

Momentum:

Research & Innovation



Fall 2016

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Momentum:

Research & Innovation



Welcome to the latest issue of *Momentum: Research and Innovation*. In this issue, the broad spectrum of excellence in scholarly activity and research ongoing at the University of Rhode Island is highlighted. The University is very proud that we can show you the excellence in scholarly works in a wide range of subjects, from music to high technology. The wide breadth of scholarly excellence allows the University of Rhode Island to serve our students and faculty well, and is a major contributor to the University's reputation as a leading research university. We hope that you will enjoy this issue and come back to *Momentum: Research and Innovation* in the future to discover more about the University of Rhode Island.

Sincerely,

Gerald Sonnenfeld, Ph.D.
Vice President for Research
and Economic Development

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A DIVIDED NATION

Must Compromise

written by **CHRIS BARRETT '08**



Shanna Pearson-Merkowitz

associate professor of political science

“A house divided against itself cannot stand,” Abraham Lincoln famously remarked in the run-up to the American Civil War. More than a century later, Shanna Pearson-Merkowitz worries America has become more divided than ever.

The associate professor of political science at the University of Rhode Island (URI) spends her days researching the polarization of America. She’s found no shortage of topics. From whom to install in the White House to immigration policy, Americans just cannot seem to agree.

“It is not good for us to see each other as enemies,” Pearson-Merkowitz says. “That’s not healthy for democracy. When we see each other as threats, that’s what’s dangerous.”

The political lines drawn during the 2016 election became so entrenched that some voters resorted to violence against opponents at campaign rallies. Hate crimes targeted toward immigrants and religious groups occurred from New York City to South Carolina. On campus, students confided to Pearson-Merkowitz that they felt so unwilling to compromise on their political positions that they lost friends during the bitter election.

Pearson-Merkowitz’s research places the blame on a confluence of events. The rise of 24/7 news coverage and social media leave little room for politicians to retreat, compromise and find common ground. The constant messaging from political elites that party members stand with them or against them paints policy as black and white with moderating equivalent to heresy.

Campaign attack ads fan the charged atmosphere, yet politicians might reconsider them. In research released this year, Pearson-Merkowitz found negative campaign advertisements failed to work. Positive ads better persuaded voters but only if the candidate also advertised more than his or her opponent.

Pearson-Merkowitz’s research also found traditional attempts at fostering compromise sputter today. A long line of psychological research says people exposed to a different population typically grow more tolerant of that group. But a 2013 research project by Pearson-Merkowitz and colleagues found that those who identified strongly with a political party against same-sex marriage opposed it even if they reported homosexual friends or family. And in research published in 2016, she and her colleagues found that people who personally know Latinos are only more likely to support a pathway to citizenship for undocumented immigrants if they identify with a



URI undergraduate honors public policy students traveled to Washington, D.C. standing on the U.S. Supreme Court steps.

political party that is welcoming toward immigrants. In short, she found that messaging from political leaders appears to negate any benefits of personal contact.

“There are such extreme one-sided and clear messaging coming from political elites today,” she says. “It’s getting in the way of how interpersonal experience affects our views.”

Perhaps even worse, the chances of coming into contact with different groups appears to be declining. Pearson-Merkowitz’s studies show that Americans have long physically separated themselves along ideological lines. During the Civil Rights era of school desegregation, whites quickly realized they could move to wealthier suburbs to avoid sending their children to schools with blacks. Poorer ethnicities stayed behind. In the 21st century, divisions persist, especially among races.

“We’re more segregated than we ever were, even more than before Brown vs. Board of Education,” says Pearson-Merkowitz, referring to the landmark 1954 U.S. Supreme Court ruling that ordered the desegregation of public schools.

Political elites reinforce these racial and now ideological divisions by drawing voting districts that ensure the majority of voters in the district align with one party. Pearson-Merkowitz says the process known as gerrymandering further creates divisions among voters and the candidates they elect.

In gerrymandered districts many candidates run in a primary against those in the same party. To win, a candidate must appeal to those most likely to vote in a primary, typically those on the extreme end of the political spectrum. The winner, almost never a moderate, moves to a general election with no real competition because political elites drew the district to favor one party. Extreme candidates then land in office. If they compromise in office, political hardliners quickly field a competitor during the next primary.

The trend of Congressional candidates facing little competition and huge pressure to toe the party line once in office lies at the center of a book under development by Pearson-Merkowitz.

“Now the parties can’t seek compromise,” Pearson-Merkowitz says. “There used to be a lot of backroom

deals. But people don’t like that idea but it’s what makes this country work.”

Pearson-Merkowitz wants the U.S. Supreme Court to rule gerrymandering unconstitutional. She also wants voters and politicians to stop and listen to each other and compromise on solutions that move the country forward.

“What we can start doing is listening to each other, to both sides of the argument with open minds, saying, ‘I might not agree with you but let’s find where can we come together,’” she says. “The rule was never talk religion or politics at the dinner table. People need to talk religion and politics at the dinner table.”

That includes politicians, who Pearson-Merkowitz wishes would look at the empirical research to find solutions. To that end, she led a team of undergraduate Honors Program students to offer unbiased policy analysis for three controversial topics in Rhode Island.

In 2015, the students presented to lawmakers and the governor’s policy staff on how to improve the lives of foster children who leave state care, options for McCoy Stadium in Pawtucket that hosts an AAA baseball team considering relocating, and whether to legalize marijuana.

The debate over policy started in the classroom and ended at the state capitol. One lawmaker paused and complimented the group on the even-handed approach. Another left impressed that students proposed an option for McCoy never before considered. Students suggested the ballpark could host a baseball-themed magnet school should the team leave.

The research was later published by The Collaborative, a local nonpartisan group spearheaded by the state’s 11 colleges that fund research based policy analysis.

As Pearson-Merkowitz urges students and lawmakers to consider all sides, the professor thinks back to a Congressional campaign she worked on shortly after graduating college and before attending graduate school. The campaign successfully unseat a moderate with someone much more ideological and less likely to reach across the aisle. At the time, Pearson-Merkowitz celebrated her victory but soon another feeling set in.

“We need politicians who can work with both parties to find compromise,” she says. “The more I studied the issue, the more I wanted politicians who didn’t always agree with me, but who were going to get along with everyone in Congress and the leaders of other countries, people who are able to work with everyone.”

And that, she worries, may not be the future of America.



“What we can start doing is listening to each other, to both sides of the argument with open minds, saying, ‘I might not agree with you but let’s find where can we come together.’”

- Shanna Pearson-Merkowitz



URI students at the RI State House after presenting to state legislators.



Shanna Pearson-Merkowitz at the Rhode Island State House



URI students with U.S. Senator Sheldon Whitehouse, (D-RI,) Washington, D.C.

Cuba

Restructuring a Revolution

written by **MICHAEL KIMMERLEIN '16**



On December 17, 2014, United States President Barack Obama and Cuban President Raúl Castro announced that diplomatic ties between the two countries would be restored. By January of 2015, less than a month after the announcement, University of Rhode Island (URI) political science Professor Maureen Moakley and economics Professor Richard McIntyre were in Havana with 20 students.

Moakley had been studying political issues in the Caribbean while looking at the possibility of statehood for Puerto Rico. Although her primary research focus is on local politics, especially in Rhode Island and New England, she has recently shifted her attention to comparing countries in the Caribbean.

"You have a region of the globe that has a similar history of colonialization and slavery," she says of the Caribbean. "Yet, look how differently the Dominican Republic, Cuba, Puerto Rico and Haiti have evolved."

The fascinating question is "How did they develop?"

Moakley says. "And how these various governments do or do not provide peace and prosperity for the citizens and a place in the global environment."

With each country's issues, Moakley finds the situation in Cuba the most fascinating.

"Because it was a communist revolution it doesn't conform to the norms of democracy," she says. "But in many ways they've done things remarkably well."

She points to Cuba's comprehensive health care system, high level of literacy and its relative economic, social, political and racial equality, which she says is unknown elsewhere in the Caribbean.

That all sounds well and good, but Cuba is obviously not without critical problems. Cuba went through a dramatic and long depression in the 1990s after the Soviet Union collapsed and so far has not been able to transition effectively from failed central economic planning and state ownership.

"The fascinating thing now is to see how they emerge," Moakley says. "It's no easy thing to restructure a revolution; they have to balance the social and political norms of equality and redistribution with an incentive-based economy."

The economy is what Professor McIntyre is looking at in Cuba with the concept of cooperatively owned enterprises [article page on 12]. But Moakley is looking at the bigger political picture.

What she's interested in, she says, is "how the regime balances its notable achievements and the structural problems without having a counter-revolution."

Many people there are not happy about the idea of moving away from a "command socialist economy," according to Moakley, but what most Cubans appear to want is a socialist democratic society like Sweden or Norway with an economy based on incentives and rewards for productivity but with an extensive welfare state.

Moakley appears regularly on Rhode Island Public Radio as a commentator on "Political Roundtable" and analyzes trends in Rhode Island state politics. Her interest in the Caribbean was piqued in the early 2000s by the issue of Puerto Rico statehood. Convinced of the need for more opportunities for foreign study, she has led student trips to the Dominican Republic and to Cuba during URI's J-Term [January classes] where they

considered the vast differences between Cuba and other Caribbean countries.

"You go to some Caribbean countries today and go out into the countryside and you see people living in appalling poverty," Moakley says. "You don't see that in Cuba."

People have reasonable housing and transportation, she says, and are well educated and have good health care. The problem, Moakley says, is the economic system was inherently flawed, particularly in agriculture.

"It simply does not work," she says. "They import 60 percent of their food."

So, Moakley is looking at theories of democracies, the development and the success or the failures, of their application.

But is democracy something that could work in Cuba? Moakley thinks it can, but with some caution.

"Ultimately, it could work but it's far down the line because they're still committed to a communist ideology," she says. "In Marxist philosophy the notion is that the state will eventually wither away, perhaps."

“It’s no easy thing to restructure a revolution; they have to balance the social and political norms of equality and redistribution with an incentive-based economy.”

- Maureen Moakley

Maureen Moakley
professor of political science



When this happens, Moakley explains, the hierarchical infrastructure of the communist party will eventually have less of a stronghold on the country and citizens will have more of a say.

“There would be more input from citizens, cooperatives and local representation,” she says. “They’re trying to move toward an economic and social system that allows people to manage their own affairs.”

With diplomacy between the United States and Cuba being reopened, Moakley is interested in seeing how Cuba’s government evolves.

“They have the potential to do a lot better than a lot of other Latin American countries,” she says. “And it’s striking that they do some things better than we do.” 99.8 percent of Cubans are literate, slightly higher than the rate in the United States, and Cubans live just as long as Americans but spend only 4 percent as much on health care.

As the renewed relationship between the United States and Cuba grows, Moakley says she sees the classic United States policy of trying to impose our ideas of democracy and democratic values changing.

