. For example, in 1992, ultra-Hindu nationalists tore down the medieval Muslim mosque of Babri Masjid. This led to unprecedented violence that spread throughout the country leading to deaths of a few thousand people. In its aftermath, interestingly, a scientific rationale was provided by the politico-religious groups that orchestrated the demolition, to justify their act. They argued that archaeological evidence conclusively proved that the mosque was built over a Hindu Temple destroyed by an invading Muslim army of the first Mughal ruler of India in the 16th century.

"Archaeology has strong political implications that can even lead to violence," said Chadha.

His work focuses on scientific practices in India, of the Archaeological Survey of India – one of the largest archeological organizations in the world while it excavates the sites of Indus Civilization – one of the oldest civilizations in the world.

Chada looks at these political aspects of archaeology and, more specifically, at how the bureaucracy of post-colonial India has influenced archaeological practices and, relatedly, the production of knowledge.



# A DECADE OF MAKING A DIFFERENCE AGAINST HUNGER IN RHODE ISLAND

As the director of the Feinstein Center for a Hunger Free America at the University of Rhode Island (URI), Kathleen Gorman oversees a program and place that trains students to open their minds and hearts to the problems of those less fortunate than they are.

Launched 10 years ago with a \$1.5 million donation from Rhode Island philanthropist Alan Shawn Feinstein, the hunger center has since secured over \$4 million in state and federal grants, which it uses to help people apply for benefits through the Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamp Program.

"We're making a difference with people in Rhode Island," said Gorman.

Over the past four years alone, participation in SNAP in Rhode Island has risen 112 percent, from 73,182 people to 155,742, she said.

The center relies on an army of student employees who visit hundreds of sites in Rhode Island to spread the word about SNAP. Over the past 10 years, they have screened more than 10,000 people for SNAP eligibility and have helped more than 6,700 people complete applications, according to center statistics.

In this way, the center is attacking the complex problem of hunger on the front lines. But, under Gorman's direction, it is also conducting research to better understand the myriad reasons families don't have enough to eat in Rhode Island and how best to help them. "We're always trying to answer questions that can help shape policy," said Gorman.

One study looked at low-income, working families in Rhode Island with the goal of ascertaining why some of them will use SNAP and some of them won't. Through telephone interviews with 450 such families, Gorman confirmed what she and others suspected: The working poor in Rhode Island are struggling, but only the most disadvantaged among them turn to SNAP for help. "Issues of pride and a complex application process often keep people from applying," Gorman said.



*Kathleen Gorman and students Justin LeBlanc & Kristen Mercier*

Using the same data, Gorman also tried to determine if ethnic differences in low-income working families, and the degree to which these families are acculturated into American society, affect issues surrounding hunger. This research addresses a current debate in the literature as to whether acculturation is always optimal. In terms of health and diet related behavior, recent research indicates that eating like Americans isn't always the best option, Gorman said.

In another study, Gorman is working with Karen McCurdy, an associate professor of human development and family studies at URI, to see if there is a link between depression in mothers and family food behavior. Are the children of depressed moms more apt to be hungry, or, in the alternative, obese? Are families with depressed moms less likely to eat together at a table or, in other ways, exhibit "food management" issues?

Data collection on this two-year study, funded by the National Institutes of Health, has just been completed. Participants are 150 low-income mothers and their young children attending childcare centers in Rhode Island. Analyses will examine the relationship between maternal depression, family food behaviors and children's weight and levels of food insecurity.

In a third area of research, funded by the U.S. Department of Agriculture, Gorman is collaborating with Elizabeth Metallinos-Katsaras from Simmons College to determine the extent to which the Women, Infant and Children Program, commonly known as WIC, has helped families in Massachusetts. More specifically, the researchers are asking whether there is a link between receiving WIC assistance and issues such as food security and obesity. "Our data show that the earlier families are in WIC and the longer they are on WIC assistance, the more apt they are to be food secure," Gorman said. As for obesity – a problem of national interest – their findings suggest a complex set of factors, including the mother's weight and food security before pregnancy predict the likelihood of the child's subsequent risk of being overweight, but is not clear whether this is due to genetics or behavioral factors.

A professor of psychology whose early research focused on the connection between malnutrition and cognitive development in children, Gorman came to URI from Vermont, where she had been on the faculty at the University of Vermont as well as board president of the Vermont Campaign to End Childhood Hunger. As the Feinstein Center's first director, she knew her task was to enhance awareness of the problem of hunger in Rhode Island and to involve students in that task.

To that end, Gorman teaches a class on hunger and poverty in America, and a minor in hunger studies is now offered at URI. Approximately 400 students have taken Gorman's class and more than 100 students have worked at the center in various capacities over the past decade. The center's statistics suggest it is making a difference in the state, but Gorman has another barometer for success: The number of students who, after taking her course or working at the center, reconnect with the center in some way. "It is so exciting to hear from students several years later, as they are working in various capacities throughout the country doing amazing things, and they recall the influence that the hunger center had on them. That's when I know it has made a difference," she said.



# THE BIG BUSINESS OF SOCIAL NETWORKING

The marketing potential of social media is one reason Facebook is now valued at billions of dollars; one out of every 12 people in the world is on Facebook. That's 600 million people, noted Nikhilesh "Nik" Dholakia, University of Rhode Island (URI) professor of marketing and international business.

"It is said that if Facebook were to be a country, it would be the third largest country in the world," Dholakia said.

