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## Momentum: Research & Innovation for Fall 2015

University of Rhode Island

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THE  
UNIVERSITY  
OF RHODE ISLAND  
DIVISION OF RESEARCH  
AND ECONOMIC  
DEVELOPMENT

THINK BIG  WE DO<sup>SM</sup>



# Momentum:

## Research & Innovation

COVER STORY

EBBS & FLOW

*Featured inside*

PUTTING PAPER TO THE TEST

THERE'S A DESTINY FOR  
EVERYTHING

MAKING RI RESILIENT TO  
SEA LEVEL CHANGE

Fall 2015



# Fall 2015

## FROM THE DIVISION OF RESEARCH AND ECONOMIC DEVELOPMENT



Welcome to the latest issue of *Momentum: Research and Innovation*, the magazine of research, scholarly activity and economic development of the University of Rhode Island. The magazine is designed to include broad areas of scholarly activity of the University to help our readers understand the scope and excellence of the scholarly activities of the University of Rhode Island. We are very proud of the scholarly achievements of our students, faculty and staff, and we want to share those accomplishments with you. I hope that you will enjoy this issue of our magazine and look forward with us to future issues of *Momentum: Research and Innovation*.

Sincerely,

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

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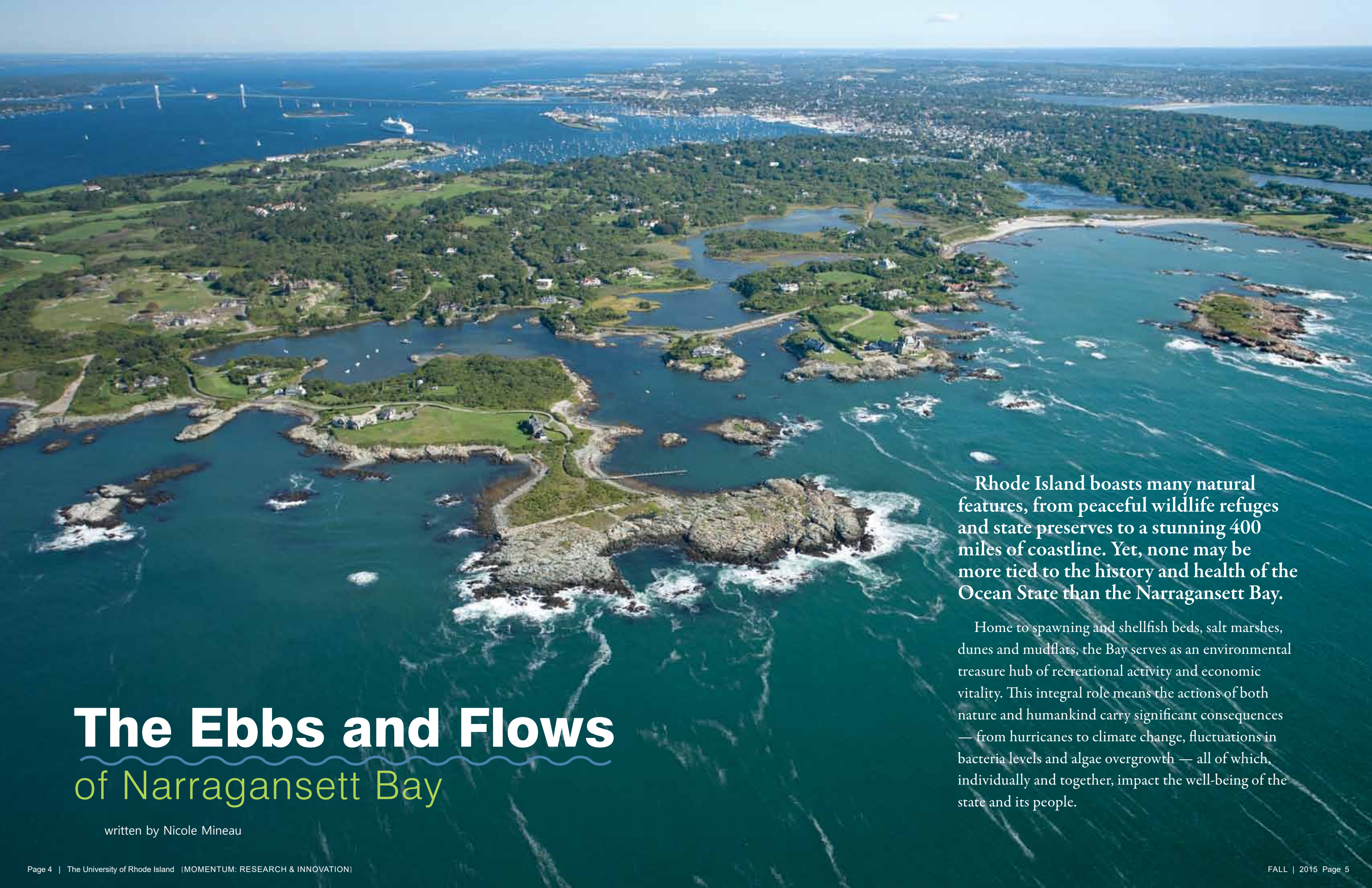
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# Momentum:

## Research & Innovation





# The Ebbs and Flows of Narragansett Bay

written by Nicole Mineau

Rhode Island boasts many natural features, from peaceful wildlife refuges and state preserves to a stunning 400 miles of coastline. Yet, none may be more tied to the history and health of the Ocean State than the Narragansett Bay.

Home to spawning and shellfish beds, salt marshes, dunes and mudflats, the Bay serves as an environmental treasure hub of recreational activity and economic vitality. This integral role means the actions of both nature and humankind carry significant consequences — from hurricanes to climate change, fluctuations in bacteria levels and algae overgrowth — all of which, individually and together, impact the well-being of the state and its people.





Calibrating compass alignment on tilt current meter.

Christopher Kincaid  
Professor, Oceanography

At the University of Rhode Island (URI) Graduate School of Oceanography (GSO), Professor Christopher Kincaid works through his research to gain a greater understanding of how events unfold in the Bay, particularly the complexities of how water flows and flushes, and how this influences such issues as high nutrient concentrations and low oxygen levels. His studies have many implications for managing the Bay in ways that maintain the vitality of the Ocean State's central resource.

It is a tricky business, charting the path to a healthy Bay while allowing for a vibrant economy, particularly given trends in climate change.

"Imagine an emergency room team trying to treat a patient without good data and good scientific tools," Kincaid explains. "We develop the physical data and state-of-the-art modeling tools that are a foundation for informed decisions on how best to manage the health of the 'patient' — in this case Narragansett Bay."

Kincaid studied geology as an undergraduate, but his interest in geophysical flows took off after graduation while working on groundwater mapping projects with the U.S. Geological Survey. This led to a doctoral program at Johns Hopkins University, in geophysical fluid dynamics, the study of each of the Earth's fluid systems, from the depths of the outer core and mantle, up through the oceans and atmosphere. After completing a postdoctoral fellowship at the Carnegie Institution of Washington, he started at GSO in 1991 as an assistant professor.



Kincaid and graduate student Christina Wertman attach current meter bracket for ADCPs.

During his URI tenure, Kincaid has attracted more than \$11 million to the University in support of his research on a range of geophysical problems, including nearly \$6 million from non-state sources for fundamental research on Narragansett Bay. For the latter, his group has used three different tools to collect one of the most detailed estuarine circulation data sets on the planet. Well over 100 million water flow measurements have been collected from multiple depths within nearly every region of the Bay and Rhode Island Sound. One tool has been Acoustic Doppler Current Profilers (ADCPs), which sit in pyramid shaped mounts on the Bay's bottom and measure sound waves sent out to ricochet off particles in the water and reflect back to the ADCPs. Changes in the returning sound — the Doppler Shift — are recorded and used

to calculate the speed and direction of water movement in remarkable detail.

The second tool in Kincaid's arsenal is the Tilt Current Meter (TCM), a less expensive and simpler design than ADCPs, developed by GSO scientist Vitalii Sheremet, which is also used to measure currents. Large clusters of TCMs, resembling long stick buoys at the bottom of the ocean, record the tilt produced by moving water, which is converted to speed and direction of the flow. Kincaid explains that the ADCP packages can cost \$40,000 each, while the TCMs are a hundredth this price. The lower cost allows him and his students to deploy dense arrays of tilt sensors that reveal fine scale circulation patterns. With the exception of 2002, Kincaid, his students and his

Kincaid's research has many immediate and real-world applications, including emergency hurricane planning.





Top of ADCP

Undergraduate student Tucker Sylvia, graduate student Christina Wertman & Kincaid

Instrument to measure water depth, temperature & conductivity.

colleagues, associate marine research scientists Robert Pockalny and David Ullman, have had instruments in R.I. coastal waters every year since 1998.

Finally, Kincaid utilizes advanced 4-D computer models based on complex mathematical equations to decipher the extensive data collected by his instruments. The applications of these 4-D models are not merely academic – Kincaid’s research has many immediate and real-world applications, including emergency hurricane planning. Kincaid and a team of URI researchers from GSO, psychology, natural resource economics, marine affairs and the Coastal Resources Center have recently received a \$1 million grant from the U.S. Department of Homeland Security to develop a more accurate hurricane modeling system; the first of its kind to combine the hurricane energy with simulations of both ocean storm surge and inland-watershed flooding.

Kincaid is an internationally known leader in using scaled down analog or physical models to represent the Earth’s fluid systems. One example is a scaled physical model of the Providence River, which was built while on a research visit to the geophysical fluid dynamics lab of the Australian National University. This scaled model is capable of recreating the types of recirculation gyres that are so apparent in his observations and, more importantly, reveals what processes control the evolution of the stagnation areas.

Laying out an old map, Kincaid points to Greenwich Bay and the Providence River, where two retention gyres, or rotating ocean currents, have been mapped in great detail and which coincide with chronic water quality problems.

“These are retention hot spots which create conditions similar to a fish aquarium where the water hasn’t been changed,” he explains.

“Rhode Island is a leader in marine and ocean related studies and should be tapped for the development of new technologies for helping Narragansett Bay and other estuaries facing similar challenges.”

- Chris Kincaid

Most recently, Kincaid and his students have begun to explore links between circulation and the Bay’s ecosystem health, building computer models that combine ocean physics with both the chemistry and biology of the water. By tracking nitrogen along with phytoplankton (sea grass) and zooplankton (tiny organisms) levels, their models are suggesting that certain regions of the Bay act as sites for bloom events that can ultimately lead to low oxygen levels, which is dangerous for marine life.

Interestingly, his 4-D models and data show that conditions in Greenwich Bay can have major impacts on the timing, magnitude and impact of subsequent blooms as far north as the Providence and Seekonk Rivers.

His models are also being used to gauge the effectiveness of management strategies in improving the Bay’s water quality. A major push has been to limit nutrients released into the Bay from waste-water treatment facilities.

“When the regions of the Bay with the most chronic water quality problems are also sites of very poor flushing, it suggests it may be time to consider outside-the-box solutions,” says Kincaid. “Rhode Island is a leader in marine and ocean related studies and should be tapped for the development of new technologies for helping Narragansett Bay and other estuaries facing similar challenges.”