“The fact is we trade with Vietnam, we trade with China, that’s a standard that I think will develop,” she says, noting that with Cuba importing the majority of its food, it is in the United States interest to trade with this country.

In addition, Moakley says Cuba is beginning to adjust the authoritarian system to be more inclusive.

“As they move along, they’ve already opened up the representative process,” she says. “The government is becoming more representative as we speak. They have quotas for women and for different races.”

Down the road, Moakley adds, a more representative system could ultimately replace the force of the communist party.

As for her students, Moakley sees Cuba as a unique learning opportunity – opening their eyes to a government totally different from what they know in the United States.

“It’s fascinating for students to observe a relatively egalitarian society,” she says. “They understand the shortages – and flaws that people don’t live the way we would expect people to live in the United States.”

With her students and in her own research, Moakley is seeing in Cuba a system that is viable yet is vastly different from our country. Moakley notes the importance of looking at and learning from alternative systems.

“Students can learn from Cuba, the critical problems, but also the remarkable successes in equality and racial relations,” says Moakley.



The *Cooperation* MODEL

written by **MICHAEL KIMMERLEIN '16**

For University of Rhode Island (URI) economics Professor Richard McIntyre, cooperation is key when it comes to running a successful economy.

Imagine the stereotypical boardroom where executives in expensive suits make decisions that affect workers on a factory floor that they themselves may never have worked on. This is a common way of conducting business.

The model is one that McIntyre thinks needs to be changed. His research is focused on the labor process.

"Employers can't technically buy labor," he says. "But, what they can buy is your time, and labor process theory looks at the various ways in which employers can motivate employees to use their time effectively."

This can be done in a number of ways. One method is implementing technology in the workplace.

"The classic example is the assembly line," McIntyre says. "Control over the pace of work is taken away from the employee."

This allows employers to see where productivity is breaking down. If you're not keeping up with the assembly line – think of the classic candy factory scene from television's "I Love Lucy" where Lucy shoves chocolate into her mouth and clothes to try to keep up with the pace – the boss can see right away who's falling behind.

Then there is the foreman model where a low-ranking manager's sole job is to get people to do the work they're paid to do. Finally, there is the job ladder theory, a formerly popular method in the United States.

"You can get people to work hard if they believe that by working hard they will be promoted," McIntyre

explains. "If you can see a career for yourself in a certain organization, or that your performance in a certain organization might lead to a better job in another organization, then you will work hard."

But, this expectation does not necessarily pan out. McIntyre has observed that many of these organizations and companies – mostly big and multinational corporations – have been "flattened." Those job ladders leading low-level employees to higher-paying management positions do not exist much anymore, McIntyre says.

"There was a wave in the 1980s and '90s, where the lingo was 'flattening the organization,' limiting the number of middle management and decently paid production worker positions," McIntyre says. "That's great from management's point of view because it saves money, but the problem is employee motivation. It's hard to motivate your employees when they see no chance for growth within the company."

From McIntyre's perspective, the distance between employer and employee is widening with globalization and that poses a problem. Workers in a factory in Bangladesh providing shoes, for example, cannot go to the company headquarters in the United States and confront their employer about their work conditions. He explains that this issue is important to analyze now considering how the global economy has grown in recent years.

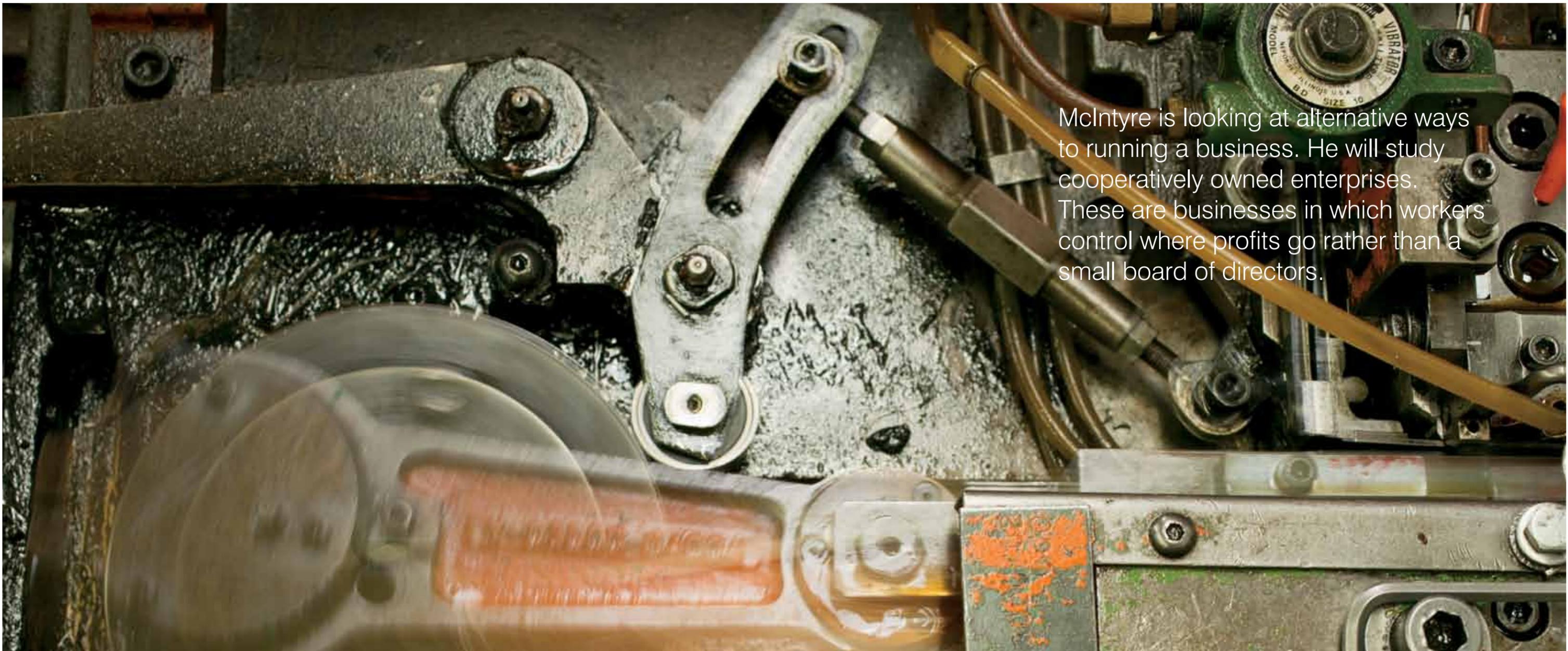
McIntyre recalls the tragic Rana Plaza collapse in Bangladesh in 2013 when more than 1,000 people died.

"Those people were working in unsafe factories to produce the clothes that you and I wear," McIntyre says. "So we are morally implicated in that disaster."

"I think a lot of what's going to happen in the 21st century is the development of a new model, which is neither state socialist nor corporate capitalist, but ways in which workers can have control over their own lives."

– Richard McIntyre

Richard McIntyre
professor of economics



McIntyre is looking at alternative ways to running a business. He will study cooperatively owned enterprises. These are businesses in which workers control where profits go rather than a small board of directors.

Morality – that’s not a word you typically hear coming from most economists. Professor McIntyre is not most economists. Most economists don’t like to talk about moral issues because there’s no way to address them scientifically – something McIntyre thinks should change.

“It’s something we avoid at our peril,” he says. “Economics is always involved with morality, whether other economists address it or not. You can’t get away from it.”

Consequently, he is looking at alternative ways to running a business. When he takes sabbatical in the spring, he will study cooperatively owned enterprises. These are businesses in which workers control where profits go rather than a small board of directors that likely never worked on a factory floor.

“That’s the source of our problems,” McIntyre says of the board of directors’ model, a conclusion he came to when a colleague raised the point in a critique of his 2008 book, “Are Worker Rights Human Rights?” and ultimately shifted the way he was looking at his research.

“If that group of people can get a bigger surplus or profit by shifting those jobs to Mexico, they’ll do it,” McIntyre explains. “The directors, generally with no real personal connection to the low-level employees, strive to maximize profits at any cost. That’s their focus.”

The potential solution, he says, of some of the issues brought about by globalization lies in granting the factory workers who produce the surplus – control of appropriating and distributing the surplus. His daughter works for such an organization in Vermont and the

model is working in multiple places in Europe.

During his sabbatical McIntyre will investigate these enterprises in three places: Cuba, France and Vermont. His work in Cuba extends URI’s presence there.

Along with Professor Maureen Moakley [article on page 8] from URI’s political science department, McIntyre has started the URI Cuba program that takes students to the country for the month of January, and recently had two students study there for an entire semester.

In Cuba it is actually official government policy to encourage cooperatives, McIntyre says. And this is the model that he sees changing the way business is done in the United States and around the world.

To McIntyre, the connection between what he sees

in Cuba and elsewhere is the focus of his research.

“I think a lot of what’s going to happen in the 21st century is the development of a new model, which is neither state socialist nor corporate capitalist, but ways in which workers can have control over their own lives,” McIntyre says.

The model McIntyre envisions hinges on the idea of taking power out of the hands of the stereotypical boardroom of company executives and giving it to the people actually doing the hands-on work – those making the car or the shoes or computer.