Dholakia is keenly interested in social media, not only for the tremendous possibilities it presents for global business, but also because of the way it is changing society. It's a subject this noted URI professor, whose research also deals with globalization, technology, innovation, market processes and consumer culture, is currently exploring with three Ph.D. students in the College of Business Administration.

The author of several books about new technologies and their implications for business, among them *Worldwide E-Commerce* and *Online Marketing: Watching the Evolution*, published in 2006, Dholakia noted that research in business schools is not usually grant-funded. Instead, it typically consists of collaborating with doctoral students, either on ideas that stem from them or which the professors want to explore.

But Dholakia has also been involved in research supported by telecommunication companies, such as AT&T and NYNEX-Verizon. When the telecommunications industry was still relatively new, after the break-up of the Bell System in 1984, he and his wife and colleague, Ruby Roy Dholakia, helped to create the multidisciplinary Research Institute for Telecommunications and Information Marketing (RITIM), a research center located at URI's College of Business Administration.

Ruby Dholakia is also a professor of marketing at URI. Today, she is also the director of RITIM, which conducts several major research projects every year as well as smaller research studies. Among the subjects RITIM researchers have studied are electronic shopping behaviors, how businesses decide to buy telecommunication equipment and the acceptance of information technology by residential users.

RITIM aims to be the premier academic research center to study the marketing behavior and other strategic aspects of the telecommunications and information technology industries, according to Ruby Dholakia. It's a quick-moving world, with new developments coming online all the time, as evidenced by the burgeoning growth of social networking sites.

Dholakia is keenly interested in social media, not only for the tremendous possibilities it presents for global business, but also because of the way it is changing society.

"What are these social media doing to change the nature of experience?" Nik Dholakia asked.

This is the question Caroline Wilcox is exploring under his supervision. Before the advent of the Internet, the nature of shared human experience consisted of face-to-face encounters, letters and other written transactions – and then voice communication over the telephone. But then came the Internet and, with it, e-mail and social networking sites, which Dholakia described as the "next stage."

This next stage is attracting different people for different reasons, Nik Dholakia said. Interestingly enough, the market for social media is growing the most among people over the age of 30 and even as old as 70, not among the young people with whom it is most often associated. For these older consumers, Facebook is a "non-place with a feeling of community," said Dholakia.

That's the positive side of social media and to understand its implications and put them into historical context, he and Wilcox have to delve into several other fields, among them anthropology, psychology, sociology and technology, making the research very interdisciplinary in nature, he said.

But there's a dark side to social networking as well, and it most often involves young users, Nik Dholakia said. With youngsters, the network of friends they interact with online is usually the same as the people they see in their daily lives. The result can be that their lives are on display 24/7, which can be oppressive, he said.

In addition to Wilcox, Nik Dholakia is working with Ph.D. student Julianne Cabusas on research that looks at how social media are stimulating consumer creativity and what that means for business.

"Companies are discovering that people have a lot of energy and creativity," he said.

How is this phenomenon affecting consumers? What are the legal, creative and technological issues involved? These are the questions Cabusas is researching.

A third research project is exploring how the Dholakias' native country of India can retain sound environmental practices, such as recycling, in the face of rising materialism. In India, everything has always gotten recycled because goods were not available, and people could get money for selling used goods, he said. For this reason, among others, India recently received the highest grade, when *National Geographic* rated countries for their green practices.

"Re-use is part of the culture," he said.

The question now is how India can balance its growth with sustainability, a topic Nik Dholakia is researching with Ph.D. candidate Rama Kompella, who is also from India.

To help the larger URI community understand Indian culture and business, the Dholakias last year helped to organize the Honors Colloquium series of lectures, which addressed several aspects of Indian society. Called "Demystifying India," the 2009 program of lectures, performances and exhibits included such provocative topics as "What Would Gandhi Globalize?" to "India's Modernity: Once Colonial, Now Global."

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# PIONEERS OF THE DEEP BIOSPHERE



A diverse group of research scientists working together at the University of Rhode Island's (URI) Graduate School of Oceanography (GSO), professors Steven D'Hondt, Arthur Spivack, David Smith and marine research scientist Robert Pockalny, have to dig deep to find the answers they are looking for about the nature of life beneath the ocean floor. Their multidisciplinary research takes them not only to the depths of the ocean floor but to questions about life on other planets.

Literally.

The microbial life that intrigues them exists miles below the surface of the oceans and is shrouded by questions about how it can survive in such an extreme environment. It is dark and cold at the bottom of the sea and little plant life exists for these subsurface communities to feed on. So what do they eat? And how much energy do they need to live?

These are just some of the questions this research group has been trying to answer in research that has taken them on two international ocean drilling expeditions, the most recent in the fall of 2010, to extract sediment that is up to a hundred million years old. In the process, the professors have earned themselves and URI an international reputation as pioneers in the field of deep biosphere research.

Many students and post doctoral scholars have also been instrumental in the work, which presently is principally funded by the National Science Foundation (NSF), with additional support from other sources.

"We combine chemical, geological, biological and physical science

to understand the communities that live beneath the seafloor," said D'Hondt.

As a practical matter, this means taking samples of subsurface sediment, rock and water, then studying its chemical composition to determine how much life it contains and how this life manages to exist. On an earlier expedition, in 2007, the scientists led an international team to the South Pacific, where they collected hundreds of core samples in a vast area known as a gyre. A gyre is the center of an ocean, where there is little wind or other turbulence, leaving the water relatively clear with few nutrients.

"Our previous work shows that a huge number of microorganisms lived in the sediment beneath the ocean floor and that they can survive on very little energy or food," noted Spivack.