When Kincaid is not knee deep in coastal waters, he has another track of research: exploring how plate tectonics and convection in the Earth’s mantle have shaped our continents, oceans and atmosphere on geologic time scales. Using a unique combination of

physical-analog lab models and complex numerical algorithms, Kincaid dissects how mantle circulation creates stresses and temperatures that result in volcanic processes within the world’s subduction zones, where tectonic plates sink back into the Earth.

Along the lines of how the magnetic field and atmosphere protect us from harmful solar radiation, Earth’s dynamic plates may protect us from plumes. Mantle plumes are buoyant, rising thermal features that lead to massive, climate changing volcanic events. For scale, outputs from plumes linked to the Ontong Java Plateau and Deccan Traps were each sufficient to cover the entire United States in 5km of magma. Kincaid’s dynamic models, however, show plumes to be efficiently diffused by mantle flows driven by Earth’s plate tectonic cycle. These are the first models to include both plumes and plates, and they show that buoyant upwellings are decapitated by subduction, with most of the high temperature plume material trapped so deeply that surface magma is not produced.

“People often ask me why I study such different fluids. Narragansett Bay versus Earth’s mantle,” Kincaids says. “I have on occasion thought of focusing on just one field. But the choice is too difficult. Work on issues that are so close to home, and of such importance to Rhode Islanders, is too rewarding to let go. And exploring the processes that drive our planet, on the very largest and longest scales, is thoroughly fascinating. It is a nice feeling to think that we are contributing to constructing the user’s manual for planet Earth. Or perhaps it is taking the saying ‘act locally, think globally’ to the extreme.”



# TRUST THAT YOU ARE THE

# Music

written by Joseph Korzeb '16

Teaching music, says University of Rhode Island (URI) Director of Orchestral Activities Ann Danis, is all about trust.

“The first topic I discuss with students who walk into my studio is them,” she explains. “I tell them that what they are reading in front of them is not music. It is notation. They are the music.”

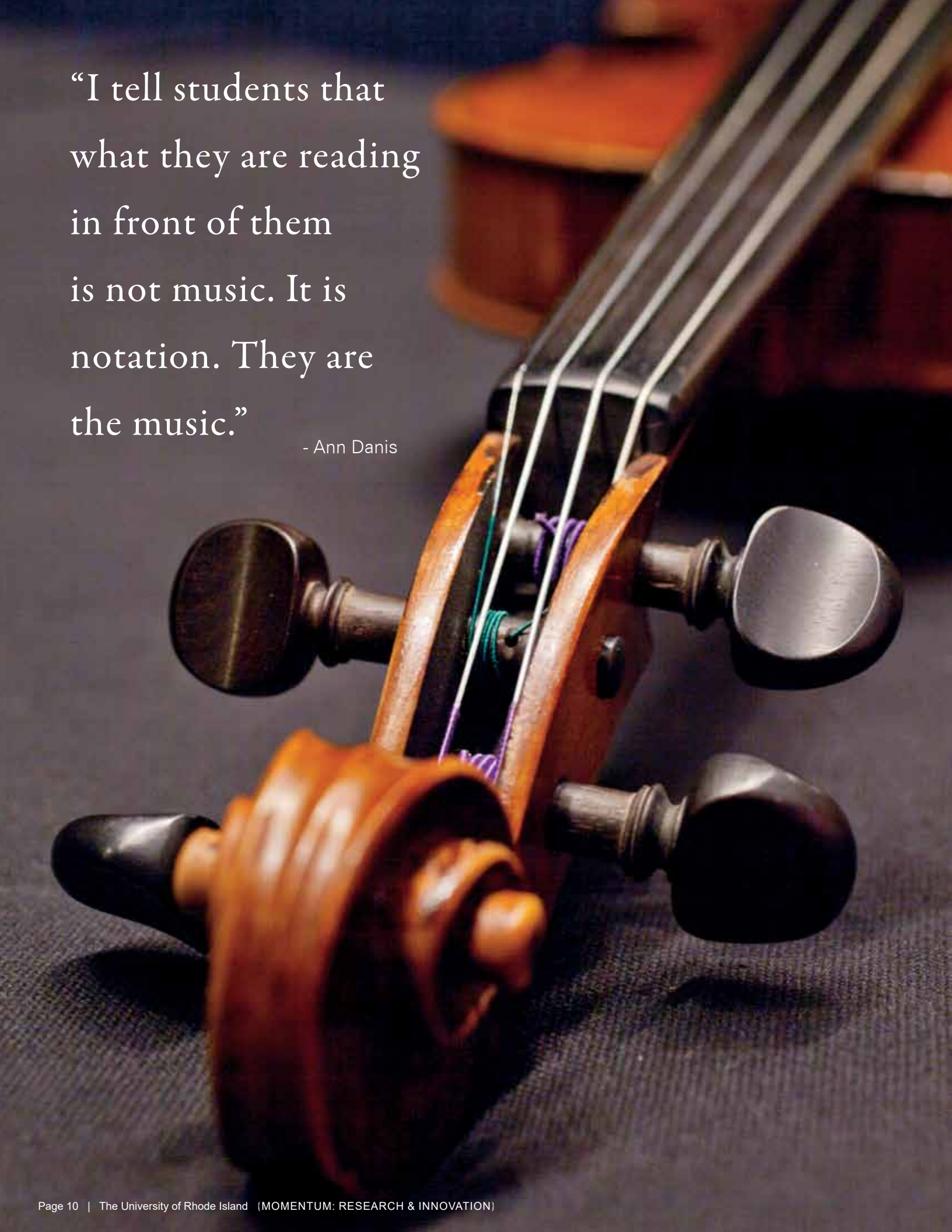
Danis, who brings more than 20 years of experience teaching music at both the high school and collegiate level, says she seeks out a unique instruction for every student. This tailored approach results in her students achieving great success.

She insists that students should never take away from whom they are.

Danis has led All-State and Festival Orchestras along the entire East Coast and reaps applause for taking intellectual and musical risks in her ensembles by introducing a wide range of innovative works, including the world-premiere of *Rage of the Heart* by Enrico Garzilli and the Rhode Island premiere of *Blind Allegory* by Nico Muhly.

In addition, Danis’ students have developed a cross-cultural understanding of music. She has taught master classes and conducted concerts in Belize, and separately





“I tell students that  
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- Ann Danis



Ann Danis  
Professor, Music, Director,  
Orchestral Activities

led a string quartet from URI to study in France. URI students were given the opportunity to collaborate with professional French musicians and established an ongoing partnership known as Les Femmes Internationales. While in France, students were not only exposed to a different style of music, but a new way of life.

Danis recalls a saying in France that asserts, “Americans live to work and we work to live.”

While teaching a new piece of music and simultaneously serving as a translator between French and English, Danis noticed there were two distinct styles of playing and approaches to learning by her students and the French musicians.

However, she points out, “Music is a language in itself. It was fascinating to see students learn a piece from such different angles and still yield one collaborative result.”

Danis looks forward to bringing more students abroad in the future. In doing so, she will learn as much as she teaches. The concept of learning being a two way street between Danis and her students stems from her passion to be the best musician and teacher possible.

A violinist by practice, Danis describes her decision to become a teacher and conductor as an evolution. After graduating from the New England Conservatory of Music with both bachelor’s and master’s degrees in violin performance, she says she told herself she would never teach. However, as the lifestyle of a performer wore on her, Danis began contemplating an alternate career path.

She recalls taking a graduate class in conducting that was very demanding, yet oddly intriguing for someone who had previously only been trained as a performer. Her experience and education led Danis to develop an innovative style of her own that she wanted to share with others through teaching.

From conducting a high school orchestra, to developing a professional chamber orchestra, and ultimately becoming the

URI orchestral director, Danis finds she has enhanced her method of conducting with each student she meets.

Danis, finds the intense one-on-one practices she facilitates with students instill sound musicianship in them and always start and end with a conversation about the students’ themselves. This process allows students to fully trust her.

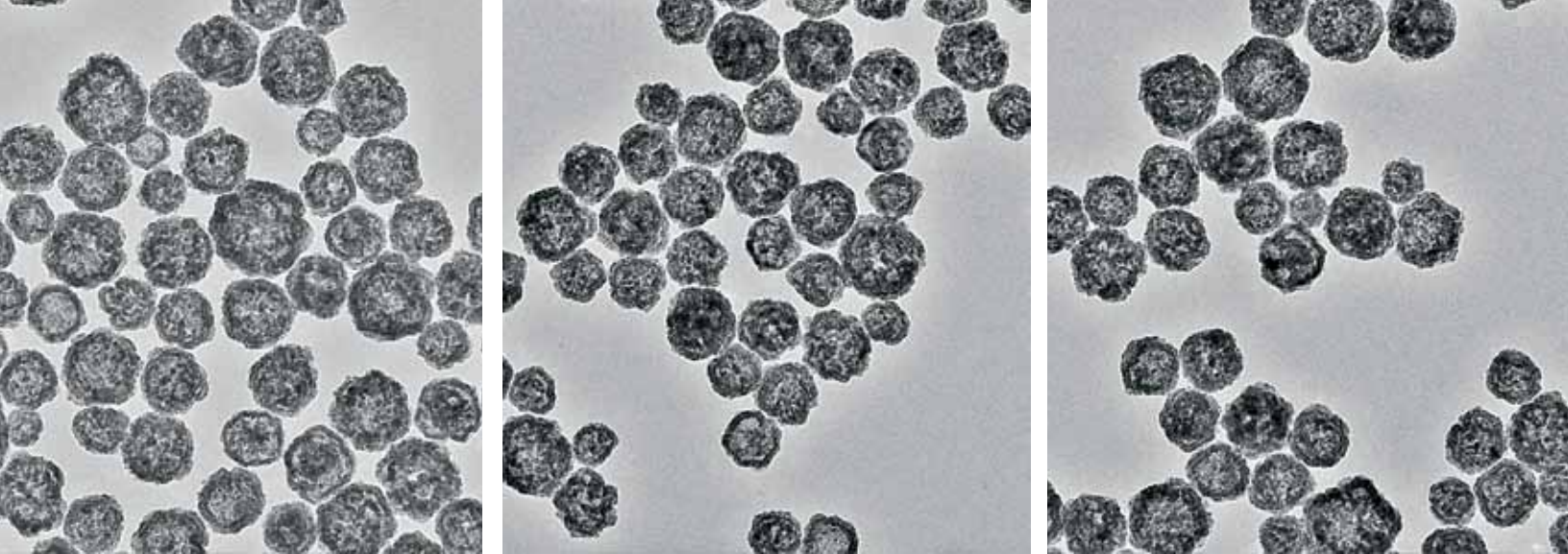
“As a conductor,” Danis says, “there is a profound responsibility to be unequivocally trusted by your orchestra as they are the music.”

“Music is a  
language in itself. It  
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see students learn  
a piece from such  
different angles  
and still yield one  
collaborative result.”

- Ann Danis







# THE UNIVERSITY MOTTO IS ‘THINK BIG’ but we are thinking small

written by Chris Barrett '08

Wei Lu discovered a passion for nanoparticles when he enrolled in pharmacy school, which may just lead to a new cancer treatment.

As an associate professor at the University of Rhode Island (URI), he's using copper nanoparticles to help destroy cancerous tumors.

"The University motto is 'Think Big,' but we are thinking small," he says. "It's a different direction, but we think the small things can really improve people's lives."