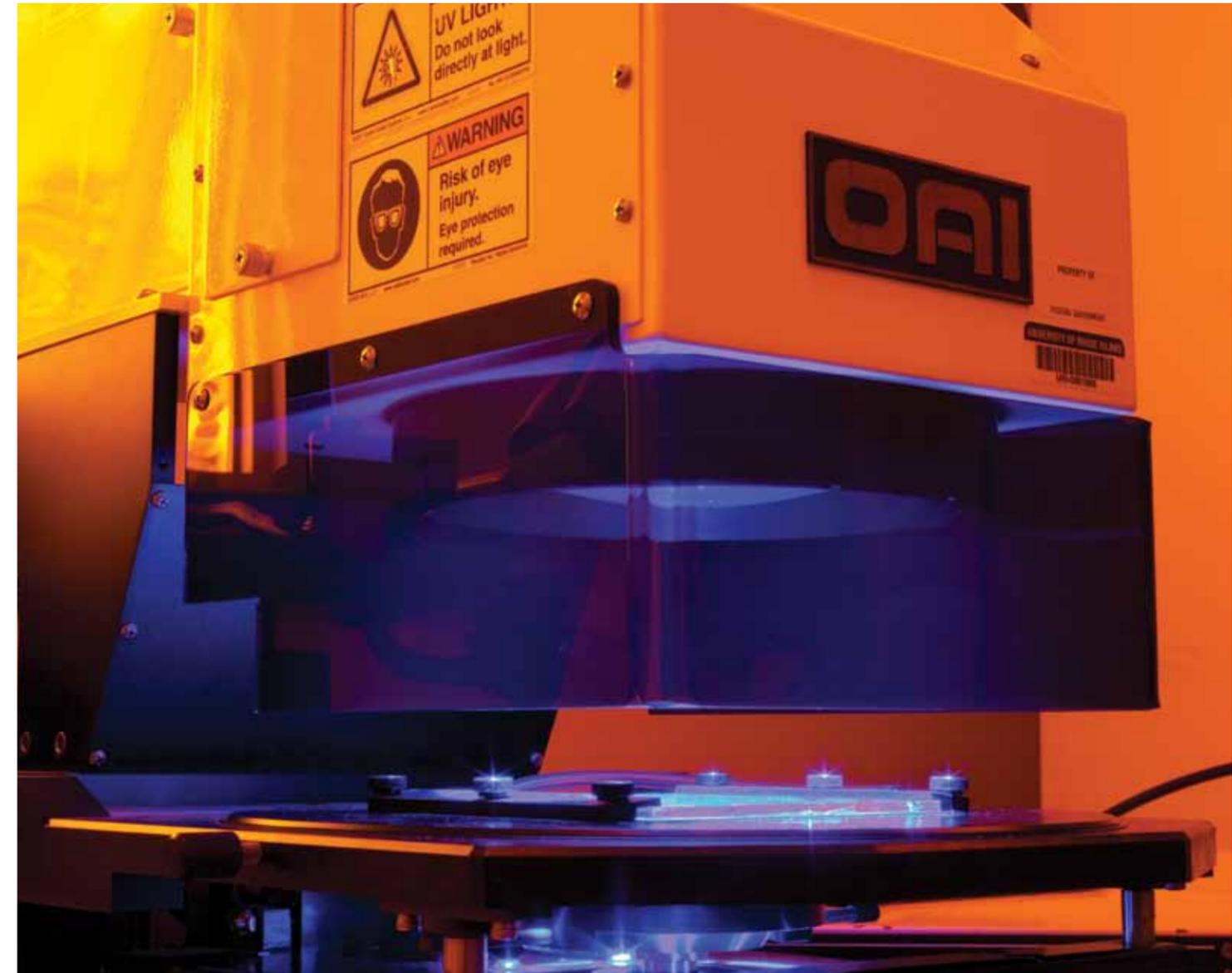
McIntyre explains: “The desire to and the possibility of controlling the material conditions of your existence is what people in all of these places are looking for.”



The combination of his lab at URI and the University's explosives expertise make the institution an ideal place for Gregory to conduct his research. He credits the labs and test range as a unique facility that allows URI to use real explosives in the place of the stimulants many other research facilities use. It sets URI apart.

GREGORY'S EXPLOSIVE SENSING "DOG"

written by **ALLISON FARRELLY '16**



It was an ordinary Tuesday in class for Otto Gregory, a distinguished chemical engineering professor at the University of Rhode Island (URI), when a sophomore in his engineering lecture raised her hand.

"Professor," Gregory remembers the student saying, "I know you don't like us using our cell phones in class, but one of my friends just texted me and said a story about you is trending number one in the world."

"I said, 'I don't know what trending is, so you have to tell me,'" Gregory responded.

As a professor accustomed to long days spent in the lab, Gregory says he was not prepared for a sudden

global interest in the technology he was developing - a sensor system that detects explosives commonly used by terrorists.

Gregory's "dog nose" sensor works the same way bomb-sniffing dogs detect explosives. The sensor system detects trace particles of explosives in the surrounding air by "sniffing" them.

Gregory's explosive sensors are designed to detect a

Pictured page 16 & 17: mask aligner and exposure device, used for photolithography.

Gregory's "dog nose" sensor works the same way bomb-sniffing dogs detect explosives. The sensor system detects trace particles of explosives in the surrounding air by "sniffing" them.

Otto Gregory
professor of chemical
engineering

specific and topical one - triacetone triperoxide (TATP). TATP has been used globally by terrorist organizations in highly publicized attacks like the 2016 Brussels Airport bombings, the 2015 Paris bombings, the 2005 London transportation bombing and the 2001 shoe bomber. TATP is widely used by terrorists due to the fact that the explosive can be made out of materials purchased from a convenience store.

"When you go into a hardware store or pharmacy, you're way under the radar," Gregory explains. "No one is looking at you thinking you're going to make a bomb out of anything from here."

Gregory's sensors work to find these bombs more effectively by drawing air across sensors that detect molecules of TATP. Currently, Gregory estimates the sensors detect particles 8 feet to 10 feet away if placed in an area with restricted volumes of airspace, such as an airport jetway.

Currently, the sensor system is laid out across a bench in Gregory's lab, but his undergraduate, graduate and Ph.D. students are working to compact the device into something portable so they can test its applications outside the lab.

A benefit Gregory sees of his sensor system is that unlike a canine it will not need training, breaks or positive reinforcement to work at peak performance.

Contrary to common assumptions, Gregory says he did not seek this line of research out, rather, it came to him. Eight years ago, the U.S. Department of Homeland Security named URI a Center of Excellence for Explosives, and tasked the University with several high-risk, high-reward government research projects.

Initially, Gregory was noticed for his work developing sensors to detect chemicals like methane and chlorine that were not explosives but posed other dangers. The combination of his lab at URI and the University's explosives expertise make the institution an ideal place for Gregory to conduct his research. He credits the labs and test range as a unique facility that allows URI to use real explosives in the place of the stimulants many other research facilities use. It sets URI apart.

"It's very cool," Gregory says. "We happened to have the right infrastructure to do this research."

Gregory says he hopes in the coming years to develop a portable system of detecting chemicals that can detect trace amounts of TATP in the air at parts per trillion.

Currently, the detection level of his sensor is at parts per billion. Since the project launch in 2007, Gregory has seen not only immense interest from the public, but from students within the University. While he once saw students come to URI to study the chemical makeup of explosives, now Gregory sees them enroll at the University with an interest in detecting these chemicals. According to Gregory, detecting explosives is quickly becoming a business.

"There are students who want to learn and be a part of the solution, not the problem," Gregory says. "I get requests all the time from students wanting to come and work in this area that could help people."



Breaking Barriers to Cure Diseases

written by COLIN HOWARTH '16

“The goal is to provide more effective treatments.”

- Samantha Meenach



Vials containing dry powder aerosol therapeutics.

One of the greatest challenges in treating cancer is penetrating tumors with medicine. Scientists are able to deliver medicine to the parameter of the tumor, but often fail to cross the tumor's membrane because of its highly pressurized nature.

As an assistant professor in two University of Rhode Island (URI) departments chemical engineering, and

biomedical and pharmaceutical sciences, Samantha Meenach is trying to change the way medicine breaks through these physiological barriers.

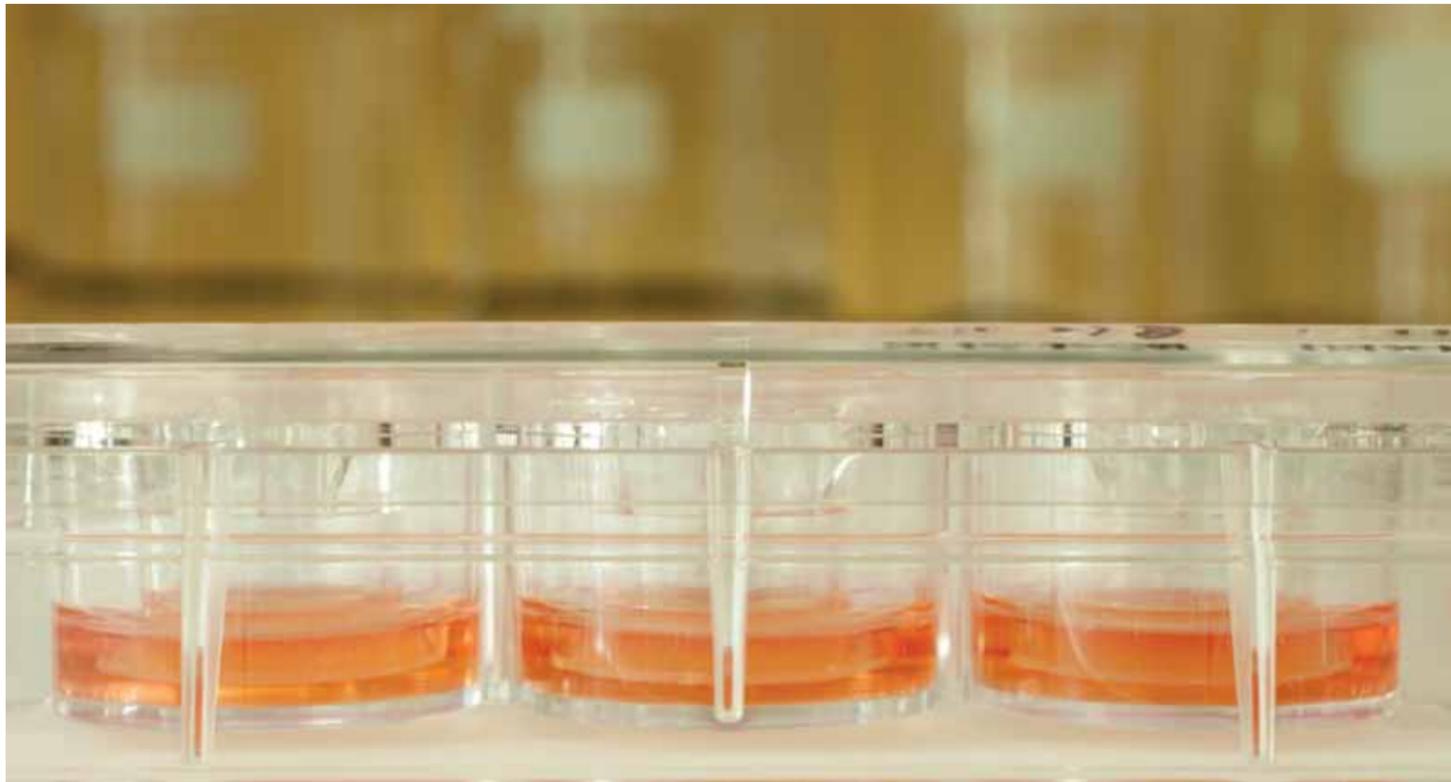
Meenach and her team, which includes 12 undergraduate students, three graduate students, and a post-doc, are looking at three different types of barriers – tumors, mucus and the lungs. Other research groups

have also focused on penetrating physiological barriers, but what separates Meenach's team from the rest is her use of an aerosol application, or an inhaler, to deliver medicines directly to the lungs.

Her team uses either nanoparticles or microparticles, that combine a polymer and a drug, to provide a controlled delivery of drugs. The particles in the form of

dry powders are placed in capsules. The inhaler breaks the capsule and the particles are breathed in by the patient.

“The goal is to provide more effective treatments,” Meenach said. “Scientists in general are getting smarter at developing better particle systems for delivering drugs. But what we've seen, I think in the last five, six



A well plate containing tumor cells.

years, is that they can get in the bloodstream but they're still getting stuck in undesirable locations. So there's still a huge barrier that people need to overcome."