Now the scientists want to know if microbial communities exist in the very organic-poor sediment extracted from even deeper beneath the seafloor of the central South Pacific, where biological productivity is extremely low in the surface ocean. They also want to determine whether or not microbes in this sediment survive on hydrogen from natural radioactive splitting of water in the sediment, as opposed to organic matter.

To answer these questions, in October 2010, D'Hondt, Spivack and Smith went back to the South Pacific Gyre with a team of 30 international scientists on a 65-day expedition. The \$10 million journey was funded by the NSF, Japan and several European governments.

Spivack called the work "basic science," but it's really more than that.



It is science designed to enhance understanding of the role carbon dioxide plays in climate change. It also aims to help answer one of the more tantalizing scientific questions of our time: Does life exist on other planets and, if so, how?

A handful of scientists have explored subsurface life sporadically since the 1920s, but the team from URI was the first to make serious, new inroads in the field. Their work began in the late 1990s and was initially supported by the Ocean Drilling Program of the NSF.

Then, in 2001, D'Hondt, Spivack and Smith were awarded a five-year, \$3.9 million grant from the National Aeronautics and Space Administration

(NASA) to continue studying this "extremophile" community. In doing so, the URI team became part of NASA's Astrobiology Institute, an international consortium of highly select scientists, who study the origin, evolution and future of life in the universe.

D'Hondt said that knowing what it takes for life to survive on earth can help in the search for life on other planets. That's one goal of the research. The other is to add to our body of knowledge about the universe and to learn more about the "limits to life." At issue is a very basic question: "Where's the line between life and non-life?" he said.

The URI oceanographers collaborate closely with scientists from around the world, who specialize in a multitude of disciplines, D'Hondt said. They have published their findings in numerous scientific journals.

The team's interests go well beyond subsurface life. In 2008, Spivack and D'Hondt worked with Judith Swift of URI's Coastal Institute to sponsor the Fall Honors Colloquium on "People and Planet – Global Environmental Change."

A series of lectures on topics such as carbon mitigation, the colloquium was accompanied by exhibits in nine libraries throughout Rhode Island showing how climate change might affect the state's coastal communities and ecosystems. The goal, said D'Hondt, was to not only show the changes people have made to the environment, but also how they might, collectively, make choices to mitigate their impact.



*Arthur Spivack and Steven D'Hondt*



## LEAVING LOVE NOTES FOR THE ELDERLY TO EXERCISE

The health challenges affecting those 65 years old and up, particularly the problems of the very old, have long interested Patricia Burbank, a noted professor in the University of Rhode Island (URI) College of Nursing.

People in their 80's and 90's need to exercise every bit as much as younger people and they get just as many benefits, Burbank noted. Even if someone has never exercised before, if he or she starts an exercise program late in life, they will realize noticeable health improvements in a relatively short period of time.

"It's never too late to start to exercise," said Burbank, noting that if she could make any one health recommendation, it would be that.

With the baby boomer generation aging, and technology making people more sedentary than ever, Burbank has been researching methods to get older people moving. And, in an interdisciplinary research effort, she is collaborating with Ying Sun, a professor in URI's College of Engineering, she thinks she has found a way.

The solution is a small wearable device, which older people can use to remind them to exercise. Burbank and Sun applied for a patent for the device, it resembles a pedometer and plays recorded messages from friends and relatives, suggesting the wearer stretch, take a walk or even just raise their legs a few times, if he or she has been immobile for too long.

Burbank said her 97-year-old Aunt Ruth inspired the invention. She lives alone in her own home, and to help keep in touch with her, and remind her that she is loved, Burbank gave her an answering machine for her 90th birthday, which the older woman grew to love. Burbank called every day and left messages often, which her aunt played over and over again. According to Burbank, that's when the proverbial light

bulb went off.

"I thought, wouldn't it be nice if I sent messages reminding her to exercise?" she recalled.

With this idea, Burbank went to Sun, who designed the device in his engineering lab.

Burbank and Sun are applying for a grant from the National Institute of Nursing Research's Small Business Innovation Research/Small Business Technology Transfer grant program, which supports innovative research with the potential for commercial development, to make six devices and test them in a small pilot study. If funded, this first phase of the project will likely be followed by a second grant of \$750,000, again from the National Institutes of Health, to find a manufacturer, who will make approximately 200 devices for further study.

Nursing, by definition, is an interdisciplinary field since it pulls together so many different areas of expertise, Burbank noted, adding she is accustomed to collaborating with colleagues in the health and behavioral fields. That said, it was a special pleasure to add an engineer to this interdisciplinary mix, said Burbank, crediting Sun with the expertise to turn her idea into reality.

"Actually seeing it drawn out was exciting," she said.

When it comes time to do the pilot study, Burbank said she will likely turn to the Shalom Apartments in Warwick, RI to find participants, since she has worked with the residents there before and found them fun, inspirational and very honest about their experiences. One such project assessed the effectiveness of a fall prevention program that included increasing activity levels. One of the results was an informational booklet for seniors with tips on how to reduce falls.

Another study in which Burbank has been involved tested the Transtheoretical Model of Behavior Change with a large group of seniors from East Providence, RI, in an effort to get them to improve their diets and to get more exercise. Co-developed by James Prochaska, co-director of the Cancer Prevention Research Center at URI, the transtheoretical model suggests people change their behavior in clearly identified stages. The Study of Exercise and Nutrition in Older Rhode Islanders (SENIOR), headed by Phillip Clark, director of URI's Program on Gerontology and which Burbank worked on, was designed to test multiple-behavior interventions, as opposed to trying to change one behavior, and how these interventions affected functional ability and general health. Over 1,200 seniors were involved in the study. East Providence was chosen because it has the largest percentage of seniors in the state.