There is no disputing Lu's big impact with his nanoparticles smaller than 1/1,000 the width of a human hair. He received a \$1.3 million grant from the National Institutes of Health in late 2013. Impressive by most definitions, the award was especially notable because junior faculty members like Lu rarely command such big grants.

Now two years into the four-year project, Lu has published two research articles in the leading journal American Chemical Society (ACS) Nano and charted a path to a new way to attack tumors.

In today's clinical trials, doctors infuse gold nanoparticles into blood circulation. The nanoparticles

enter into tumors and powerful lasers hit them in a process called photothermal ablation therapy. The lasers stimulate the gold nanoparticles that heat up when "excited" and destroy the tumors, but the gold nanoparticles stay in the body. Lu's studies show that they remain for at least three months. Other studies indicate that they may persist in the body for a year or more.

Lu wants to develop a better particle that the body can excrete faster. When he arrived at URI in 2010, he and a URI undergraduate pharmaceutical sciences student, Kimberly Gaboriault, started testing different materials. An undergraduate student, Samy Ramadan, from Roger Williams University also joined Lu's lab through participating in summer research, sponsored by the Rhode Island IDEa Network for Excellence in Biomedical Research hosted at URI.

When Ramadan called with some intriguing results, Lu headed to the University's transmission electron microscope. Clustered around the equipment, Lu and the student realized they discovered the right material: copper.

Made famous by the penny, but rarely associated by the public with cancer treatment, copper contains just the

## Wei Lu

Associate Professor, Biomedical & Pharmaceutical Sciences

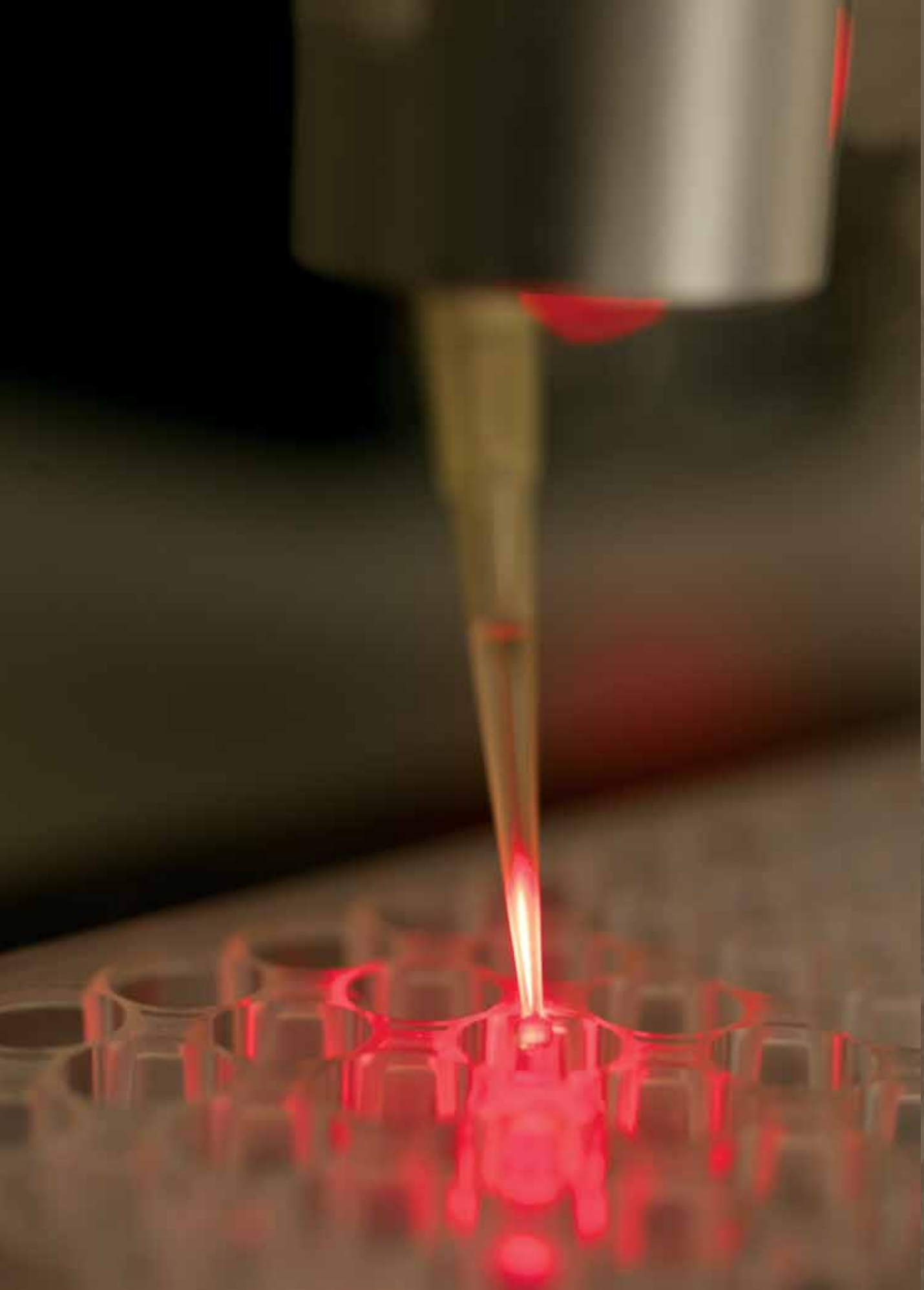
right properties. It conducts heat, plus the liver and kidney can metabolize it. With some refining, the team developed hollow copper sulfide nanoparticles and sprang into action.

The team initiated further testing and brought onboard pharmacy professor Bingfang Yan, who specializes in studying drug metabolism and toxicology. Post-doctoral fellows, graduate students and undergraduate students also joined the effort.

The group quickly expanded its charge to also look at combining its nanoparticles with immunoadjuvants that boost the immune system in the body to fight cancer cells. By combining Lu's copper sulfide nanoparticles with a regime of immunoadjuvants, photothermal ablation therapy can be more effective. The laser treatments will attack the initial and obvious tumors while the boosted immune cells target smaller cancerous cells throughout the body.

Made famous by the penny, but rarely associated by the public with cancer treatment, copper contains just the right properties. It conducts heat plus the liver and kidney can metabolize it. With some refining, the team developed hollow copper sulfide nanoparticles and sprang into action.





“This could be my whole life’s research,” Lu says.

Patients with breast cancer stand to benefit most from his work. About 12 percent of American women will develop breast cancer during their lifetime. With early detection, surgery is typically the preferred and often most effective route. But for those with late-stage or very aggressive cancer, surgeons may not catch every cancerous cell. Approximately 40,000 women will die this year from breast cancer.

Lu believes his treatment holds hope for these women.

He knows behind each patient is a name, a face and a story. He worked for three years as a post-doctoral fellow at MD Anderson Cancer Center at the University of Texas. One of the nation’s premier cancer treatment and research institutions, the center offered Lu a chance to study gold nanoparticle’s role in cancer treatment. He didn’t work with patients directly, but he saw them come and go every day.

“I did my post-doc work on cancer treatments mostly because of these patients,” he says.

It was a world – literally and figuratively – from where Lu envisioned himself. Growing up in China, Lu took a placement test, administrators recognized his potential and passion and offered him a spot in pharmacy school.

In China, thanks to inspirational professors, Lu found a love for the pharmaceutical world. At URI, he tries to instill the same passion in his students. He developed a new professional laboratory course that teaches students how to compound medicines from skin creams to nasal sprays to medical injections. Along the way, students research new drug combinations and learn the foundational skills necessary to conduct lab work.

The associate professor is also known for working one-on-one with students who want to explore a unique area of research or learn how to connect a research project to another discipline like business.

“Excellent teaching really impacts students,” he says. “I want them to be inspired.”







# Academic Head in the Past

written by Paul Kandarian  
& Chris Barrett '08

Medieval historian and University of Rhode Island (URI) Professor Joëlle Rollo Koster has her academic head in the past. The shelves in her narrow office reflect her expertise, with titles such as “Women in the Medieval English Countryside,” “Sex, Dissidence and Damnation,” and “Eleanor of Aquitaine and the Four Kings.” Nearby is a heavy

and authentic 15th-century helmet she received as a gift when she was hired by URI in 1996.

But her movie-loving side is here as well. On her door is a “Star Wars” poster, and on shelves sharing space with her professional world are figurines from the popular film series, including a Darth Vader clock.

“What is Star Wars but the retelling of old myths, heroes, quests, adventure, love and magic,” Koster says. “There is no big difference between King Arthur and Luke, Obi-Wan Kenobi and Merlin.”

It all plays into her teaching at URI, where she uses the past to illuminate the present here and now.

“People don’t realize how much the medieval period influences our society,” says the Toulon-born Koster, in her strong French accent.

Example: Go to the movies. You always see a beautiful champion male hero. Violence and virtue are paralleled. Often being ‘good’ means being extremely violent, the end justifies the means. Any action movie will tell you that.

The same message was passed though crusaders’ tales. The violence of medieval knights was sublimated into violence for God; a glorification of violence in the name of a perceived ‘good.’ Many modern films translate the medieval mind directly.

“The knight in shining armor is virtuous, he represented Christian ideology,” she says enthusiastically. “I go and fight for ideology, and my virtue is equal to my prowess!”

Koster is not one to pull punches, in class or in stating her beliefs.

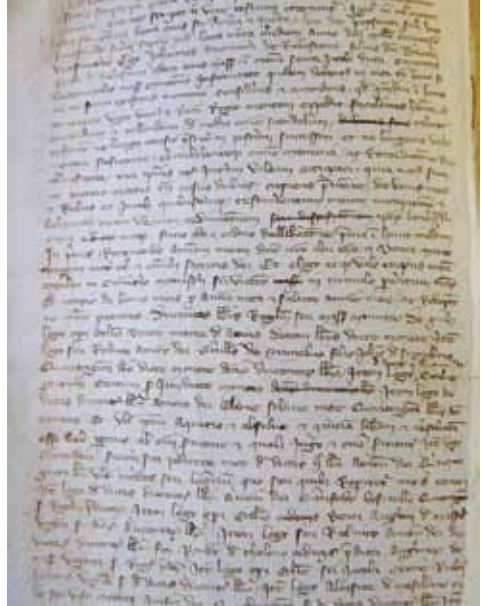
“Movies today are based on that same medieval principle,” says Koster, known around campus as a no-nonsense, straightforward and fair professor.

*It all plays into her  
teaching at U.R.I.,  
where she uses the past  
to illuminate the present  
here and now.*



Joëlle Rollo-Koster  
Professor, History





She grew up in France surrounded by history in a 16th-century convent with no running water until she was 12. France took a long time to reconstruct after WWII.

“Being raised in Toulon meant surviving in an old world,” she says. “I was born in the medieval section of Toulon, entrenched in history.”

Koster says the town occupied by the German army in World War II is most known for leading the scuttling of the French fleet to prevent the Nazis from taking over their ships. Her parents, whom Koster visits yearly in France, were self educated. Her mother read a lot, which influenced her young daughter.

“She had an encyclopedia of history, and we always read,” Koster says, adding she still has some of her mother’s books in her office. “When I was five years old I told my mother that I’ll be an historian. But coming from a lower-class working background, I had very limited opportunities for education in France. The road was not simple.”