As research has become even more multidisciplinary Meenach's background in engineering allows her to look at the problem from a different angle. Engineers have become more involved in medicine and the delivery process in the last 20 years, she says.

"Engineers have always been involved in the pharmaceutical industry," Meenach says. "Originally, engineers were designing reactors to make drugs. Now, engineers are designing both the drugs and the reactors.

"I think as engineers, we're particularly attuned to designing systems that can overcome these barriers. A lot of people have to attack these problems from different angles," she says.



Capsules containing dry powder therapeutics that go in an inhaler.

Meenach explains that cell penetration is especially important because if successful scientists can deliver medicine to the lungs, which will take it through the bloodstream to the body.

Her team designs the particles themselves. To test the particles, the team either creates or uses existing technology that simulates the physiological barriers.

For tumor penetration, her team grows mini tumors in the lab and puts the particles on the tumors to see if the penetration is successful. To test if particles can penetrate through epithelial cells, cells that form the surface on the inside of lungs, researchers use a piece of equipment called the Next Generation Impactor. Essentially, it acts like a model lung. It tells Meenach's team where the particles would deposit in the lung. For mucus penetration, the team creates model mucus to see how the particles react with it.

Meenach's team focuses on the idea stage to demonstrate the potential of these systems to deliver therapeutics. The team is working with collaborators to take the ideas to the next stage.

"I feel like my job as an engineer is in idea production," she says. "We're also working with the VA Medical Center in Providence, Rhode Island because they have the potential to bring this research to the next phase of testing, which we hope will ultimately save lives."



Samantha Meenach
(center)

assistant professor of
chemical engineering,
and biomedical and
pharmaceutical sciences
with Meenach: Zimeng Wang,
chemical engineering Ph.D.
candidate and postdoctoral
Sweta Gupta



Complexity

Merging with Simplicity

written by **EMMA GAUTHIER '18**

Engineers are known for intricate details; their designs tend to involve a multitude of moving parts that are responsible for technological advances in all areas of daily life. But, while elaborate inventions improve our quality of life, Stephen Kennedy, assistant professor of biomedical and chemical engineering at the University of Rhode Island (URI), knows that complexity isn't always the answer, especially at the juncture where engineering and biology merge.

In his lab, Kennedy takes basic electromagnetic principles and applies them to create responsive hydrogels that doctors can surgically or hypodermically implant inside the human body.

Using different kinds of stimulation, including electric, magnetic and ultrasonic fields, these gels can release therapeutic payloads at different rates and times. These gels can contain more than one type of medication at a time. The hydrogels can be targeted, and then release their payloads depending on what, when, where and how the body needs treatment to fight injury and disease.

This method is particularly useful for cancer treatments and tissue regeneration, and is far less complicated than it seems.

"It has important applications, but inherently it's a very simple thing, a sponge that you can squish with a hand-held magnet, for instance," Kennedy says. "As engineers, we want to make things intricate and complicated and cool, but simplicity is sometimes best. When you put something in an animal or person, it has to actually be pretty simple; the more parts it's going to have, the less likely it is to actually work. Biology is complicated enough."

Explaining a potential use, Kennedy says that after a physician removes a tumor from a body, he or she would implant the gel in the tumor's former location — all in the same procedure — to locally deliver therapeutics to prevent tumor resurgence.

The gel is made from biomaterials formed by hydrophilic polymers, one of which is alginate, a product made from algae. Because the gel uses naturally derived molecules in its structure, the body won't reject it when it's implanted.

"It's an awesome material," Kennedy says.

Working with tissue regeneration involves a similar process. For instance, if a person has a large bone defect, the body won't regenerate bone on its own. Kennedy explains that when the defect is too big, doctors can use a strategy that places a material in the defect to act as a scaffold, upon which new bone may grow. Typically, biomaterials can be used as this kind of scaffolding to build upon. The cells that are recruited to rebuild the bone are not always bone cells, but are most likely stem cells that can later become bone cells.

"Once the cells arrive at the site, they need to be told what to do when they get there," Kennedy explains. "Using these gels, doctors can release different drugs at different time points to direct a sequence of regenerative events. This begins by getting stem cells to quickly repopulate that scaffold, which can be achieved by initially delivering drugs that recruit those stem cells."

After the initial delivery, those cells still need to grow. With the addition of subsequent deliveries, those cells can be directed to rapidly multiply and mature into healthy bone cells.

Kennedy notes that he and his lab team of five graduate and 12 undergraduate students are working to answer questions such as, "What do you deliver at what time points, and how much?" A key facet of the gel lies in its capability to release different drugs at different times.

"We need to implement the material, then see what gives the best regenerative outcome," Kennedy says. "Our systems afford that capability."

During cancer treatment, after delivering the first round of chemotherapy, Kennedy explains, many cancer cells can become resistant. A second dose of medication in the gel can be remotely administered at a later time to eradicate any of the remaining cancer cells without requiring a second surgery or injection.



Pictured left to right: URI chemical engineering Ph.D. students Tania Emi, Seyedeh Zahra Moafi, and biomedical and chemical engineering Assistant Professor Stephen Kennedy.

In both procedures, once the gel is inside the body, physicians can stimulate the gel using magnets, ultrasounds, or even light sources. When the gels are stimulated at different frequencies, they vibrate at different rates. The faster the gel vibrates – the more efficient drug releases, providing a means to externally regulate drug delivery doses. Different medical scenarios can call for different drug release regimens, according to Kennedy.

This overall delivery method enhances cancer cell destruction because the gel’s targeted release provides tight control over drug concentrations right at the tumor site. In turn, the method minimizes side effects and saves the surrounding non-cancerous tissue. Because the drug deliveries are localized at the tumor site, doctors would be able to flexibly control the dose and period of time in which the drug is administered.

“In many therapies, constant chemotherapeutic concentrations over time are not necessarily optimal,” says Kennedy. “When you change the concentration over time, that kills the tumor much faster, and keeps it from growing back.”

These are only two of the projects currently under investigation in Kennedy’s lab, where he broadly applies his expertise at the intersection of materials science, electromagnetics and biology.

“We are also adapting these stimuli-responsive gels to direct sequences of biological events critical in regenerating vascular tissues, programming the body’s immune system to attack tumors, and for managing the inflammatory response in wound-healing applications,” Kennedy says. “In other areas we are developing specialized materials for electrically interfacing with neural tissues, as well as electrically endowing

orthopedic implant materials with properties that help facilitate their integration with existing bone.”

In the future, he sees these stimuli-responsive gels as a cost-effective, outpatient procedure. He anticipates that it will be easier for physicians to adjust drug quantities being administered as needed.

In some circumstances, patients themselves could just use a handheld magnet.

“You need to be able to flexibly control when these events happen and our materials allow that,” Kennedy says. “Part of the power of this lies within its simplicity. You don’t need a trained person to wield a magnet.”

In working in seemingly different scientific fields, Kennedy reminds his students that any one of these fields is inextricably linked to the others. He attributes his varying interests that led him to this point in his career, and being able to merge a background in electromagnetics, materials science with cellular and molecular biology, and stem cell technology. Kennedy uses his experiences to offer advice to his students:

“In medicine, technology and biology can’t exist without the other. What good are these technological materials that we are developing if we can’t demonstrate their medical and biological utility? The same could be said about medical approaches — medical advances must be driven by technology. Your ability to innovate is limited if you are stuck in a single trajectory. When you jump from one field to another, you’re not changing your original background, rather, you are adding to it. These additions diversify your background and inherently put you in a position to innovate.”



“Using these gels, doctors can release different drugs at different time points to direct a sequence of regenerative events.”

- Stephen Kennedy



Stephen Kennedy
assistant professor of
biomedical & chemical
engineering



ANTI-SMOKING VACCINE

MAY LEAD TO DISEASE TREATMENTS

Xinyuan "Shawn" Chen
assistant professor
of biomedical and
pharmaceutical sciences

written by **EMMA GAUTHIER '18**

“The advantage of the laser-based powder delivery is that it is painless, needle free and can sustain drug or vaccine release over time, which is promising to reduce dosing frequency of drugs and systemic side effects of vaccines.”

- Xinyuan “Shawn” Chen

In a not-so-far-off future, liquid drugs and hypodermic needles could be obsolete. Xinyuan “Shawn” Chen, assistant professor of biomedical and pharmaceutical sciences at the University of Rhode Island (URI), is developing technology to administer drug therapies through the skin using powdered medication and a microscopic laser.

The bulk of Chen’s research focuses on an alternative cessation method for the millions of people who are trying to quit smoking. Chen notes that less than 10 percent of people trying to quit fully kick the habit. With the help of his laser-based powder delivery system, Chen is working to improve nicotine vaccine efficacy to help people put down cigarettes for good.

“The nicotine vaccine is an emerging promising therapy to treat nicotine addiction,” Chen says.

Typically, medication-based therapy blocks nicotine binding to its receptors inside the brain, whereas Chen’s nicotine vaccine stimulates anti-nicotine antibodies to prevent nicotine entry into the brain.

“There are several clinical trials proving that if a high anti-nicotine antibody titer develops in patients, those patients tend to have a higher abstinence rate as compared to a placebo,” he says. “However, only 30

percent of smokers were able to develop such a high anti-nicotine antibody titer.”

An obstacle Chen had to overcome is how to boost anti-nicotine antibody production. A common approach is to incorporate vaccine adjuvants and further deliver them into the highly immunogenic skin tissue. Yet, injecting vaccine/adjuvants often induces significant skin reactions, as exemplified by skin injection of the tuberculosis bacille Calmette-Guerin (BCG) vaccine. This is where Chen’s microscopic laser comes in.

He uses a non-traditional patch to administer adjuvant-admixed vaccine with the help of the microscopic laser. It’s a two-step process. First, the focused high-energy laser makes small incisions to form microchannels in the skin surface. Then a patch the size of a dime coated with vaccine powder is topically applied onto laser-treated skin. Within hours, the vaccine dissolves into the skin through the microchannel.

“When comparing hypodermic needle-based skin injection to the laser and patch procedure, the advantages are clear,” Chen says.

Injection of entire vaccine doses into a single spot can cause side effects, such as red and swollen skin. This does not occur when utilizing skin microchannels. Instead of one injection site, the laser creates hundreds of tiny channels to allow vaccines to pass through. This way the body can minimize reactions to vaccines, and heal the microchannels more rapidly than a needle injection.

The concept of using a nicotine vaccine for smoking cessation has existed for 20 to 30 years, but Chen is the

“The nicotine vaccine is an emerging promising therapy to treat nicotine addiction.”

- Xinyuan “Shawn” Chen



Chen uses a non-traditional patch to administer adjuvant-admixed vaccine with the help of a microscopic laser.

first to combine it with a novel transdermal delivery to improve efficacy. In his lab on URI's Kingston Campus, he is developing this research with one postdoc, two doctoral and two undergraduate students.