At URI, Burbank is the coordinator for the new Doctor of Nursing Practice program and is on the faculty of the interdisciplinary Rhode Island Geriatric Education Center. This expertise was vital to the SENIOR project, which relied on the availability of a distinguished interdisciplinary team at URI that was headed by Clark, and included Nancy Fey Yensan, associate dean of the College of Human Science and Services, and Deborah Riebe, the chairperson of the university's kinesiology department.

"Increasingly, funding agencies are emphasizing the importance of research conducted with an interdisciplinary framework," the research team, led by Clark, wrote in the *Oxford Journal of Medicine and Health Education Research*.

"This interdisciplinary pool of resources served to enhance, expand and extend the expertise of those affiliated with the SENIOR Project," they wrote.

Burbank said she enjoys interdisciplinary research immensely. "It brings you a whole different way of looking at things, of seeing them from a whole new perspective," she said.

The author of several books and articles, Burbank's research has also looked at the effects of static magnetic fields on sleep and cognition in Alzheimer's patients, as well as understanding the needs of gay, lesbian, bisexual and transgender elders in Rhode Island. She chairs the Fall Injury Prevention Subcommittee of the Rhode Island Lieutenant Governor's Injury Prevention Coalition.



Patricia Burbank

## Underwater Landscapes

### Rod Mather, underwater discoveries

When not teaching maritime history and underwater archaeology to students at the University of Rhode Island (URI), professor Rod Mather is apt to be under water himself, exploring centuries-old shipwrecks and other cultural and geological features of the ocean floor.

A vast undertaking, to be sure, considering that about 70 percent of the earth's surface is water and only about 5 percent of the ocean's floor has been mapped, according to Mather.

But, working with a team of multi- and interdisciplinary researchers that included URI oceanography professor John King, Mather has already mapped the floor of Narragansett Bay and points offshore, in the process, pioneers in the cyber mapping field locating dozens of shipwrecks. Among them are ships from as early as the Revolutionary War era as well as a four-masted schooner called the *Addie Anderson*, which sunk near Prudence Island in 1899.

In June 2011, he will be heading back to an area off the coast of Virginia as part of a 16-day expedition funded with a \$3 million grant from the Federal Bureau of Ocean Energy Management, Regulation and Enforcement. The location of the research, near the continental shelf, is not only historically important, but it is also rich in oil and gas deposits and has been targeted for offshore drilling exploration.

Working with an interdisciplinary team of archaeologists and biologists, Mather will search for evidence of Native American activity, as well as the wrecks of German war ships, which were sunk there after World War I. Other scientists will study the biological communities that live in the area's deepwater canyons, which are considered vital to the area's ecosystem, he said.

For the past two years, Mather has been part of an interdisciplinary team, which recently developed an Ocean Special Area Management Plan (SAMP) plan for the State of Rhode Island. Headed by the Coastal Resources Center at URI and adopted by the state's Coastal Resources Management Council in 2010, the Ocean SAMP is a blueprint for zoning Rhode Island's offshore waters that takes into consideration the area's historical, cultural and environmental significance. It was developed as a prerequisite to considering proposals for offshore energy projects, such as wind farms, off Rhode Island's southern coast.

Mather's role involved locating the underwater sites of historical and archeological significance in Rhode Island Sound. An experienced diver, who will dive as deep as 200 feet if he thinks it's important, Mather said he is fascinated by the "underwater landscape" and, in particular, how humans have changed it over the years.

"The earliest shipwrecks really don't look like much," said Mather, who came to URI after earning his Ph.D. at Oxford. Usually, they consist of a pile of stones that were used as ballast in the old sailing ships. But even these piles can shed important light on another time in ways that can be useful to the present, he said.

"I'm interested in where underwater sites are, what they are, and why they are where they are," he said.





## SUSTAINABILITY: IT'S NOT JUST ABOUT ENERGY ANYMORE.

In a developed society like the United States, the choices facing consumers can be staggering. This goes for food as well as more lasting products, such as clothing and TVs, and every day the choices seem to grow: Should you buy butter or margarine? Is free-range chicken healthier than the chicken raised in coops? And what about fish? How can you know the fish you are eating is safe? Where did it come from? How was it caught or raised?

These latter questions have been the research province of Cathy Roheim, a professor in the University of Rhode Island's (URI) department of environmental and natural resource economics and a nationally recognized expert on eco-labeling and its impact on the market for seafood. Her research spans across diverse disciplines from fisheries sciences to economics to aquaculture.

"What I do is try to figure out whether or not the market is creating economic incentives to move toward sustainability," said Roheim.

Sustainability in fisheries is controversial, and not a simple term. At a minimum it might mean that the world is not depleting fisheries by over-harvesting, nor is it creating new ecological problems with aquaculture methods which, in many countries, are not well governed. With seafood consumption on the rise, assisted by the world's ever growing population, sustainability has assumed a new urgency in the planet's quest to feed itself.

"The issue with both capture species and aquaculture is: Is it being done in a way that's environmentally, economically and socially sustainable?" Roheim noted.