Koster attended the University of Nice where she majored in history. Then she moved to the U.S., earning her Ph.D. in medieval history from the State University of New York at Binghamton. She was hired by URI in 1996 as an assistant professor, and is now a full professor and chair of the Faculty Senate.

When she started her academic training in 1980, she was more interested in geography. Geography and history had always been taught together in French schools. She always loved cultural and “human” geography, and making topographical maps. But, it took one course in medieval history to change her path.

“From then on,” she says, “I knew it was medieval.”

The freedom and scarcity of researchers in the field plus the abundance of archival material attracted

her. It was an easy step for her to move from cultural geography to cultural history and eventually to historical anthropology.

Learning in France, she says, is different than America, particularly when studying ancient archives.

“In France, they throw you into the archives right away,” says Koster, who speaks and reads several languages – a necessity in her research. “They teach you to swim, then you learn theory.”

Medieval studies require deciphering and transcribing – making legible – old hands, or penmanship. Medieval documents are most often in Latin and abbreviated with forms comparable to modern-day stenography. Documents often read like codes and the first step is to decode, then translate them. The job is painstaking, tedious and tremendously time-consuming. The analysis of their meaning comes last.

Her research spans a broad spectrum of medieval culture, some of it on the utilization of space by political powers. She once read a story about President Richard Nixon’s resignation. According to Kissinger, when Nixon bade his farewell to the White House’s staff, chairs in the room were oriented one way, yet when Ford spoke later, to introduce himself to his new staff, the chairs had been re-oriented. Here is proof for her of the symbolic importance of space. Someone in August 1974 decided that a new leader could not address his audience in the exact same spot his disgraced predecessor did. Space is loaded with meaning.

“I look at the interplay between space and power in medieval history,” Koster says. “You look at capital punishment in medieval times, and something like dismemberment, an extreme form of punishment reserved for traitors, done on a dead body by the way. Body parts, arms, heads and legs, were hung in different places. It all had meaning. They were located to remind people who had the utmost power.”

In one of her publications, “The Politics of Body Parts: Contested Topographies in Late Medieval Avignon,” which won a prize from the Society for French Historical Studies, Koster examined the spatial power play between various factions in Medieval Avignon. She showed how political lobbies competed for physical space in the city, and used human body parts to brand their territories.

Space is also present in her study of Avignon repentant prostitutes. These repentant prostitutes turned nuns were isolated in a convent located on the isolated southwestern boundaries of the city. But most of the donations they received in the form of real-estate concentrated in the center of town, demonstrating the constant ebb and flow between pollution and isolation (prostitutes) and acceptance and redemption (nuns).

The city of Avignon and its rich archives, has been the focus of Koster’s career. Avignon became the capital of Christendom for some 100 years when Rome and Italian politics became too hostile for the popes. Her most recent book, her sixth, *Avignon and its Papacy (1309-1417): Popes, Institutions and Society*, intertwines papal institutional history with urban history. The book centers on several popes who ruled from the city, the crises they faced and their administrations, but also tries to evoke what the city felt like for its inhabitants. The work is not focused solely on grandees but also on the artisans, merchants, laborers and prostitutes who lived alongside cardinals, bishops and clerics. As today many people came to Avignon to better their lives. The papal court attracted business and Avignon provided a platform for success to scores of Europeans. People came from northern and southern Europe. Thus, Avignon was very multi-cultural for its time, and allowed a social mobility not encountered frequently in secular medieval society. Someone with smarts and gumption could succeed. There are plenty of rag-to-riches stories, such as the one of the great Italian merchants, Francesco di Marco Datini.

Avignon’s archives have provided Koster with a rich ground for research. She has studied merchants’ fraternities and their death ritual as well as the rituals surrounding the death of popes, including the traditional ransacking and pillaging that accompanied papal death and elections. Scores of testaments, many of which were dictated by women, ironically gave her access to the details of simple women’s lives. Last wills open a window into the mind of individuals, their fears, and their loves. Burial, mourning, inheritance was all part of the natural tide of things but most of all they served the

living. Thus, studying medieval death and its ritual, the multiplication of funeral masses and prayers (suffrages), informs on life during the Middle Ages. The living and the dead worked together and relied on each other. The living prayed and honored their dead, as the dead accepted their fate and expected the support of the living in order to move on. An upcoming publication, *Death in Medieval Europe: Death Scripted and Death Choreographed*, will collect several essays on this specific topic.

Koster’s work has garnered her dozens of URI faculty development awards, ranging from \$350 to more than \$8,000.

Her up-front nature translates well to the classroom, she believes, including not allowing students to use laptops or tablets to take notes. She points to research as her reason.

“Research demonstrates that hand-taken notes work better than computerized notes,” Koster says. “And no cell phones in my class. I see a student with his hands in his lap with his phone, and they never do it again.”

She can’t point to one inspirational teacher or event that led to her pursuit of teaching.

“Little by little, I found my voice,” Koster says. “Early on I was told not to make history a career because there were so few jobs. I did it anyway. Call it karma, but I’m lucky to have found the job that maybe I was made for.”

*“I look at the interplay between space and power in medieval history.”*

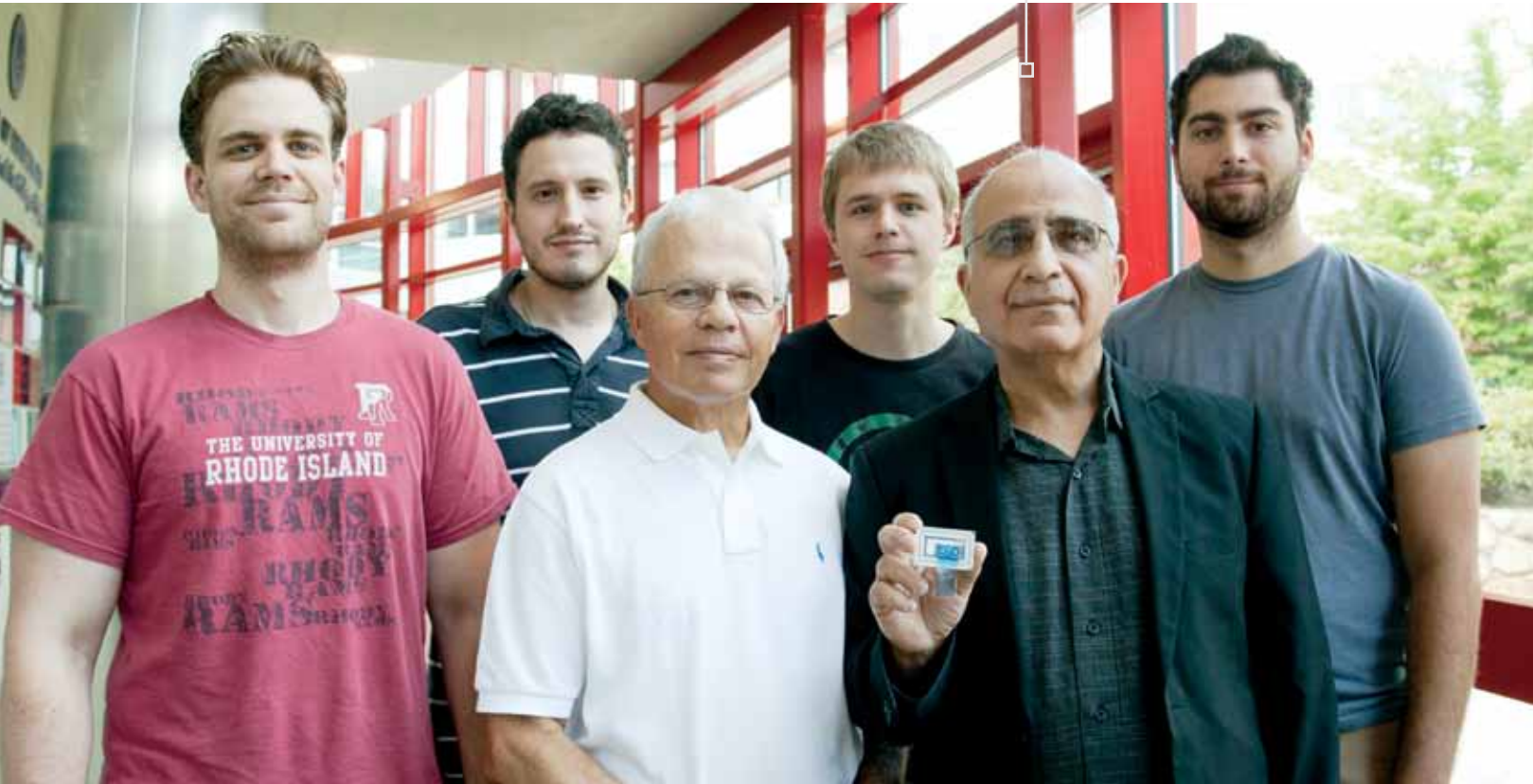
- Joëlle Rollo-Koster





# PUTTING PAPER to the Test

written by Dan Kopin



Mohammad Faghri, (second from right) Professor, Mechanical, Industrial and Systems Engineering, Constantine Anagnostopoulos, (second from left) Adjunct Professor, Mechanical, Industrial and Systems Engineering and their students

Mohammad Faghri, professor of mechanical, industrial and systems engineering at the University of Rhode Island (URI), once had a student approach him with a terrible problem. The student was worried about contracting HIV. Embarrassed to get tested and having a doctor know the result, Faghri's student did not know what to do.

When Faghri and one of his graduate students invented "lab-on-paper," a groundbreaking platform technology that could change point-of-care diagnostics, they had that student in mind.

Point-of-care diagnostics is defined by the College of American Pathologists as tests designed to be used at or near the site where the patient is located, that do not require permanent dedicated space, and that are performed outside the physical facilities of the clinical laboratories.

As an inexpensive and autonomous test, the lab-on-paper fits the bill.

Faghri, who began at URI as an associate professor in 1983, has written multiple books on heat transfer and fluid flow, his areas of expertise. In 2004, he received the prestigious Heat Transfer Memorial Award. In recent years, however, he has taken heed of larger trends in innovation – venturing outside of mechanical engineering and into medical diagnostics.

"Over the past 15 years, everything has become miniaturized," Faghri says.

In 2005, Faghri and his colleagues received a grant for nearly \$2.5 million from the National Science Foundation (NSF) to create a hand-held "lab-on-a-chip" device for point-of-care diagnostics.

"I had no background in biology or chemistry," explains Faghri, "so along with other mechanical, chemical and electrical engineers, we brought on board biologists and chemists."

Many companies have sought to miniaturize laboratories into small devices. A notable example is a glucose meter. The meter uses an electrochemical process to determine glucose levels in the blood. But the meter does not have the capabilities to conduct more complex blood tests. Faghri's lab-on-a-chip aims to do just that.

When people contract a virus, the body generates antibodies to fight antigens, the foreign substances in the blood. To test for a virus in a normal laboratory, scientists use an enzyme-linked immunoassay – a multi-step biochemical technique – to detect the presence of a foreign antigen.

"With funding from the NSF, we were able to develop a shoebox-size lab (lab-in-a-box) that was later miniaturized to a hand-held biosensor with smartphone application for the detection of the C-reactive protein, a marker for various cardiovascular diseases," Faghri says.