Chen's research is not limited to anti-smoking vaccines. His methods can be utilized for other vaccines or medications for disease treatment.

The thought of laser incisions may sound daunting to some people. But because the microchannel is less than 100 micrometers in diameter and 200 micrometers in depth, Chen says the procedure is mostly painless for human use. Chen's lasers are the same as used in clinics for procedures such as wrinkle removal, except a low-laser energy is used for vaccine and drug delivery purposes.

“The advantage of the laser-based powder delivery is that it is painless, needle free and can sustain drug or vaccine release over time, which is promising to reduce dosing frequency of drugs and systemic side effects of vaccines,” Chen says.

Additionally, the powder form is more convenient than the traditional liquid form. Powdered medications tend to have a longer shelf life, smaller packaging size, and eliminate human errors during reconstitution processes.

“When comparing hypodermic needle-based skin injection to the laser and patch procedure, the advantages are clear.”

- Xinyuan “Shawn” Chen





PREVENTING OBESITY

through Community Based Involvement

written by **ALEX KAHN**

Alison Tovar
assistant professor
of nutrition and
food sciences

Before joining the University of Rhode Island's (URI) Department of Nutrition and Food Sciences, Assistant Professor Alison Tovar already was part of the world of food. Born and raised in Colombia, South America, the cultural framework in which she found herself growing up cultivated an understanding of the importance of food in everyday life.

Tovar's current research is understanding the possible risk factors for obesity early in life to inform community based interventions to prevent obesity, particularly among Hispanic populations. She brings her past experience to her academic research and through her community-engaged research deploys her knowledge and warm memories of a culture that she left when coming to the United States.

As a young adult at a university in South America, Tovar decided to leave her home in Colombia to finish the last semester of her undergraduate studies at Northeastern University.

After graduating with a degree in psychology she decided to stay in the Boston-area. Already a patient at Joslin Diabetes Center for her Type 1 diabetes, Tovar did what many unemployed graduates do. She networked for career opportunities – particularly through her doctor – which paid off.

Tovar found that her job at Joslin clarified her direction in life. There she found herself working with children, many of whom shared her diagnosis of Type 1 diabetes, a chronic condition for the remainder of their lives.

"There was a moment of 'this is ridiculous'," says Tovar. "These kids had to live with a chronic disease for their entire life, and it's not their fault."

Propelled by both the passion she found at Joslin and an itch to delve into research, Tovar pursued both her master's and doctoral degrees at Tufts University.

Like the moments before in her life that had led her

"There was a moment of 'this is ridiculous', these kids had to live with a chronic disease for their entire life, and it's not their fault."

- Alison Tovar

to Tufts, the seemingly innocuous became the most profound as she pursued her graduate degrees.

First came the decision to take a step into nutritional biochemistry as a means to round out her knowledge by sharpening her mind on the physiological implications of food. Yet, while this course may have supplied a scientific backbone, it proved far too removed from the patients and families she had worked with, and therefore, far too detached from her heart.

Then came the lab work, it's an overall experience that can best be told by Tovar herself: "I hated it; hated it."

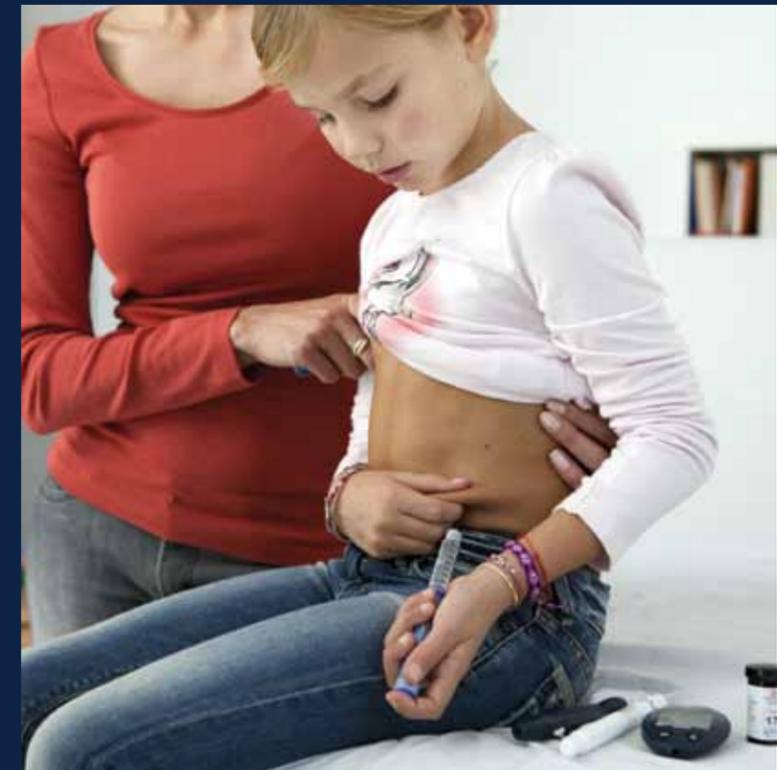
"You can think that your career can be very straight forward, but it's not," says Tovar of the winding road that led to her Ph.D. from Tufts and her current research.

Following her Ph.D., she remained at Tufts, working with immigrants from Latin America, Brazil and Haiti through a grant provided by the National Institutes of Health to the institution. Based once again in the community, Tovar was able to continue her research by not only observing individuals but actively linking her research to their lives.

"As researchers, we sometimes get busy but I feel that it's important to communicate and disseminate any results that we may have with our participants," says Tovar. "They are the research, and we should respect and value what they have to say."

Yet as her work progressed, so too did her life, and soon enough, Tovar found herself at a crossroads professionally and was ready to move forward and begin a faculty position. URI was a perfect fit for her community based research.

Arriving in the fall of 2012, Tovar has continued her research into obesity risk factors among ethnically diverse populations, while breathing more life into URI's educational resources. Mixing lectures with participatory activities, and guest lecturers, Tovar says she hopes she both engages students on



issues and the opportunities presented in public health, and connecting the issues of nutrition directly to her students' lives.

"I see the sparks go off when they are really engaged," Tovar explains, "Having debates is amazing because they are really involved and care about an issue."

Presently, with three doctoral candidates, and three master's students, Tovar has been able to extend her research, including working with the University of North Carolina to delve into the feeding practices of childcare providers and collaborating with Brown University on an intervention to improve the eating and physical activity environments of family child care homes.

Nooreem Mena, a third-year Ph.D. student working under Tovar, says she finds Tovar as a mentor who communicates openly, and encourages her academically and professionally. She provided the push for Mena to apply and receive, a National Institutes of Health grant funding the completion of her doctoral studies.

"She helped set me on my path, it's as if the universe sent her," says Mena.

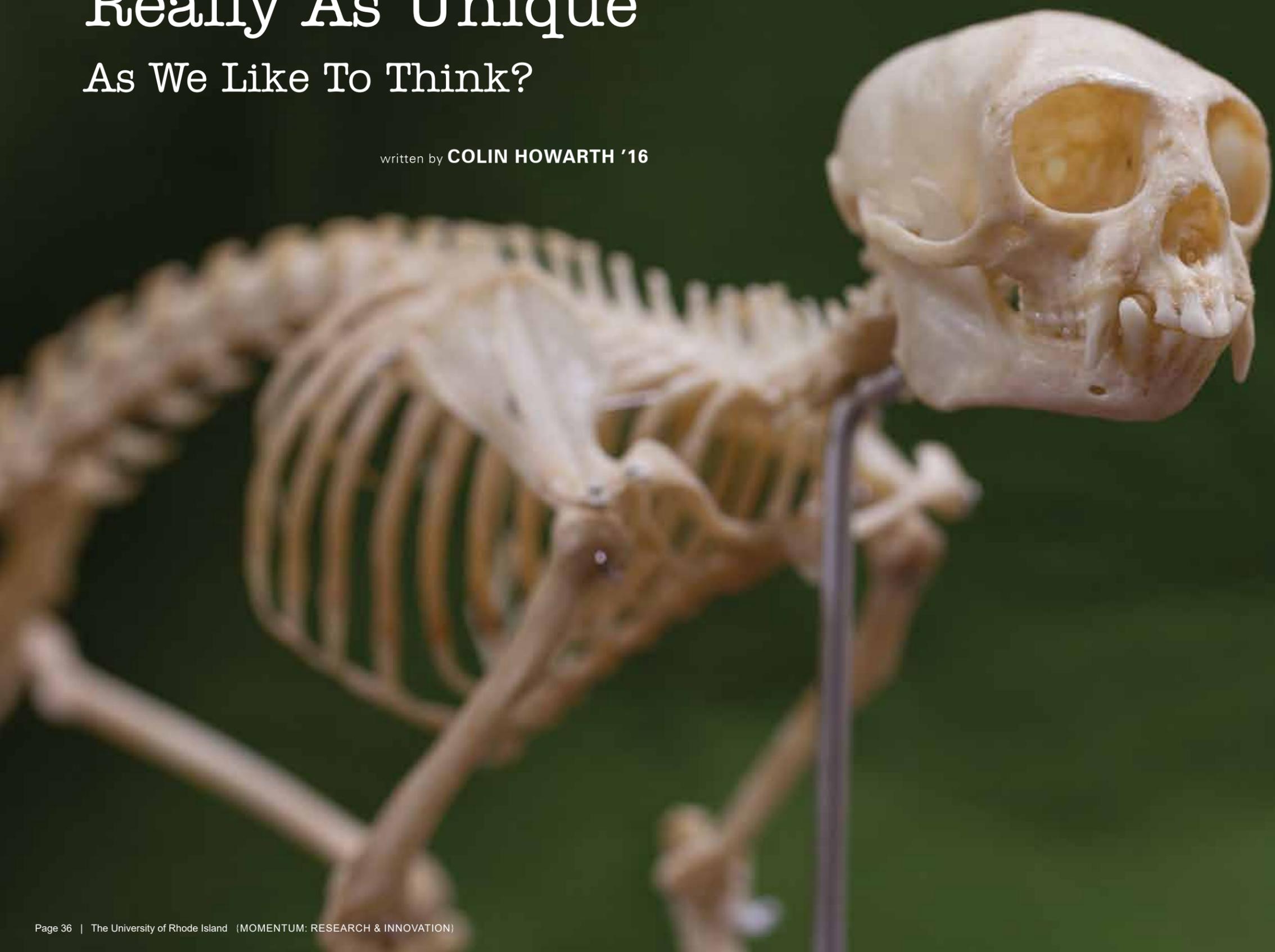
For Tovar, it is about balance and impact.

"I think ideally, I want to be able to prevent obesity as early as possible," says Tovar. She holds just one caveat, "I just think that it is so important to enjoy what you are doing, and I wouldn't be doing this if I didn't."