That's the big question driving the multidisciplinary research of Roheim, who is a frequent advisor to industry, environmental groups and others interested in using the market to promote sustainable fisheries. She also currently serves as lead on the Sustainable Seafood Initiative, a joint program of Rhode Island Sea Grant and the College of the Environment and Life Sciences, which was created to educate policy-makers, retailers, the fishing industry and others about the effect of market-based efforts (such as eco-labeling) to promote sustainability.

But within this broad objective of sustainability, Roheim has carved out a more specific line of inquiry: Namely, what drives consumers to make the choices they do and are they willing to pay more for fish they know has been caught or raised in an environmentally sound manner? Does labeling fish to show it meets sustainability standards make a difference to consumers? Or not?

Multiple research projects since 1997 have looked at different aspects of these and other related questions, said Roheim. Currently, she is the lead investigator on a project funded with a \$360,000 grant from the U.S. Department of Agriculture, which has as its goal helping consumers weigh the health benefits versus risks of consuming aquaculture products.

Roheim's co-investigators on the project are Robert Johnston, an economist at Clark University, and Seth Tuler, a risk communication specialist from the Social and Environmental Research Institute. Tuler will develop information tools for consumers contrasting health benefits and risks of farm-raised fish based upon the best scientific literature.



“As economists, we will assess how relative risk information and economic factors influence consumers’ purchasing decisions,” said Roheim.

Consumers who are better informed about the health benefits of eating fish relative to other food choices may increase the demand for certain aquaculture products compared to other choices, thereby improving the competitiveness of the U.S. aquaculture industry, Roheim said.

In another study, Roheim and David Beutel, a former URI fisheries researcher, who is now employed by the Rhode Island Coastal Resources Management Council, are taking their questions about whether consumers care about aquaculture certification and labeling straight to where consumers are usually found – in local markets.

Using a \$78,000 College of the Environment and Life Sciences CARES (Community Access to Research and Extension Services) grant, the researchers developed a survey, which shoppers were asked to complete at the entrance to local markets. The results of the survey will be used to produce a guide that will help support the sustainability of Rhode Island’s aquaculture.

One goal of the project is to determine the benefits to aquaculture farmers of going through a certification process, which might be time-consuming and costly. Farmers want to know in advance if there will be a return on their investment in certification, Roheim said.

It’s not just the buying habits of individual consumers that interests Roheim. Big fish buyers like supermarket chains and the food service

industry also affect sustainability. Getting back to the big picture of the reasons for her research, Roheim said, “The bottom line to all of this is: Do the changes in buying behavior by those who demand seafood translate into making changes in the environment?”

For her expertise on sustainability issues, Roheim was recently named to the National Geographic Society’s Ocean Restoration Advisory Council and the Scientific Advisory Council of the World Fish Center in Malaysia. She has also served on the Marine Stewardship Council Stakeholder Council for many years, and was president of the International Institute of Fisheries Economics and Trade from 2006 to 2008.



Cathy Roheim

# BOOKS AND ELECTRONIC MATERIALS, PUBLISHED BY UNIVERSITY OF RHODE ISLAND FACULTY MEMBERS, 2010

Compiled by Margaret J. Keefe, professor, university libraries

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

[www.uri.edu/library/faculty\\_publications/index](http://www.uri.edu/library/faculty_publications/index)

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### Psychology

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### Sociology and Anthropology

Britt, Chester and Barbara J. Costello. *Causes of Delinquency Revisited*. Routledge. 2010.

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## Writing and Rhetoric

Anson, Christopher M., Robert A. Schwegler and Marcia F. Muth. *The Longman Concise Companion*. 2nd ed. Longman. 2010. 562p.

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## COLLEGE OF ENGINEERING

### Electrical, Computer & Biomedical

He, Haibo. *Self Adaptive Systems for Machine Intelligence*. Oxford Wiley-Blackwell. 2010.

### Mechanical, Industrial, & Systems

Shukla, Arun and Guruswami Ravichandran. *Dynamic Failure of Materials and Structures*. Springer. 2010. 408p.

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## COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

### Biological Sciences

Goldsmith, Marian R. and Frantisek Marec. *Molecular Biology and Genetics of the Lepidoptera*. CRC Press/Taylor & Francis. (Contemporary Topics in Entomology Series) 2010. 362p.

### Fisheries, Animal & Veterinary Science

Carrier, Jeffrey C., John A. Musick and Michael R. Heithaus. *Sharks and Their Relatives II; Biodiversity, Adaptive Physiology, Behavior and Conservation*. CRC Press. 2010. 713p.

## Marine Affairs

Nixon, Dennis W., Michael J. Daly and Susan E. Farady. *Marine and Coastal Law; Cases and Materials*. Second Edition. Praeger, 2010. 527p.

## Natural Resources Science

Wang, Yeqiao, Editor. *Remote Sensing of Coastal Environments*. CRC Press. 2010. 423p.

## COLLEGE OF HUMAN SCIENCE AND SERVICES

### Communicative Disorders

Weiss, Amy L., Editor. *Perspectives on Individual Differences Affecting Therapeutic Change in Communication Disorders; New Directions in Communicative Disorders Research*. Psychology Press. 2010. 296p.

## COLLEGE OF NURSING

Kim, Hesook Suzie. *The Nature of Theoretical Thinking in Nursing*. 3rd ed. Springer. 2010. 340p.