To operate the biosensor, users place a drop of blood from a finger prick on a disposable plastic polymer cartridge and insert it into the biosensor. The blood is pumped through the cartridge in tiny channels to a detection site where it reacts with preloaded reagents enabling the miniaturized image processor and data analysis tool to detect the target protein.

The results – the same accuracy as a normal lab – are sent from the device to a doctor via wireless communication in real time.

Interested in bringing the lab-in-a-box technology to market, Faghri, and his colleague Constantine Anagnostopoulos, an adjunct professor of mechanical, industrial and systems engineering at URI, formed Labonachip LLC.

Faghri and Anagnostopoulos, who is president of Labonachip, quickly found the market extremely competitive.

Faced with a difficult market, Faghri asked one of his graduate students, Hong Chen, to begin looking into a paper-based diagnostic test, one that did not require any pump or even electricity. They wanted it to be used at the point-of-care, as well as in a clinic, pharmacy, or doctor's office – such as a pregnancy test.



"What our lab-on-a-chip did was combine macro-fluidics with biochemistry."

- Mohammad Faghri



Pregnancy tests and glucose meters are lateral-flow test strips. They are not capable of doing more complex analyses of sample fluids. For instance, they are unable to receive multiple reagents at a specified time after introducing the sample into the strip to perform complex diagnostics such as enzymatic assays.

When Faghri learned that other research groups had proposed different kinds of paper-based lateral-flow tests, he found these tests were still limited by similar constraints. He and his research group set out to improve the standard design in two ways, allowing for timed interactions between the sample fluid and reagents, and allowing for the introduction of multiple reagents in the test.

They succeeded.

The lab-on-paper's current design is both innovative and elegant.

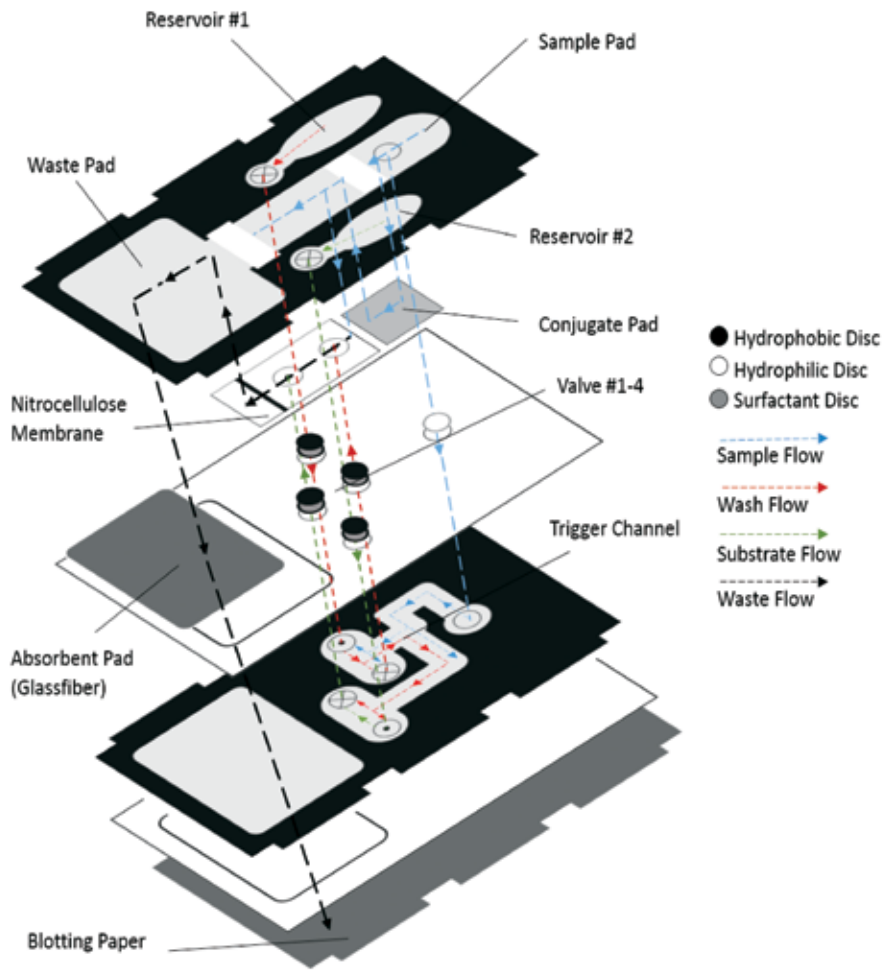
Using a computer-aided design system, Faghri along with his colleagues and students draw up and fabricate a three-dimensional structure of valves and channels along which the fluid sample travels, triggering the addition of reagents at the appropriate time, generating a result.

What enables Faghri and his colleagues to sequentially manipulate the sample fluid and reagents through multiple layers of paper are proprietary fluid actuated valves embedded in the paper. An invention of Faghri's lab, the valves and the associated fluidic circuits delay the sample fluid and reagents' movement, allowing the researchers to, in essence, create a precise and controlled laboratory on paper.

Faghri's method for introducing the multiple reagents into the lab-on-paper is proprietary. But he and Anagnostopoulos say there are no major constraints on what the architecture must look like.

At the request of ProThera Biologics they already have successfully designed the lab-on-paper architecture to detect a biomarker indicating a patient's early symptoms of sepsis, a life-threatening complication that can result from an infection.

# An inexpensive and autonomous test, the lab-on-paper fits the bill.



Brown University Professor Yow-Pin Lim, who co-founded ProThera, has called the lab-on-paper exciting and a significant improvement over the conventional lateral flow test strip. Faghri's invention gave Lim an accurate measurement of sepsis biomarker without costly laboratory equipment and trained personnel.

Faghri and his students research on how to optimize the lab-on-paper and lab-in-a-box sensors have yielded 12 published papers, 12 master's theses, five doctorate theses and one issued patent.

Five more patents are pending, which Faghri and Anagnostopoulos hope will allow them to secure investments. The University Rhode Island Research Foundation is helping them make industry connections and partnerships.

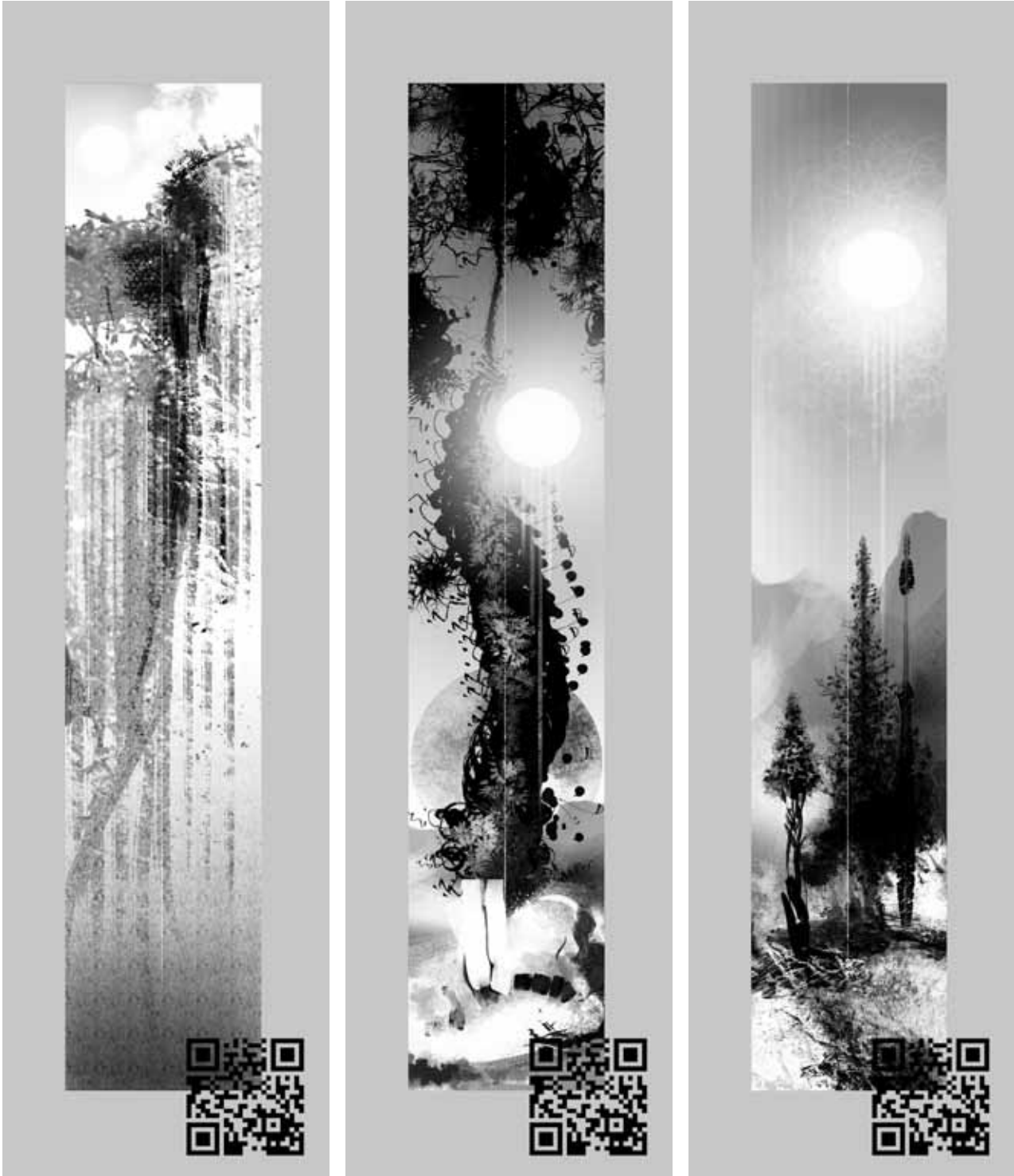
The potential applications of the lab-on-paper in medical diagnostics are vast, from HIV to Ebola to Dengue fever to Lyme disease. But Faghri also points out that the test could be used to identify contaminants in water or soil or biological threats at the airport and application of the method could extend to veterinary field and agriculture.

"When you look at the present technology today, you want to be a part of what is happening," Faghri says. "You want to use your expertise to help solve tomorrow's problems."

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# Provisional Art: Taking on the Digital Realm

written by Kara Watts '17



Axis Mundi / Open Portals: Bandelier – 01, 2015  
Digital painting on paper  
10 x 36 inches

Axis Mundi / Open Portals: Delphi – 01, 2015  
Digital painting on paper  
10 x 36 inches

Axis Mundi / Open Portals: Los Alamos – 01, 2015  
Digital painting on paper  
10 x 36 inches

Fig 1





**Ron Hutt**  
Associate Professor,  
Digital Art and Design

“Technology has already been changing traditional forms of art.”  
- Ron Hutt

After earning a degree in expressive therapy from the University of Louisville in 1986, Hutt worked as an art therapist for 10 years on the south side of Chicago, and credits this experience for his current artistic perspective.

“Why do I make art, why do others make art? I ask myself that a lot,” he muses. “It’s an opening up. A lot of what I’ve done has not been driven by the economics of the art market. It’s art as some means of self-revelation, integration of experience and ideals, connecting with others and the larger forces of the natural world.”

Hutt describes his own use of technology as interrogative, maintaining a pedagogical view that engages his mediums of choice, and engaging his audience’s thought about these mediums.