Are Humans Really As Unique As We Like To Think?

written by **COLIN HOWARTH '16**



Researchers and scientists like to point to our complex birth process – more specifically, the role of the pelvis bone during birth – as a factor of human uniqueness.

However, research being conducted by University of Rhode Island (URI) anthropology Associate Professor Holly Dunsworth questions whether our bony birth canal does, in fact, differentiate us from the rest of the animal kingdom.

“People are still arguing that the pelvis is why we are born when we are born,” says Dunsworth. “They want it to be a uniquely human story to explain what appears to be our uniquely human helplessness as infants: we’re born early, the thinking goes. I don’t want to take away from how wonderful humans are, but at the same time I want to know how things happen and why they are the way they are. If one hypothesis is weak, I don’t want to work under that hypothesis.”

Dunsworth and her team hypothesize that it’s not the pelvis bone that dictates when and why humans are born, but rather our energy use and metabolism.

According to Dunsworth, a woman’s metabolic rate will ramp up during pregnancy because the fetus demands more from the mother. As the fetal energy demands grow, the mother’s energy use - the energy it takes to bring a fetus to term - increases too. Around nine to 10 months, the mother hits her theoretical max of sustainable metabolic rate and energy use, which Dunsworth believes dictates the average length of pregnancy for our species, rather than the size of the pelvis.

This type of data is available for people. However, it has not been widely studied on primates similar to humans. That’s where Dunsworth comes in.

“Prior hypothesis relied on pelvic morphology to explain pregnancy and childbirth, which is not irrelevant. However, I work with collaborators on energetic use in nonhuman primates and how they compare to humans when they’re not reproducing,” Dunsworth explains. “And now we’re researching when they are reproducing — when they are pregnant and lactating.”



Dunsworth and her team hypothesize that it's not the pelvis bone that dictates when and why humans are born, but rather our energy use and metabolism.

Dunsworth's career has focused around primates. In her office at URI, monkey figurines stand on the shelves. Her walls have pictures of primates, a Darwin quote and awards she has received for her research.

Her interest in the field began during her trips to western Kenya to search for fossil apes. She did this for about 10 years to help reconstruct the paleoenvironment where the apes were living, dying and evolving.

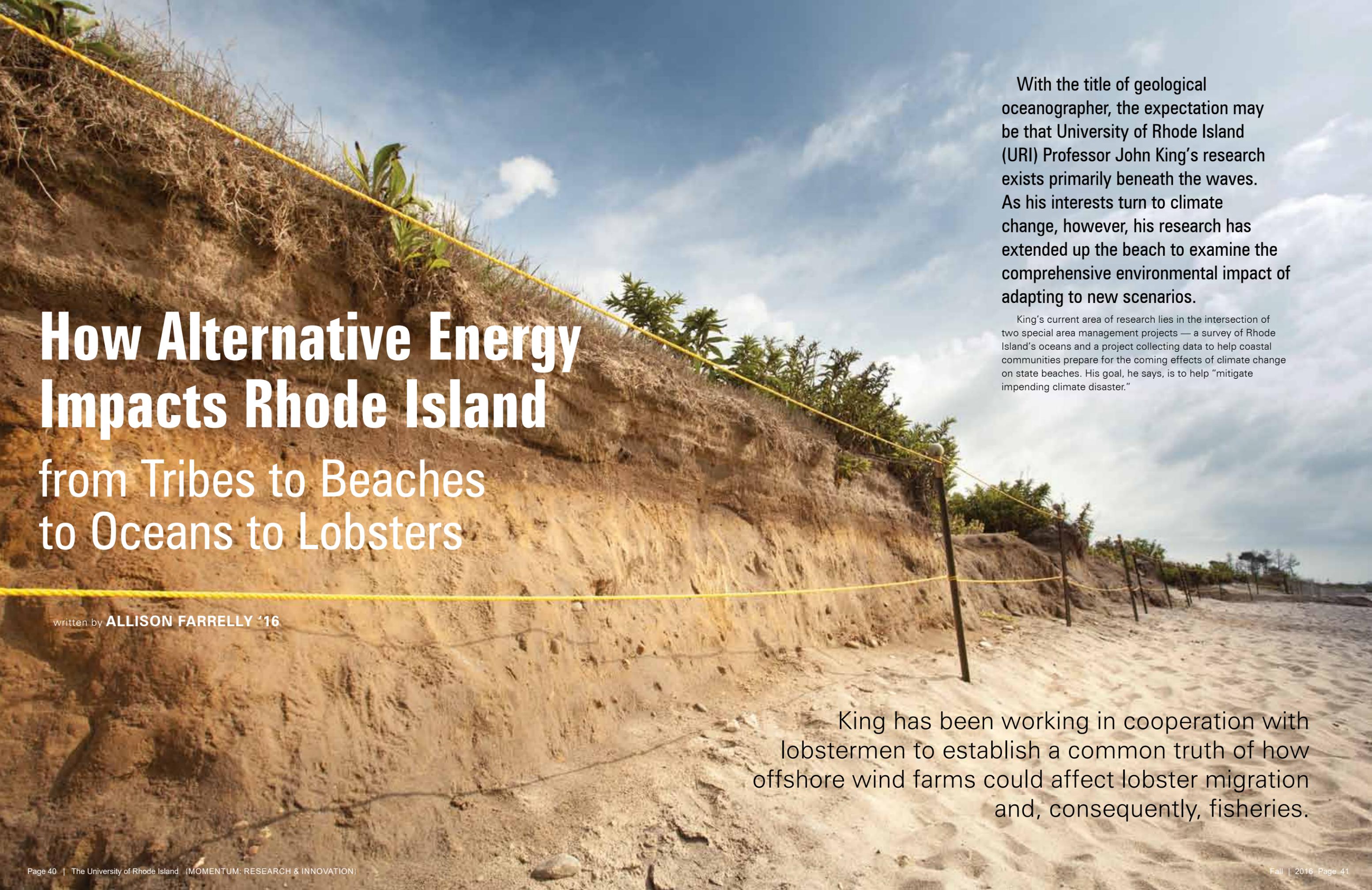
This work influenced the research she conducts now. Within the next year, Dunsworth's team will measure the energetic use of pregnant and lactating common marmoset monkeys at the Southwest National Primate Research Center in Texas.

"We're hypothesizing that it's the energetic and metabolic limits that are constraining gestation and pregnancy," Dunsworth says. "If that's the case, then it looks like humans are not unique in terms of when we give birth."

Dunsworth will finish up this study in the summer of 2017. Until then, she will continue teaching courses on human evolution and writing, whether for an anthropology blog, 'The Mermaid's Tale,' or freelance writing for scientific publications, such as her January article for Scientific American titled, "Do animals know where babies come from?"



Holly Dunsworth
associate professor of
anthropology



How Alternative Energy Impacts Rhode Island from Tribes to Beaches to Oceans to Lobsters

written by **ALLISON FARRELLY '16**

With the title of geological oceanographer, the expectation may be that University of Rhode Island (URI) Professor John King's research exists primarily beneath the waves. As his interests turn to climate change, however, his research has extended up the beach to examine the comprehensive environmental impact of adapting to new scenarios.

King's current area of research lies in the intersection of two special area management projects — a survey of Rhode Island's oceans and a project collecting data to help coastal communities prepare for the coming effects of climate change on state beaches. His goal, he says, is to help "mitigate impending climate disaster."

King has been working in cooperation with lobstermen to establish a common truth of how offshore wind farms could affect lobster migration and, consequently, fisheries.

King is working to measure the coastal erosion of eight different beaches in Rhode Island. By surveying the shoreline to create a profile, King and his team have been comparatively tracking the amount of sand on the beaches. The monitoring program was launched in 1963, and is the longest in the world.



King is not just researching the local effects of climate change. He also is working both to understand the environmental repercussions of offshore alternative energy and to establish connections with stakeholders in areas affected by the development of an alternative energy source such as offshore wind farms. By researching how climate change and alternative energy will affect local organisms and human stakeholders, King says he aims to promote research-driven, environmentally conscientious alternative energy development.

“It’s all about preventing the unintended consequences,” he explains.

The Rhode Island Shoreline Change Special Area Management Plan (Beach SAMP) and the Rhode Island Ocean Special Area Management Plan (Ocean SAMP) are separate entities. Beach SAMP was launched as an effort to quantify the effects global warming will have on Rhode Island shores by studying an area of the coast; Ocean SAMP was initiated parallel to the Block Island Offshore Wind Farm to engage stakeholders and predict the effects of the project on the surrounding ocean.

Though there are different funding, goals, and scientists involved in each project, when it comes to environmental research, King cannot see the two as separate: “You can’t really draw a line and say ‘OK here is the water side, this is the beach side,’ they are part of the same thing.”

Under the umbrella of Ocean SAMP, King has been working collaboratively with researchers from URI to develop three separate, but related projects. The first involves a distribution and population study to determine the effects the wind farm could have on lobsters. According to King, no research was being done on lobster populations at the ocean level appropriate for constructing wind farms.

“People were researching lobsters offshore and close to shore, and the only people that had knowledge about this area were the lobstermen,” King says. “And scientists and lobstermen don’t always agree on what the truth is.”

He has been working to bridge this gap by gathering data on lobster behavior in this middle ground in cooperation with lobstermen to establish a common truth of how offshore wind farms could affect lobster migration and, consequently, fisheries.

“We’re getting answers on where there seem to be lobster migration routes and, therefore, where to stay away from when building wind turbines,” King says.

Another stakeholder in the coastal shelf where developers are looking to house wind farms is Native American tribes. According to King, other states that did not include this collaboration caused projects to be halted and agreements cancelled. King set out to develop best practices for interacting with tribes.