## GRADUATE SCHOOL OF OCEANOGRAPHY

Ballard, Robert D. Dr. Robert D. Ballard: Senior Scientist, Woods Hole Oceanographic Institution. Multimedia Support Center, United States Naval Academy. 2010. (DVD; Originally 1996)

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### Public Services

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# THE UNIVERSITY OF RHODE ISLAND

## RESEARCH HONORS & AWARDS 2009-2010

Compiled by the College Deans Offices

### COLLEGE OF ARTS AND SCIENCES

**KATHLEEN DAVIS**, associate professor of English, was selected to be a 2010-2011 Scholar at the Institute for Advanced Study, School of Social Science at Princeton.

**WILLIAM EULER**, professor and department chair of chemistry, and **IGOR LEVITSKY**, adjunct professor of chemistry, received a U.S. patent for "Hybrid Solar Cells Based on Nanostructured Semiconductors and Organic Materials" in 2009.

**DONNA HUGHES**, professor of women's studies, received the 2010 Norma Hotelling Awards: the Josephine Butler Abolitionist Award for Policy for her important work as founder of DIGNITY, and for her work in Rhode Island to criminalize prostitution. Her work is recognized in the fight against human trafficking and commercial sexual exploitation of women and children.

**JOHN LEO**, professor of English, was elected in an international competition to the prestigious Hugh le May Fellowship for 2010 from Rhodes University, Grahamstown, South Africa. The fellowship, which is given in alternate years, recognizes outstanding research in arts and humanities and supports promising new research.

**BRETT LUCHT**, professor of chemistry, and **WILLIAM EULER**, professor and department chair of chemistry, received a U.S. patent for "Thermochromic Indicator Materials with Controlled Reversibility" in 2009. In addition they received a patent for "Thermofluorescent Pigments for Security and Safety Applications" in 2010.

**NAOMI MANDEL**, associate professor of English, was selected to serve as a Visiting Professor at the Halbert Centre of Canadian Studies at The Hebrew University in Jerusalem in spring 2010.

**KEVIN MCCLURE**, associate professor of communication studies received the Top Paper in Rhetoric and Public Address for "The Rhetoric of Disaster: The Presidential Natural Disaster Address as an Emergent Genre." The paper was presented at the Annual Eastern Communication Association Convention in Baltimore, MD. 2010. He also received the 2009 National Communication Association award for outstanding article in Political Communication for Rhetorical Criticism: Perspectives in Action, Kenneth Burke's Dramatistic Criticism, in James Kuypers.

**RADHA NARAYANAN**, assistant professor of chemistry, received the 2009 starter grant from the Society for Analytical Chemists of Pittsburgh. The award is presented annually to the junior faculty member considered the best in the nation in analytical chemistry, to encourage high-quality, innovative research.

**DAVID OH**, adjunct professor of communication studies, received the second place faculty research award, Minorities & Communication Division, Association for Education in Journalism & Mass Communication, for "Promise and Peril: *Time Magazine's* Construction of the Promise and Peril of Michelle Rhee" in 2009. In addition he received the second place faculty research award, Asian/Pacific American Caucus & Division, National Association of Communication, for "Viewing Identity: Second Generation Korean American Ethnic Identification and the Reception of Korean Transnational Films" in 2010.

**JAMES PROCHASKA**, professor of psychology and executive director of the Cancer Prevention Research Center, received the 2010 Beckham Award. This award is for inspiring his students to establish a lasting concept, procedure or movement of comparable benefit to the community at large. He received the 2010 Bertram Yaffe Award. This award is for his contribution to the field of public health as professor and for his role in developing the Transtheoretical Model of Behavior Change. In addition, he received the 2009 Lifetime Achievement Award. This award is from the Connecticut Psychological Association for career contributions to psychology.

**JOËLLE ROLLO-KOSTER**, professor of history, received the 2009 Adele Mellen Prize for Distinguished Contribution to Scholarship for The People of Curial Avignon. In association with the Center for Medieval and Renaissance Studies, Saint Louis University, she also received a National Endowment for the Humanities Research Fellowship (10 weeks) at the Vatican Film Library (2009-2010).

**ROBERT VAN HORN**, assistant professor of economics, was a Fellow in the History of Political Economy at Duke University from June 2008 to May 2009.

**ROBERT VINCENT**, technician in physics, received a U.S. patent for "System and Method for Tuning a Monopole Antenna" in 2009. He also received a U.S. patent for "Systems and Methods for Providing Distributed Load Monopole Antenna Systems" in 2010.

### COLLEGE OF BUSINESS ADMINISTRATION

**XUANJUAN CHEN**, adjunct professor of finance decision science, **BING-XUAN LIN**, associate professor of finance decision science **HENRY OPPENHEIMER**, professor of finance decision science, and **TONG YU**, professor of finance decision science, received the Best Feature Paper Award from the *Risk Management and Insurance Review* in 2009.

**SILVIA DORADO**, professor of entrepreneurial management and law, was the winner of the 2010 Carolyn Dexter Award to the best international paper at the Academy of Management Conference.

**JEFFREY JARRETT**, professor of finance decision science, received the Distinguished Paper Award in statistics and decision analysis from the Decision Sciences Institute Conference in 2009.

**KATHRYN J. JERVIS**, professor of accounting information science, received the Governmental Accounting Standards Board Gil Crain Research Project Award in July 2009.

**TONG YU**, professor of finance decision science, received the Best Feature Paper Award in corporate finance from the Chinese Finance Association (TCFA) in 2010.



## COLLEGE OF ENGINEERING

**ARIJIT BOSE**, professor of chemical engineering, received a U.S. patent for "Modified Freeze Fracture Direct Imaging Apparatus and Technique" in 2010.

**YING SUN**, professor of electrical, computer, and biomedical engineering, and **ROBERT HILL**, research professor of biological sciences, received a U.S. patent for "Apparatus for Neuromuscular Measurement and Control" 2009.