University of Rhode Island (URI) Professor Ron Hutt’s art resists categorization, and he’s quite happy about that.

“It’s hard for people to get their heads around what I do sometimes,” he explains. “I show someone my paintings and they say, ‘Oh, so you’re a painter!’ And I say, ‘Well... I can be. Now, let me show you something I did on my iPad...’”

Hutt’s early brush with digital came via *National Geographic* in 1980, when he saw the first digital satellite photos of Jupiter that NASA’s Voyager spacecraft sent back to Earth.

“It was the first time I heard of anything digital like that,” he says. “This was long before Photoshop. I saw these beautiful visions of planets and moons millions of miles away. A camera took these photos, digitized them into ones and zeros, and then sent them back to California where their supercomputer reconstructed the information into images – that was what got me. That information could be turned into the visual – that was the hook, and I’m still working from that premise.”

Taking from both digital and traditional media, Hutt blends the strengths of both to create new kinds of art. The work he displayed this past spring as part of “Provisional Haven,” an installation at San Francisco’s Refusalon Art Gallery, shows this. Curated by Hutt’s founding partner for Provisional Art Spaces (PAS), Anna Novakov, “Provisional Haven” focused on provisional or temporary, changing spaces.

Hutt’s contributions feature digitally mediated images that embed a series of shapes and icons related to the concept of collapsed time, past, present, future all at once. All the works are set in a clock face with Roman numerals, over which floats the definition of words, in one the word “folly,” is literally behind the eight ball, and a sphere of wise counsel containing an image of Athena plus a memento mori, skull. A haunting, wild-eyed dog creature confronts the viewer at the center of the clock – becoming the clock’s literal “face” and asking the viewer to think carefully about the nature of time and acts of unintentional “folly.” (Fig. 2)

While some may object that art and the digital cannot cooperate productively, Hutt disagrees.

“Technology has already been changing traditional forms of art,” he says, pointing out that contemporary sculpture is often done by computer-assisted techniques of digitally programmed robotic cutting tools, for example. Throughout art history, technology always changed what artistic mediums were available, thereby allowing artists to discover new aesthetic forms that represent a time in history.

Before oil paints, Hutt notes, fresco was the accepted traditional form of painting in the Western world: “Fresco dried very fast, making a totally different painting process and a totally different result. Oil paint was workable for a longer time – you could add glazes, luminosity of color, layers. For 300 years, it was an entirely different form of painting.”

Even with a focus on the new, the digital, and the temporary, there is a rootedness to Hutt’s works. Scan the varied landscapes of New Mexico or Greece in his new pieces, “The Axis Mundi / Open Portals” (Fig. 1) project, set for display in the fall at Saint Mary’s College Museum of Art in Moraga, California. Looking up and down, left to right, it’s easy to recognize an intensity of focus in the place, a rootedness that encourages a quasi-spiritual connection.

But layered atop these composites of iconic landscapes is one distinctly 21st-century addition – QR codes. Often used in advertising and in retail stores, QR codes are a popular digital code, a bar code that can be scanned by devices such as smartphones or iPads to access related material. Hutt intends to use the codes to link viewers of his works’ to related pictures or sound files of the very artwork a person is viewing as well as links to download a free print version of each work in this show.

“I encourage action,” he explains. “My art is a call to action for the viewer. It’s a decision they make to receive that call to action. I’m very interested in how smartphones have become very personal and embedded in an individuals’ daily experience of the world, I want to engage the view in that new personal space.”

Hutt’s summer preparations for his fall show involved taking panographic photos across the U.S., to the Southwest and up the West Coast. Right now is a big test, he says – by moving through many places to do his work, he has pushed his art and technology further as he works and reworks pieces for his “The Axis Mundi / Open Portals Project.”

“With my digital technology and my traditional drawing and painting, I’m trying to see how mobile I can be with my ideas and my practices,” he says. “What I want to know is what are the aesthetic forms intrinsic to the new digital art forms? How do they link up to the traditional art forms? How do you bring them both together? What new forms of visual expression come out of the process of blending them together? I always have new questions!”

Hutt laughs and says, “I’m always just exploring, if I network paintings as files with sound, what happens, what value is added? I want to see how this all resonates with my creative impulses, and my need to express something. I’m just totally intrigued by all the emerging possibilities – I’m never bored!”



Fig 2

Hutt’s “The Axis Mundi / Open Portals” project, a one-person show, runs October 4 to December 6, 2015, at Saint Mary’s College Museum of Art. Unlike most art shows, smartphone use is encouraged.

To view more of Hutt’s work and see where it’s on display next: [ronhutt.info](http://ronhutt.info)

For more on his international association of artists and curators, PAS, see the association’s site: [provisionalartspace.info](http://provisionalartspace.info)



Ron Hutt digital field sketching at Bandelier National Monument, NM





# PROMOTING PHYSICAL ACTIVITY:

by Understanding Barriers and Increasing Intervention Involvement

written by Bruce Mason

Despite the fact that we live in one the most inactive and obese countries in the world, Mary (Molly) Greaney, director of health studies and assistant professor of kinesiology at the University of Rhode Island (URI), says that we can effectively combat this massive health problem.

Yet, physical activity — one of the key antidotes — remains a frustratingly elusive cure for many people.

The remedy seems so easy. However, Greaney's research establishes that the answer is much more nuanced and complicated than getting up off the couch and heading out the door. What works for one person may not for the next, and the reasons are as individualized as the people who suffer from obesity or are inactive.

Greaney studies physical activity promotion and obesity prevention by focusing on understanding barriers to and motivators of physical activity so that interventions are more successful. By developing interventions that recognize individual, behavioral, community and environmental factors, people can increase their skills and confidence to improve their own health behaviors and ultimately health status.

"Factors that motivate healthful behaviors vary from person to person," Greaney says. "For example, older adults may be motivated to be physically active as it will allow them to keep up with their grandchildren, while college students may be motivated to exercise as they believe it will enhance their appearance and increase dating options."

Greaney's research indicates that where people live also can affect their physical activity levels. Through qualitative studies, she and her colleagues determined that a perceived lack of safety might prevent older adults, some immigrants and urban mothers of preschoolers from engaging in physical activity. Other environmental barriers include the absence of sidewalks, traffic and lack of a place to walk. Conversely, for example, the presence of a safe park or a place to walk can promote physical activity.

"Individual-level interventions to promote physical activity will not get rid of these environmental level factors that may inhibit physical activity, but intervention messages and skills building materials for participants should be designed to help individuals address these barriers while recognizing the context of their life," she says.

Greaney says education, skills building, and increasing self-efficacy are key to promoting physical activity. Short-term goals for her studies include continuing to identify sociodemographic, behavioral, and health-related factors associated with physical activity across the lifespan. The long-term goals center on developing widely used intervention strategies to promote physical activity among groups with the greatest health disparities that can be sustained while not being cost prohibitive.

"I do not think we have the definitive answer of how to best increase the use of interventions, but we do know that we need to understand the social context of and design interventions that can be incorporated into a participant's life," Greaney says.

Self-monitoring remains critical to inspiring a change in habits, but many people seeking change do not consistently track behavior. The web-based tools used in intervention studies likely need work to promote sustained use and to appeal to a wide audience, according to Greaney.

Greaney worked as a postdoctoral fellow on the SENIOR Program (Study of Exercise in Nutrition in Older Rhode Islanders) with URI Gerontology Professor Philip Clark from 2001 to 2004. She then went to the Harvard School of Public Health and then the Center for Community-Based Research at the Dana-Farber Cancer Institute. Greaney says she is happy to return to URI to work with former and new colleagues.

"It is exciting to be on the ground floor in developing URI's new health studies major and to ensure that students are acquiring the knowledge and skills needed to promote health and well-being whether it be through health promotion, health administration or health services on a state, national or international level," she says.

Greaney says she was drawn back to the University because: "For me, URI offers a nice balance between the important role of research and teaching. I like being around students and enjoy teaching as well as advising students. I find students' enthusiasm and excitement invigorating."



**Mary (Molly) L. Greaney**  
Assistant Professor, Kinesiology;  
Director, Health Studies



# There's a Destiny for Everything



written by  
Aiden Fitzgerald  
and Chris Barrett '08

For the Narragansett Native American Tribe, fish hold a central role in its heritage and diet. But possible contamination of its waters sent the tribe searching for solutions.

University of Rhode Island (URI) Assistant Professor of Nursing Marcella Thompson stepped into an untraditional role for a nurse as the Rhode Island Tribe grapples with possibly polluted fish at its Charlestown, R.I. reservation.

This summer, Thompson launched the Namaus Project, which translates to "All Things Fish" in the Narragansett language. With Thompson at the helm and backed by a tribal council resolution, a team comprised of the tribe, URI, Brown University and Dartmouth College launched a five-year mission to study the issue and recommend a remediation plan. To fund the effort, the group received grants from the National Institutes of Health/National Institute for Environmental Health Sciences,

the Brown University Superfund Research Program, the U.S. Environmental Protection Agency (EPA) and URI.

The Namaus Project team is using novel and multidisciplinary approaches in environmental health research to engage tribal members and build their capacity to fully participate in decision-making processes around this environmental issue.

"I am not a traditional nurse," Thompson says. "As an environmental health nurse scientist, I employ multidisciplinary methods to address very complex environmental health issues."

Her latest project is certainly complex. The EPA warned the Narragansett Tribe that fish in its waters might contain potentially harmful amounts of environmental contaminants, such as mercury. In 2012, Thompson was working with the tribal government and leading workshops with the tribal elders on planning for emergencies such as natural disasters. The tribal government asked her to help determine what to do

Marcella Thompson, Assistant Professor, Nursing (blue dress) with colleagues and members of the Narragansett Native American Tribe.

about the fish and she sprang into action. Thompson works closely with her environmental scientist colleague, Dinalyn Spears, a Narragansett and director of the tribe's Department of Community Planning and Natural Resources.

"Cultural and economic factors are important determinants of health; in particular, fishing and fish consumption among indigenous populations," Thompson says. "Individual participation in community-based research and group discussion of the risks and benefits of consuming fish has been shown to be effective methods for modifying dietary behaviors."

While seeking to protect the public from harmful health impacts, fish advisories do not take into account the impact of the absence of fish on an indigenous culture, including a loss of language and traditional technical and social activities associated with fishing. Conversely, continuing tribal fishing traditions in communities where fishing is critically linked to cultural identity has the potential to place tribal members at increased risk for health impacts from environmental contaminants.

This fall, Thompson and her colleague Elizabeth Hoover, an assistant professor of American/ethnic studies at Brown University, will facilitate talking circles, a traditional way for Native Americans to discuss problems. This first step in the project will offer Thompson insight into how the tribe views the issue while building trust between the researchers and tribe, and especially the elders.

Discussions will center around tribal fishing traditions to understand the meaning of fishing and its relationship to cultural ways of knowing, as well as the potential impact of environmental pollution on fishing and fish consumption among tribal members. Recordings of these sessions eventually will find a home in the tribal heritage collection and the Tomaquag Indian Memorial Museum.

During the last three years, Thompson built and nurtured a collaborative working relationship with tribal leadership, the Tribal Government Administration, and tribal elders, "The elders are the gatekeepers of the tribe. If they don't trust you, you're not going anywhere," she says.