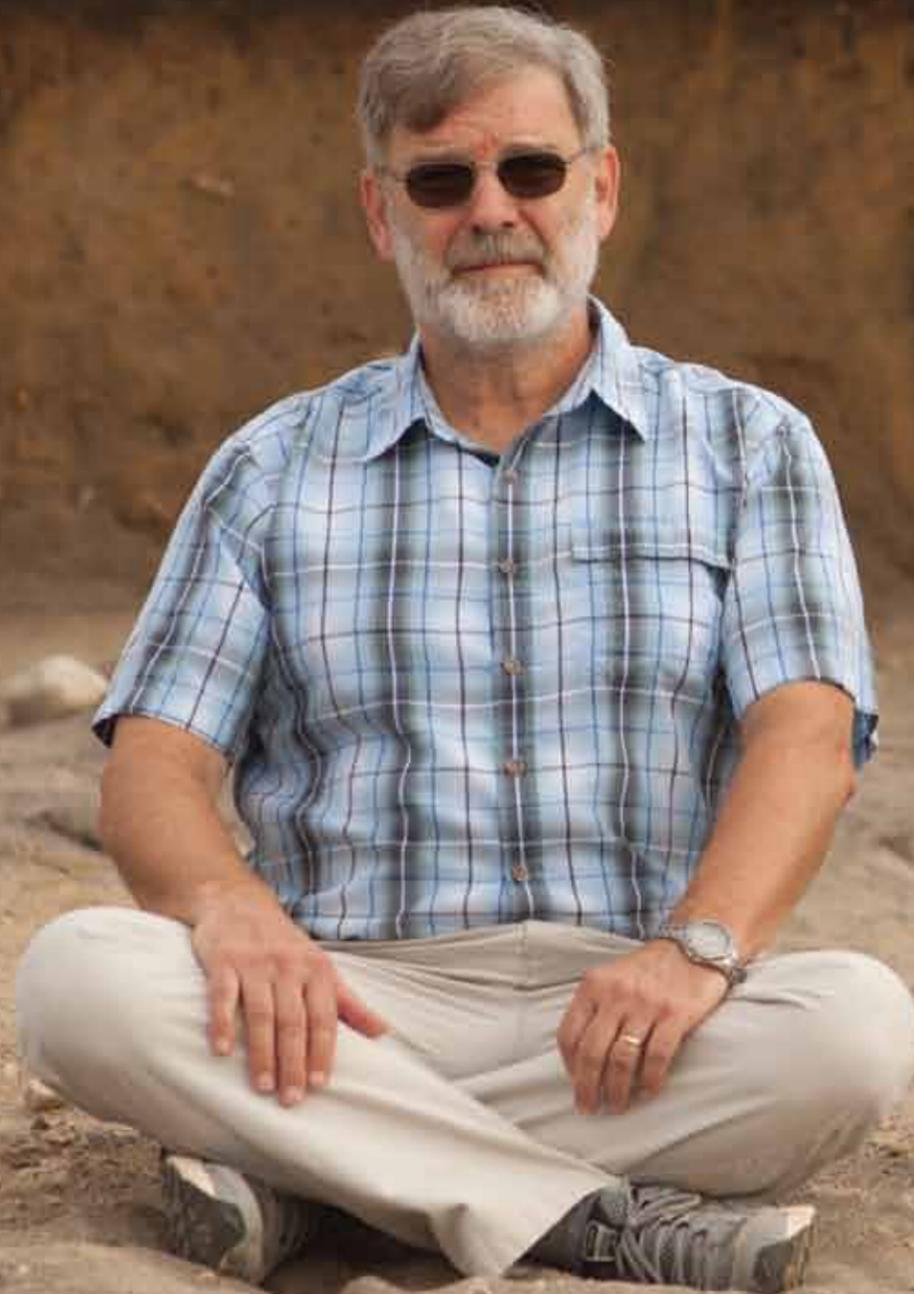
He and his team conducted a non-disruptive survey of coastal shelf areas that were once dry land occupied by the ancestors of the Narragansett and Wampanoag Indian tribes to determine where turbines could be installed without impacting now submerged sites that were of cultural importance. By engaging the tribes in research-backed communication with regulatory agencies and energy development companies, King says he hopes to create a partnership model that promotes conscientious development.

King’s third project in this field studies the effects the cables that transport energy from offshore wind farms to land will have on ocean organisms. The cables generate magnetic and electrical fields, and King’s research is slated to determine how these fields could affect organisms and fisheries.

“The thing about climate change is we know it is going to be bad, we just don’t know how bad.”

- John King

King and his team are studying whether the cables have any effects on the behavior of marine organisms, and whether the effects are large enough to have a potential impact on well-being.



“Sharks, or skates seem to be attracted to the power cables,” King says. “They sense the fields, and no one knows exactly why they are attracted to them.” Lobsters will also be studied to see if they are sensitive to these fields and therefore potentially impacted by power cables.

King and colleagues helped develop an underwater acoustic telemetry system that can sense their behavior. He and his team are studying whether the cables have any effects on the behavior of marine organisms, and whether the effects are large enough to have a potential impact on well being. Using a power cable off the shore of New Haven, Connecticut that feeds energy to New York City as a test site, King is setting up enclosures to study organism behavior.

There is a lot of interest in the pending results of this research. Google has proposed the creation of a large cable that could connect a series of wind farms off the eastern shores of America. The impacts of King’s research are important in this area.

On land, King is working to measure the coastal erosion of eight different beaches in Rhode Island. By surveying the shoreline to create a profile, King and his team have been comparatively tracking the amount of sand on the beaches. The monitoring program was

launched in 1963, and is the longest in the world, but King is working to modernize it. He now can get accurate readings of coastal erosion up to the centimeter using a Light Detection and Ranging (LiDAR) detection system, which consists of laser beams that bounce off objects and generate comprehensive images of coastal changes.

With research that extends into such a multitude of fields, King says he depends on the knowledge of his team of students and co-researchers. Above all, he stresses the collaborative nature of his work, describing science today as a team sport.

King worries, however, that not enough people are paying attention: “The thing about climate change is we know it is going to be bad, we just don’t know how bad.”

One of the key questions, notes King, is how much time is left to do something?

“People often do the math and think, ‘I’ll be dead then, why should I care?’” he says. “Well, I’ll probably be dead then too, but I still care because I have children and students that won’t be.”



John King
professor of geological
oceanography

HIS KEY TO LIFE:
COMMUNICATING THROUGH

Music

written by **BRANDON MAXWELL '16**

Manabu Takasawa, professor of music at the University of Rhode Island (URI), has spent his entire life communicating with the world in the best way he knows how – through music, specifically the 88 keys of a piano.

As a young boy growing up in Japan, Takasawa's love for music began with a toy piano his parents gave him. He brought the little piano with him everywhere he went.

Takasawa says his parents never put any pressure on him to play, and they never thought it would be a practical career choice. He practiced for as long as he chose to without the worry or guilt of not playing — a relaxed approach that made him enjoy the piano even more in the long run.

"The way I was trained was not really forced because I wanted to play the piano and I liked getting better at it," Takasawa says. "I didn't consciously think I was talented or

anything. I just did what I liked."

At 17 Takasawa made one of the biggest decisions of his life, he moved to Palmer, Alaska, to attend high school while living with a host family. After spending two years there he attended Whitman College, a small private liberal arts school in Walla Walla, Washington. As an undeclared freshman, he took courses mainly revolving around math and science to plan for a job in the medical field while continuing to hone his piano skills. He declared music as his major at the end of the year.

As one of the few pianists at his college, he gained attention and opportunities he would not have been able to take advantage of at a larger school with more students. Takasawa recalls his first recital as a freshman:

"It was an unforgettable experience. I was nervous for a whole month before the event, because I needed to



“As soon as I sat down at the piano, everybody came to listen. I think that saved me. The piano, for me, is the best communicator.”

- Manabu Takasawa

Manabu Takasawa
professor of music

memorize almost one hour’s worth of music and present it in front of an audience. It was an incredible amount of work, but at the same time, when you’re preparing for something really difficult and you achieve your goals, the feeling you get from that is just indescribable.

“While I was on stage I felt a sense of enlightenment. I was certain that this was what I wanted to do, and that was the precise moment when I decided to go into music,” he says.

He adds that one of his favorite things about playing the piano is that he can do so without the help of any outside force or advanced technology. The notes you play are the notes you hear.

Takasawa says that many of the habits he formed in his youth have stayed with him throughout his life. When he first started taking piano seriously as a career, he would look at his instructors and assume they would never have to practice once they achieved their level of success. Now that he is on the teaching side, he tries to play in front of students as much as possible to show them that he still has a lot to learn and must always practice to get better.

The bulk of Takasawa’s time today revolves around working one-on-one with students, teaching courses, advising, and practicing for the concerts he is scheduled to perform. Every year on Mother’s Day, for example, he plays a recital at St. Matthew’s Episcopal Church in Jamestown, Rhode Island, a tradition he has done for 10 years. Also Since 2003, he has directed an annual piano festival on campus — Piano Extravaganza! — held every

spring, which serves as an outreach activity to promote music and give students an opportunity to perform competitively and professionally.

Throughout the course of his career, Takasawa has played around the world and in front of many audiences. He cites one of his biggest accomplishments as playing a solo piano recital at the John F. Kennedy Center for the Performing Arts in Washington, D.C. in 1992 while still a doctoral student at the University of Maryland. The performance was one of the first experiences in which he had to plan every step of the concert by himself.

“Every time I play it feels like an amazing experience,” he says. “Sometimes it could be the location, sometimes it could be the setup, the piano, it could be a lot of different things, but just to be able to get in front of an audience that is actually there to listen

to me play for an hour or more — it’s such an honor to me and it’s a big responsibility.”

Since he began his career at URI in 2001, Takasawa has made it a point to showcase the importance of hard work and practice, as well as the marvels the piano possesses.

When he first came to the United States, Takasawa says playing the piano was one of the only ways he knew how to show who he was to the people around him.

“As soon as I sat down at the piano, everybody came to listen,” Takasawa recalls. “I think that saved me. The piano, for me, is the best communicator.”



Creative *Inspiration*

written by **BRANDON MAXWELL '16**



David T. Howard
professor of costume design



One of the best-kept secrets at University of Rhode Island (URI) can be found tucked away in the back of the Fine Arts Center, where fabrics and clothing from decades of theatrical productions fill rooms to capacity. David T. Howard, professor of costume design in the URI Theatre Department, breathes life into these rooms; his office an intriguing combination of drawings, jewelry, books, 18th century corsets and Greek Chitons.

"A mess," Howard says, describing his surroundings, "which gets worse during production week."

Howard has worked on more than 35 productions at URI. His most recent, this past spring's rendition of *Legally Blonde*, had 156 costumes, 114 pairs of shoes and 875 pieces of clothing created in a six-week period. Preparation for the show began about five months prior, when he dived into an enormous creative process months before the curtain went up on opening night.

"To my knowledge, the show had more clothes appear on stage than any other production in URI history," Howard says.

This September, Howard began work for his next URI production — *The School for Lies* by David Ives — that opens February 2017.

"Every production is somewhat similar in the steps to get to opening night," Howard explains. "Obviously, reading the play is incredibly important. Once I have a sense of character and situation, I need to start having conversations with the director, scenic designer, lighting and others."

Howard will research the historic period, learning about the clothing, politics, mood or movements of that time.

"Each production has its own research need, and rarely is just 'creative,'" Howard says. "It has a source — a jumping off point. It could be a painting that may have nothing visually to contribute, but might offer an emotional connection to the piece. I have to be very open at this time as anything might be interesting or useful: an intriguing color combination, a textile, the placement of some tile."

Howard sketches his ideas for the production team to communicate ideas as clearly as possible, without the expense of making things.

"It is a challenging time, but so incredibly important because next is acquiring pieces," says Howard.

Some pieces will need to be made, some purchased, or some pulled from the pre-existing stock of costumes. Fabric selection is one of his favorite pursuits because he finds so many possibilities. According to Howard, he is lucky to be near one of the best fabric stores, Lorraine Fabrics in Pawtucket, Rhode Island, which offers everything from silk to wool. He also travels to Boston or the famous Mood Fabrics in New York when searching



for the right material, chasing what he says are the most important elements — what the fabric is made of, what it feels like, and how it hangs when draped.