**AUGUSTUS UHT**, professor of electrical, computer, and biomedical engineering, and **RESIT SENDAG**, associate professor of electrical, computer, and biomedical engineering, received a U.S. patent for "System and Method for Cache Replacement" in 2009.

**QING YANG**, professor of electrical, computer, and biomedical engineering, received a U.S. patent for "Data Recovery System and Method Including a Disk Array Architecture that Provides Recovery of Data to Any Point of Time" in 2010.

## COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

**ARTHUR GOLD**, professor of natural resources science and director of URI's water quality cooperative extension program, was appointed Senior Advisor to the United Nation's FAO/IAEA Coordinated Research Project on Water Conservation Zones from 2008-2013.

**SCOTT MCWILLIAMS**, professor of natural resources science, was appointed the 2009 Research Scholar at the Advanced Facility for Avian Research, University of Western Ontario, Canada. He was also named a Research Fellow at the Max-Planck Institute for Ornithology, Seewiesen, Germany from 2005-2009. In addition, from 2008-2011 he is a Visiting Scholar at the Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Israel.

**CHERYL WILGA**, associate professor of biological sciences, was appointed Research Associate in the Museum of Comparative Zoology at Harvard University in 2009. She also received the 2009 Research Scientist Award, from the College of the Environment and Life Sciences at the University of Rhode Island for outstanding research.

## COLLEGE OF HUMAN SCIENCE AND SERVICES

**SUSAN ROUSH**, professor of physical therapy, was the 2009 recipient of the J. Warren Perry Distinguished Author Award from the Association of Schools of Allied Health Professions for her paper with Nancy Sharby titled "Decision Making Model for Addressing the Needs of Allied Health Students with Disabilities."

## COLLEGE OF PHARMACY

**SERPIL KIŞLALIOĞLU**, professor of biomedical and pharmaceutical sciences, was honored by the Executive Board of the Turkish Society of Cosmetic Scientists for her lifetime achievements in cosmetic science at the 8th International Cosmetics Symposium (ICoS) held in Istanbul, Turkey, May 2009.

**KERRY LAPLANTE**, associate professor of pharmacy practice, received the Society of Infectious Diseases Pharmacists Young Investigator of the Year Award, 2010.

**RITA MARCOUX**, research assistant professor of pharmacy practice, and **PAUL LARRAT**, clinical professor of pharmacy practice, received the Pharmacy Benefit Management Institute's Rx Benefit Innovation Award, 2009.

**KEYKAVOUS PARANG**, professor of biomedical and pharmaceutical sciences, and **GONGQIN SUN**, professor of cell and molecular biology, received a U.S. patent for "Bisubstrate Inhibitors of Protein Tyrosine Kinases as Therapeutic Agents" in September 2010.

**NAVINDRA SEERAM**, professor of biomedical and pharmaceutical sciences, received the 2009 Young Scientist Award from the Agricultural and Food Chemistry Division of the American Chemical Society.

**KRISTINA WARD**, clinical associate professor of pharmacy practice was recognized by the American College of Clinical Pharmacy (ACCP) for making significant contributions to the profession of pharmacy through the publication of a Drug Information Practice and Research Network (PRN) Opinion Paper in *Pharmacotherapy*, the official journal of the ACCP, 2010.

**CYNTHIA WILLEY**, professor of pharmacy practice, served as a National Institutes of Health Research Mentor for the National Heart, Lung and Blood Institute, 2009.

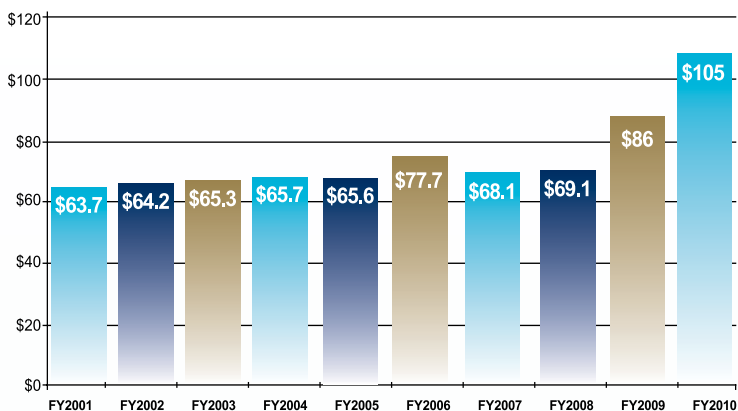
**NASSAR ZAWIA**, professor of biomedical and pharmaceutical sciences, received the United States Environmental Protection Agency, Scientific and Technological Achievement Award (Level I) for "Highlighting the Use of Genomics in Understanding Mode of Action in Developmental Neurotoxicity" 2009.

## THE GRADUATE SCHOOL OF OCEANOGRAPHY

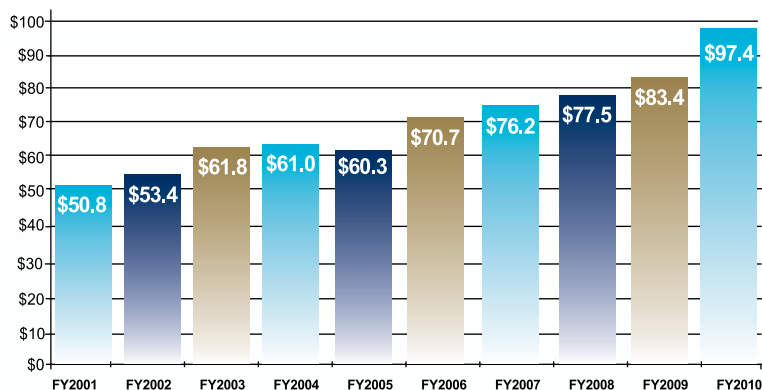
**H. THOMAS ROSSBY**, professor of physical oceanography, was selected to receive the 2009 American Geophysical Union's Maurice Ewing Medal. This is one of the society's highest awards and is given for those making exceptional contributions to our understanding of the deep ocean.