“I thought, ‘This is where I need to be.’  
My ancestors knew their ancestors. I consider working with  
the Narragansett Tribe an honor and a privilege.”

- Marcella Thompson

Thompson with colleagues and members of the Narragansett Native American Tribe.

Separately, researchers from URI, R.I. DEM and U.S. EPA will catch fish to test for toxicity levels. URI’s Graduate School of Oceanography and Dartmouth College will measure the levels of mercury and polychlorinated biphenyls (PCBs), as well as their nutrimental content for omega-3 fatty acids and selenium, a nutrient trace metal that binds with mercury.

“By testing both contaminants and nutrients, we can provide the tribe with a full picture of the risks and benefits of fish consumption,” Thompson says.

As the testing occurs in the lab, URI nursing students paired with tribal members will survey tribal households about fish consumption. These results will paint a picture of the average tribal member’s diet and the role of locally caught fish.

Besides keeping the tribe from eating potentially harmful fish, the tests and survey results also promise to show how containments flow through fish and tribal members.

Mercury and PCBs are pervasive and persistent in the environment. The chemicals are toxic to the brain and nervous system, and they can harm fetal and infant brain development. Thompson’s prior research in 2012 documented that 55.8 percent of childbearing-aged women in the U.S. exceeded the median blood level for both of these chemicals.

This is critical because ingested pollutants don’t just pass through our bodies. They tend to stick around and can be passed on by a pregnant woman to her fetus or a nursing mother to her baby. Age and fish consumption are significantly related to elevated blood levels among these women. Fish, especially top predators, are known to accumulate high levels of mercury and PCBs.

Eating the right fish could reduce pollutants for the tribe and provide health benefits, particularly because consuming some fish may reduce the risk of diabetes, obesity and cardiovascular disease.

“We’re exposed to hundreds, if not thousands, of environmental chemicals every day, and they impact our health,” Thompson says.

A report will document the team’s final results: Which Fish Are Safe To Eat? At that point, Thompson will work with the tribal government and its members to connect their cultural ways of knowing about fishing and consuming fish, with technical and scientific knowledge so that they can decide appropriate action. If remediation is necessary and feasible, Thompson will assist the tribe in networking with environmental scientists and chemical engineers.

Thompson and her students also will partner with Lorén



Chief Sachem Matthew Seventh Hawk Thomas, Marcella Thompson, Elizabeth Hoover and Dinalyn Spears

Spears, curator of the Tomaquag Museum, to work with the tribe’s children to design posters, fish puzzles, a children’s book and, if necessary, fish advisory signs about the findings. In addition, Thompson will help organize a fishing event for tribal youth where the elders and other adults will teach them to fish using traditional methods.

“We start with the tribal elders because they are the keepers of tribal knowledge,” Thompson says, “and we will continue to work with the children so that they become the tribe’s environmental stewards.”

The professor hopes that despite concerns about pollution, fish will continue to play an important role for the tribe in nutrition and cultural spirit alike.

“Not all fish are highly contaminated,” says Thompson, pointing out that fish low in the food chain, such as pumpkinseed, typically absorb fewer contaminants yet may hold high nutritional value.

If the team finds safe fish in tribal ponds and the Narragansett people don’t currently eat that species, a

creative solution, Thompson says, would be to create new recipes and traditions around that fish species.

For Thompson, the project continues a family tradition of sorts. Her ancestors arrived in Rhode Island with founder Roger Williams, who wrote extensively about the Narragansett’s fishing culture in 1648.

“It will be interesting to see if Williams got it right,” Thompson says.

Thompson recalls when she began working with the tribal elders three years ago she says, “I thought, ‘This is where I need to be.’ My ancestors knew their ancestors. I consider working with the Narragansett Tribe an honor and a privilege.”

With her latest project, she says she has promised herself and the tribe to leave no stone unturned and no report incomplete. And, she knows that her efforts will improve not only the physical health of the tribe, but their spirit as well.

“I don’t hide in the science,” Thompson says. “I became a nurse because I want to make a difference in people’s lives.”





# Making Rhode Island

Resilient to Sea Level Change



writing contribution from Cassandra O'Bryan '15



Eight high school students worked at Fox Hill and Marsh Meadows

# Salt Marshes on Jamestown, R.I. with Engelhart



To better understand the impacts of climate change, Simon Engelhart, assistant professor of geosciences at the University of Rhode Island (URI), is looking to the past, researching the history of relative sea-level rise in local salt marshes, from the Last Glacial Maximum 20,000 years ago to the present.

“Sea-level rise is not like a bathtub,” Engelhart explains. “You don’t just add water to the ocean and see a uniform rise globally. There are differences due to gravity, ocean circulation, and how the temperature and salinity in the ocean vary.”

Engelhart’s research seeks to better understand how the land, atmosphere and ocean have contributed to sea-level rise in Rhode Island and at other sites along the U.S. Atlantic coast during the past 4,000 years. One particular focus is to better understand the relationship between climate and sea-level rise, a goal supported by a recent National Science Foundation award.

“Unless we have an understanding of how climate influenced sea level in the past, our forecasts of how sea level is going to rise in the future are going to be less precise,” says Engelhart. “The oldest tide gauge records of sea-level rise on the U.S. Atlantic coast only collected data from the middle of the 1800s, and so we need a method to look at the longer term response of sea-level rise to climate changes.”

Engelhart’s preferred method is to use salt marshes, and the organisms that inhabit them, to reconstruct sea-level rise before tide gauge data were available. Salt marshes are a useful tool to reconstruct sea level because they have a well-defined relationship to sea-level, forming in the upper half of the tidal range above mean tide level, and because they contain organic plant remains that

allow Engelhart to use radiocarbon analysis to date the sediments.

Further, Engelhart uses microscopic animals called foraminifera to improve the precision of the reconstructions. Individual species of foraminifera have very specific preferences for how often they are submerged by ocean water and, therefore, are very precise indicators of former sea levels. In a typical Rhode Island tidal range (1.2m; 4 feet), this allows Engelhart to identify where relative sea level was during the past 4,000 years with a precision of 0.3m (1 foot).

“If we solely relied on the salt marsh plants we find in our cores, we can say where the sea level was in Rhode Island with a precision of approximately plus or minus 30cm. Starting to use the foraminifera, we can begin to reconstruct where sea level was 3,000 years ago with a precision of approximately plus or minus 15cm,” says Engelhart. “That improved precision allows us to see smaller responses of sea level to climate that previous methods could not resolve.”

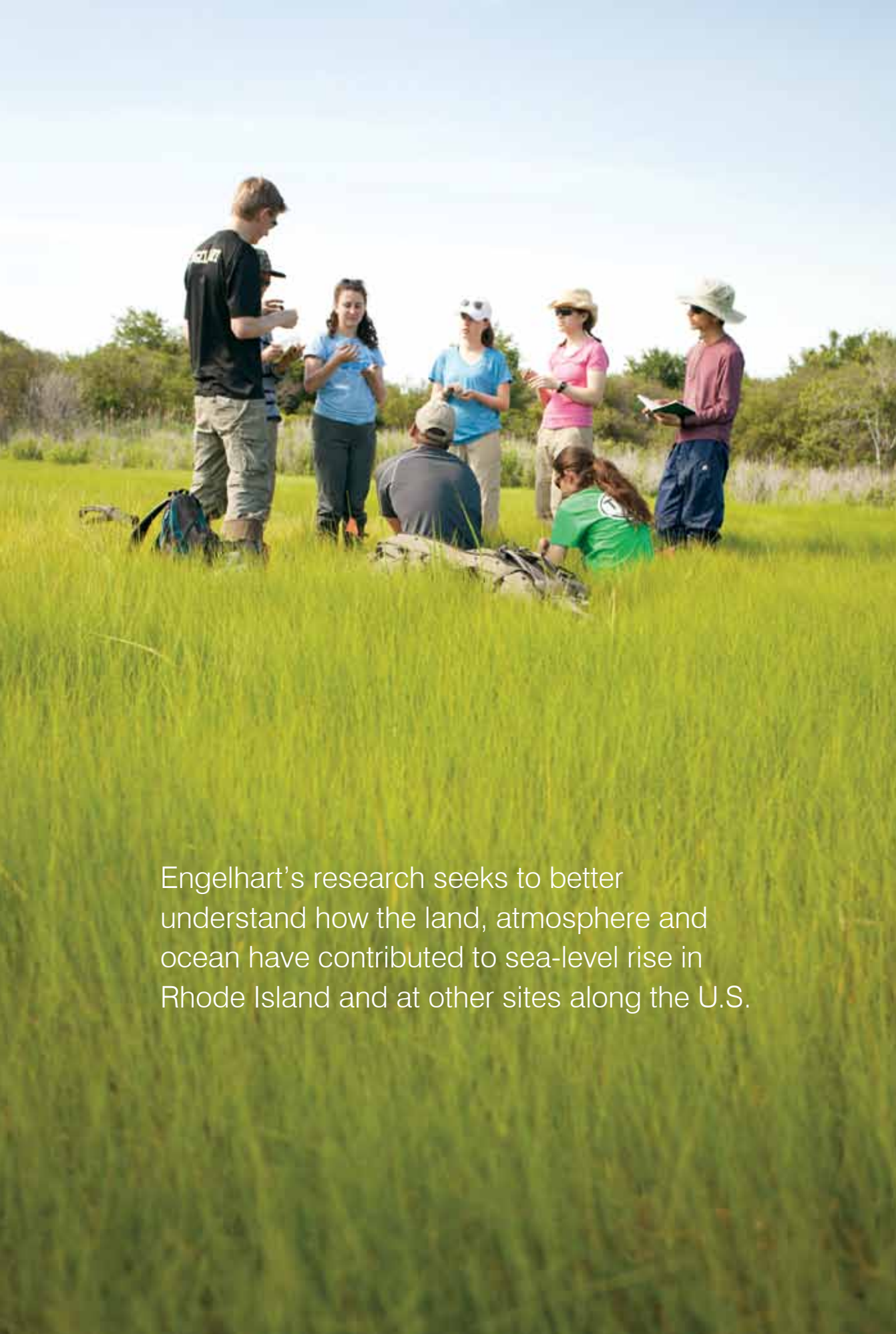
“Sea-level rise is not like a bathtub.  
You don’t just add water to the ocean  
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salinity in the ocean vary.”

- Simon Engelhart



Core Sediments





Engelhart’s research seeks to better understand how the land, atmosphere and ocean have contributed to sea-level rise in Rhode Island and at other sites along the U.S.



Engelhart was recently part of a URI-led team that received a two-year, \$870,000 grant from the National Fish and Wildlife Hurricane Sandy Coastal Resiliency program. This project aims to make coastal Rhode Island communities better able to cope with hazards such as sea-level rise and coastal storms. Engelhart’s role is to determine which of the state’s salt marshes have been more resilient over thousands of years and, therefore, may be better able to withstand future sea-level rise.

A key focus of this project is to engage youth in the scientific research. Engelhart has teamed up with Earthwatch Institute, an international environmental charity that helps a wider population to get involved in research through programs led by scientists. Through a grant from the Durfee Foundation, Earthwatch runs the IGNITE program. This program enables about 50 high school students a year from the Los Angeles region to participate in two-week residential research projects working with a designated scientist; Engelhart leads one project every summer.