Once Howard acquires the materials, he turns to the stages of the building phase, taking measurements and creating costumes from scratch. A muslin or toile is an inexpensive material, which allows Howard and his students to cut, draw, and pin it to get it to the shape and style he wants. What playgoers see on the outside is only part of the process, according to Howard. The piece may need special under-fabrics such as interfacings, paddings, and bonings, linings, and finish trims. Some garments can be made of multiple fabrics laid on top of each other to get a certain quality.

"All the fabrics are prepared, cut and stitched," Howard says. "My students and I use many different processes for constructing. We do try to take a great deal of pride in our sewing. Machines are used mostly for main construction, but almost all finish work is done by hand.

"During the many fittings I encourage the actor to move in the costume, walk down the hall in it, with the proper shoes and undergarments. We make any changes that need to happen, and then we do all the finish work: final hems, trim, labeling. And then we do it all over again for the next garment. Whew!"

By the time a show opens, hundreds of hours have gone into these garments. And, after every performance, every item needs to be cleaned, ironed, mended, fixed, and ready for the next show. Wigs have to be cleaned and reset, shoes polished.

During the high pressure days leading up to a performance at URI, Howard and his team, can be found toiling away for more than eight hours a day to prepare. His team includes a full-time costume shop manager and a part-time stitcher, with students working alongside them for a few hours a day. When he loses himself

in his work or witnesses how passionate and excited students get about what they are creating — those are the moments, Howard says, when he truly believes that there is no better job. He adds that he also appreciates the responsibility working with students at such a pivotal age.

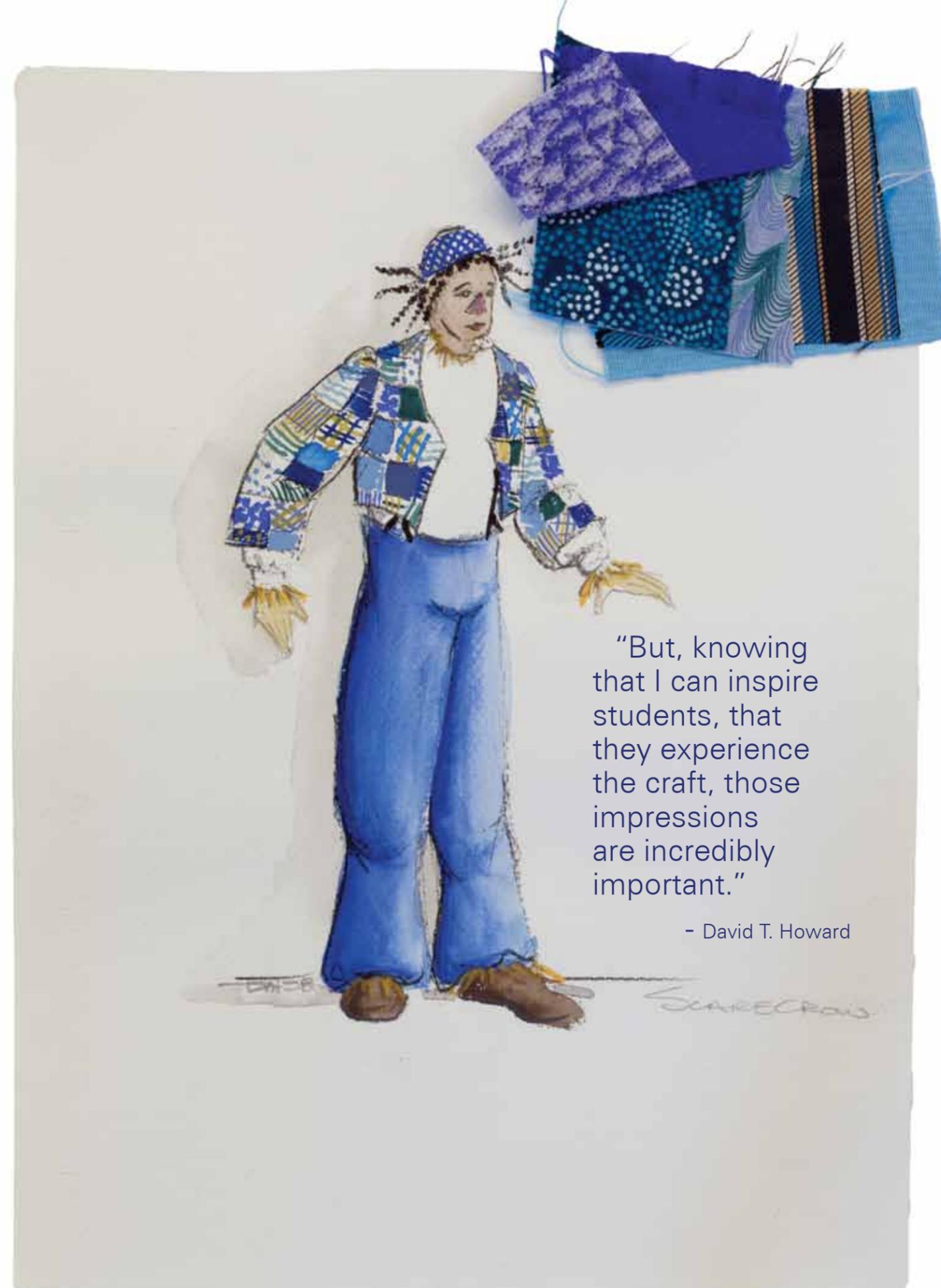
"I do try to engage them in thinking differently, to parse out the ordinary and find the unique," Howard says. "I try to listen to what they want and try to get them to see what they need. Encouragement is key. They can do anything, but not everything."

For Howard, the work doesn't end with the curtain call. He also faces hours of paperwork, emails and meetings. However, as a costume designer he also has a lasting, tangible legacy of clothes. And, the students are part of that legacy. Howard says that encouraging every student to define his or her own version of success is what he sees as his main purpose at URI.

"Sometimes this stuff isn't quite as important, the thread and the needles in the specificity of the day," he says, gesturing to the costume studio. "But, knowing that I can inspire students, that they experience the craft, those impressions are incredibly important."

In addition to his career at URI, Howard works at the GAMM Theater in Pawtucket, Rhode Island, where he creates costumes for a several productions each year without any staff. All told, he has worked on 40 GAMM productions; the most recent, Tom Stoppard's Arcadia just opened. And, Howard has begun pre-production work on the theater's new play, King Elizabeth, adapted from Mary Stuart by Schiller. These professional productions run for five to six weeks and can take up to four months of creating and preparation.

"I enjoy the freedom to create and revel in the camaraderie among my colleagues, many of whom have become my closest friends during the last two decades," Howard says.



"But, knowing that I can inspire students, that they experience the craft, those impressions are incredibly important."

- David T. Howard



Understanding the Evolving Shopping Experience

written by **TODD MCLEISH**

Technology is rapidly changing the shopping experience, and marketing Professor Ruby Roy Dholakia is racing to keep up with it. She has spent more than 30 years examining the relationship between technology, marketing and society, and her research is revealing how consumer behavior and the retail environment are evolving.

“As electronic and mobile commerce become the dominant ways for us to acquire the goods and services we need, all these brick-and-mortar stores that fill the landscape of America will become vacant and will lead to questions of employment and the use of space,” she says.

In one of her earliest research projects about technology and consumer behavior, Dholakia sought to understand the variables that determined whether individuals will accept new ways of consuming, including shopping methods, and she found significant differences between men and women.

Dholakia, who joined the University of Rhode Island (URI) faculty in 1981, says that shopping is a very female-oriented activity in the United States, while technology is typically more male-oriented.

“Women often use shopping as a way to get out of the house, so the rationale of using technology to shop because it’s faster and more efficient took away the pleasures of shopping for many women,” she explains. “So the early systems being developed just weren’t appealing to them.”

But that is changing. Often customers will shop at a brick-and-mortar store so they can try on shoes or clothing, but then they will purchase the product from an online retailer that sells it cheaper.

“The problem is that the physical store incurs all the cost of displaying the item and letting you try it out, but they don’t benefit from it,” says Dholakia. “So the stores are now trying to keep customers there with mobile shopping applications that let them search within the store for the products they want.”

In South Korea, which is far ahead of most other countries in the leveraging of technology, Dholakia states that retailers are experimenting with alternative uses of the time most residents spend waiting at train stations by placing posters in the stations that look like the shelves of a supermarket. Prospective customers can scan the items with their mobile phones to place an order, and they can even indicate when they want the products delivered.

Peapod, the online grocery ordering and delivery service of Stop and Shop supermarkets, is testing a similar system in the United States, notes Dholakia. In one version, the company is putting images of groceries on its trucks that can be scanned by customers while the trucks are parked at various places.

“All of these stores are trying out new ways of leveraging technology, but keeping up with it is difficult,” Dholakia says. “It’s quite an evolution going from a physical store where you can touch and feel the products to online stores, mobile stores and virtual stores.”

One application she thinks has great potential is a virtual dressing room for trying on clothes.

“It’s a pain going into a dressing room and trying things on only to find out it doesn’t fit correctly,” she says. “But with a smart screen and a smart mirror, you can stand in front of it and it will take your measurements, show you dress options, and that dress will be superimposed on your body so you can see what it looks like. Then you can even post it on Facebook to get feedback from your social group.”

Dholakia notes that one downside of virtual shopping is the loss of personal interaction and the feeling of being part of a community.

“But for every application that does that, someone sees the problem and creates a counter-application,” she states. “So this field is really humming along.”

It’s a somewhat different story in many developing nations, where global companies must adapt their practices to fit the local culture and infrastructure. In India, for instance, Dholakia explains that most purchases of consumer products are paid with cash on delivery, while in Kenya, where everyone has a mobile phone but often no access to banks, mobile banking and electronic payments are preferred.



Ruby Roy Dholakia
professor of marketing

“It’s a very different logistics system in different countries, and competition is also very different from one place to another,” Dholakia says. “So it really forces companies to adapt and innovate.”

Dholakia points with pride to several of her research projects that were especially influential. Early in her career, she led a successful family planning research effort to evaluate the government of India’s marketing campaign in the state of Orissa at a time when population control was a major issue. Social marketing had become popular and led to numerous research projects that examined the use of traditional marketing practices in non-traditional settings.

She also helped establish the International Society of Markets and Development, which sought to bring a developing country perspective to traditional marketing issues. She founded the URI Research Institute for Telecommunications and Information Marketing, an early and influential association whose research helped spawn the field of technology and mobile marketing.

All of these projects have provided Dholakia with insight into consumer behavior that represents the future directions in marketing.

“I’ve spent my career trying to see how consumers are choosing from these many options, why they do so, and how it’s changing their behaviors,” she says. “We’re asking these questions because the marketers of the future will have to deal with these changes.”



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