# THE UNIVERSITY OF RHODE ISLAND RESEARCH ENTERPRISE AT A GLANCE

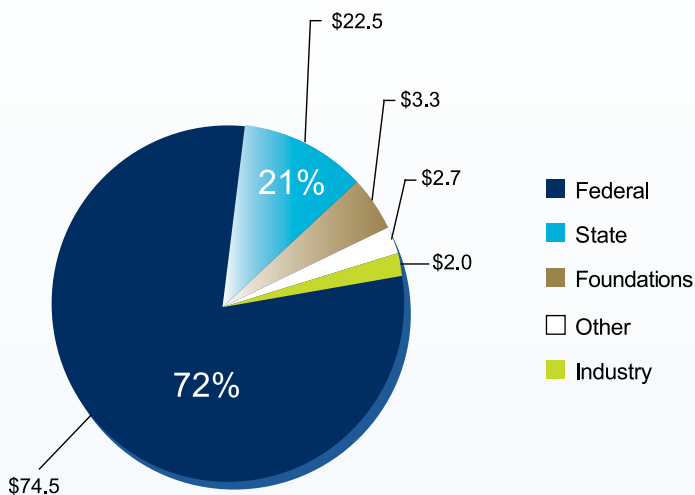
SPONSORED PROGRAM AWARDS FY2001 TO FY2010  
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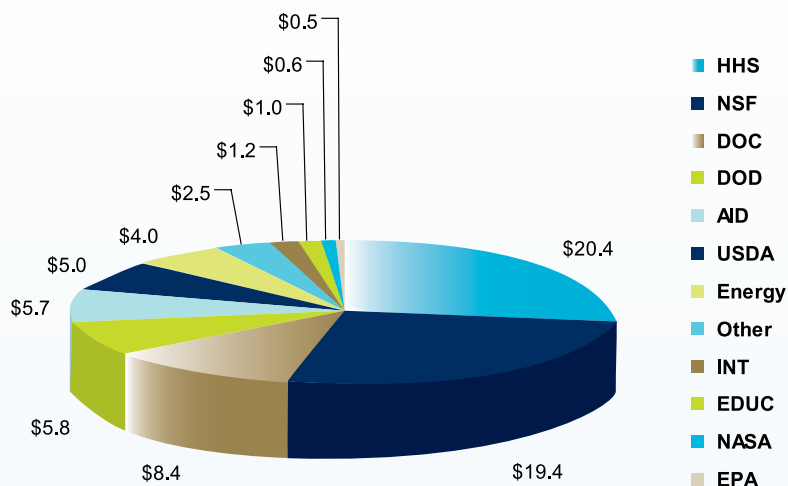
SPONSORED PROGRAMS EXPENDITURES REPORTED TO THE  
NATIONAL SCIENCE FOUNDATION FY2001 TO FY2010  
[\$MILLIONS]



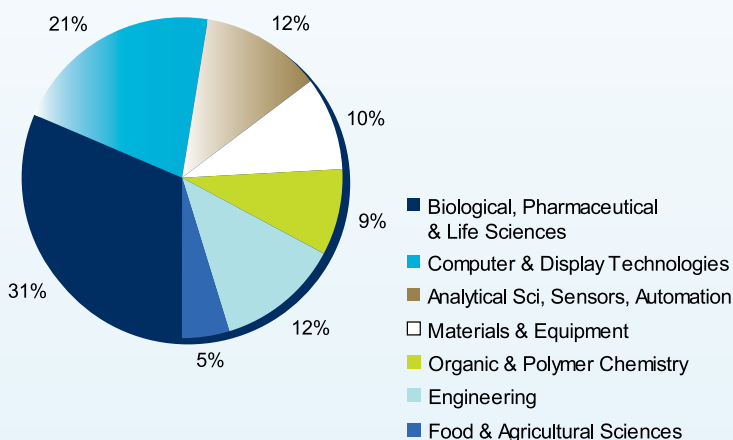
SOURCES OF SPONSORED PROGRAMS FUNDING FY2010  
[\$105 MILLION TOTAL]



SPONSORED PROGRAMS AWARDS BY FEDERAL AGENCY FY2010  
(\$74.5 MILLION TOTAL)



FY2010 DISTRIBUTION OF CURRENT  
PENDING & ISSUED PATENTS



PATENT & LICENSING ACTIVITY, FISCAL YEARS 2008 - 2010

	Disclosures Received	New Patent Applications <sup>1</sup>	US Patents Issued	Licenses Generating Revenue <sup>2</sup>
2010	21	20	4	25
2009	26	5	5	27
2008	17	11	3	25

<sup>1</sup> New category for 2010. First filing of patentable subject matter in world includes US provisional, US non-provisional or PCT designating US.

<sup>2</sup> 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  
UNIVERSITY  
OF RHODE ISLAND

DIVISION OF RESEARCH &  
ECONOMIC DEVELOPMENT

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