This year, eight high school students worked at Fox Hill and Marsh Meadows salt marshes in Jamestown, R.I. with Engelhart, collecting data that will enable him and his students to produce a new high-resolution reconstruction of sea-level variability during the past 3,000 years. They collected samples of present day salt marsh sediment to understand the distributions of foraminifera within Rhode Island salt marshes as well as 3-meter cores of ancient salt marsh sediment. Analysis of the data is commencing as part of a master’s thesis. The project will return to Rhode Island next summer to collect further samples from new sites in the Ocean State.

“The more data we collect, the better idea we will have of how sea level changed in the past in Rhode Island and which salt marshes were able to withstand sea-level rise and survive over time,” says Engelhart. “This will help us better manage this important resource under the significant sea-level rise forecast during the 21st century and beyond.”



**Simon Engelhart**  
Assistant Professor,  
Geosciences



# READING

## Through Their Eyes

written by Nicole Mineau

“Children are learning in ways they may not be teaching and learning in school. It’s very directed and very personal.”

- Theresa Deeney



The University of Rhode Island’s (URI) Theresa Deeney has a strong academic reputation for her work as an associate professor of literacy education, coordinator of the graduate literacy program, and director of graduate studies in the URI School of Education.

Her latest round of accolades comes from her work with teachers and local children through the URI After School Literacy Program, which recently garnered Deeney the 2015 Outstanding Teacher Educator in Reading award from the International Literacy Association.

“Through the After School Literacy Program the teachers are teaching and children are learning in ways they may not be teaching and learning in school. It’s very directed and very personal,” explains Deeney.

Children with literacy difficulties typically struggle with a range of challenges, including language, comprehension, attention and dyslexia, all of which can generate feelings of anxiety and lack of self-esteem. In the classroom, student difficulties can be magnified by standardized testing demands and comparison to other students.

Federal legislation requires in-school testing for students suspected of having reading and learning disabilities, but many literacy issues evade detection or labeling. Although schools offer students additional assistance through special education individualized education programs (IEPs) for students diagnosed with reading and writing disabilities, more individualized assistance and concentrated tutoring sessions can make all the difference. In Rhode Island, finding these kinds of outside services for children with reading difficulties often poses significant challenges. Some parents cannot afford private tutors.

The mission of the URI After School Literacy Program is to combine university teaching and community service in a way that benefits multiple constituents. Graduate students in the URI School of Education Reading Program gain the knowledge and skills to become reading specialists in public schools. URI undergraduates in education have an additional opportunity to work with children who struggle. Rhode Island children with literacy difficulties develop skills in reading and writing. They increase their confidence and independence through cutting-edge learning methods. Families come to better understand their children’s struggles and learn to advocate on their behalf, and schools gain needed help in raising the literacy levels of their most vulnerable students.

“It’s a win-win all around,” says Deeney.

Deeney’s work in the After School Program originally started in 2001, when she and her graduate students traveled to Rhode Island schools in Chariho, South Kingstown and Providence to carry out the program. Limited access to technology and other forms of instruction posed challenges. Consequently, in 2009, the program switched and brought the students to campus. To address barriers to involvement such as lack of transportation, Deeney worked out a carpool system with one of the involved schools to bring the youngsters to campus.

“Now the little kids come to a big kids’ place,” Deeney says. “Some may find the university setting intimidating at first, but they soon discover it’s cool to come here.”

As it turns out, the students look forward to wearing their backpacks like their college-age counterparts and attending class on a university campus. The program provides snacks, which the children enjoy in the Robert L. Carothers Library and Learning Common’s 24-hour room, just like every other college student. In addition to overcoming their learning disabilities, the children gain a sense of inspiration and encouragement that URI is accessible when they may have felt as though higher education was beyond their reach.

The teachers and youngsters benefit from the resources at the URI Curriculum Materials Library (CML). Deeney was able to acquire cutting-edge technology for the CML through a 2009 grant from the Champlain Foundations for \$76,971 (in conjunction with Instructional Technology and Disability Services) as well grants from the URI Foundation for \$2,164 received in 2009 and \$1,500 received in 2005. The funding allowed purchase of laptops and smartboards, along with accessibility tools such as Kurzweil and Dragon software, which provide text-to-speech and speech-to-text functions, highly effective in assisting students’ reading and writing.

The After School Program, which can serve students in grades K-12, takes place year round, and currently engages about eight to 15 students enrolled for the weekly 90-minute sessions. The cost runs \$50 per semester, but need-based scholarships are available.

The students are assessed before and after the program, using various standardized and informal testing and records and evaluations obtained from schools with parental permission. The information is then analyzed, and an individual instruction plan developed.

Using multisensory instruction, which involves incorporating the body, eyes and ears into the learning process, proves helpful, especially for students with dyslexia. These students face difficulties with language processing and getting words off the page. The teachers help the students through their frustrations by recognizing their strengths and praising their successes.



Theresa Deeney  
Associate Professor,  
School of Education

The mission of the URI After School Literacy Program is to combine university teaching and community service in a way that benefits multiple constituents.

- Theresa Deeney

In at least one turnaround, Deeney notes, a young girl enrolled in the program now wishes to become a reading teacher. “That’s the highest form of praise,” says Deeney.

Some parents initially worry that the program may be too much of a commitment after a full day of school. But, one of Deeney’s goals is to promote a fun and relaxed learning environment without the structure and pressures of school.

The last 20-30 minutes of each weekly session is dedicated to special projects determined by each child. One first-grade boy researched animals through online e-books and magazines with text-to-speech functions. He then wrote a book about them using “Educreations,” an education application that allowed him to find photos of animals, write a sentence about them, and then record his voice reading it. This became a book for others in the program to read or listen to. Through this process, he was applying his growing literacy skills.

“It’s this out-of-the-box teaching that boosts students’ self-esteem and confidence in the end. The growth we can’t measure is in some ways more important,” says Deeney. “Disabilities are invisible, and sometimes the progress isn’t something you can show on a piece of paper.”

An end-of-year celebration gives the students an opportunity to shine and showcase their new proficiencies and skills in many different ways.

“Our little guy who wrote the animal book displayed it on the smartboard. After his recorded reading, he answered questions from the group,” says Deeney.

Students have used their literacy skills in so many ways, from creating a game along the lines of Dungeons and Dragons, to chronicling the life and music of Taylor Swift, to creating a CSI “who-done-it” mystery.

“Choice and ownership are powerful motivators for all students, but particularly for students who struggle,” says Deeney. “Imagine the feeling of success that comes from showing such innovative work to others!”

Deeney says the literacy program helps students discover their voices and allows them to see that they are not alone in their struggles. The youngsters gain advocacy skills and learn to speak up on their behalf.

“They find that they may have to learn to read or write a little differently,” Deeney says. “And that’s okay.”





# Flagship Pedagogy

A Unique Opportunity  
for Students Learning  
the Chinese Language

In early July, students' laughter filled a classroom in Washburn Hall on the University of Rhode Island's (URI) Kingston Campus. Projected on the slide in front of the class featured an image of Harry Potter with text written entirely in Mandarin Chinese. The teacher at the front of the class smiled, and then – in Chinese – began a fast-paced conversation with her first-year students. The 15 students sat upright and engaged while speaking about a familiar character in an unfamiliar language.

These students elected to spend eight weeks of their summer on campus for URI's Chinese Language Flagship Program, overseen by Professor Wayne Wenchao He. "In eight weeks these students will learn one academic year's worth of Chinese," says Professor He.

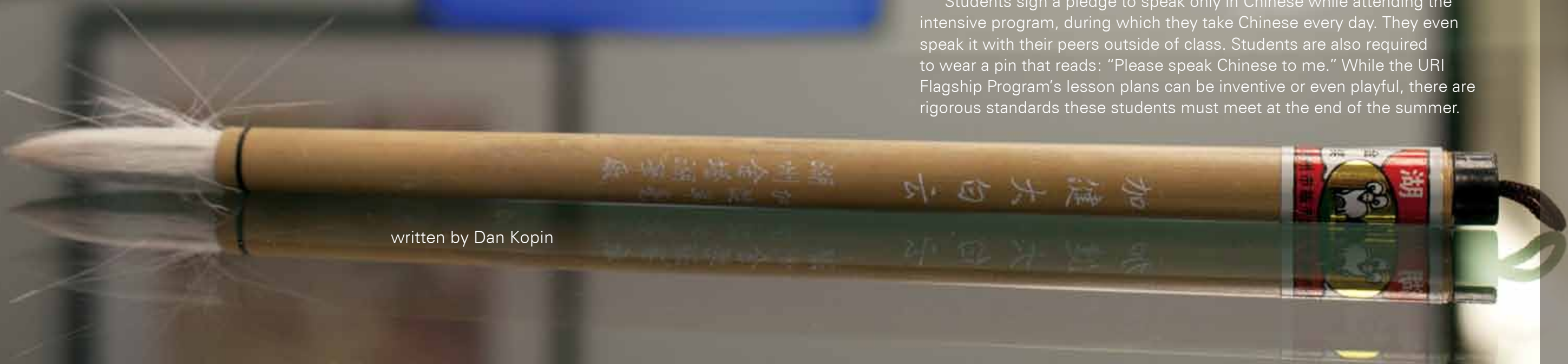
Students sign a pledge to speak only in Chinese while attending the intensive program, during which they take Chinese every day. They even speak it with their peers outside of class. Students are also required to wear a pin that reads: "Please speak Chinese to me." While the URI Flagship Program's lesson plans can be inventive or even playful, there are rigorous standards these students must meet at the end of the summer.



**Wayne He**

Professor, Languages; Program Director,  
Chinese Language Flagship Program

written by Dan Kopin





“The new curriculum builds the connection between pronunciation and writing characters.”

- Wayne He

Professor He requires his students to take the same standardized tests used by the U.S. State Department and other federal agencies to assess a diplomat’s language skills. The American Council on the Teaching of Foreign Languages, which creates the tests, breaks down language proficiency into four categories: novice, intermediate, advanced and superior.

“We want to train high quality students, but regular Chinese classes only meet three times a week,” explains Professor He. “With four years of these classes, the best a student can get to is intermediate. But after only one academic year and one summer in the URI Chinese Language Flagship Program, students reach the intermediate level. The goal of the second year is for the students to reach the advanced level. The goal for the final year is the superior level in the capstone study, which is an intensive year in China taking courses and doing an internship in their final semester.”

Funded through the U.S. Department of Defense’s National Security Education Program (NSEP), URI’s program is one of 12 across the United States. Flagship languages – Arabic, Chinese, Hindi Urdu, Korean, Persian, Portuguese, Russian, Swahili, and Turkish – are considered “important for U.S. national security and economic competitiveness,” according to the NSEP.

Professor He’s leadership of URI’s Chinese Language Flagship Program is based upon his extensive experiences teaching students as well as his research into pedagogy and the practices used to teach Chinese. He is a proponent of complementing traditional methods of teaching with more pedagogical approaches, emphasizing important language skills for future global professionals.

While teaching at New York University and at West Point, Professor He found his students struggled with a staple of traditional first-year courses: copying Chinese characters. Many Chinese language teachers believe that students’ first year of study should be spent copying characters in order to lay a foundation for other skills.

“I remember when I was in elementary school, every day the homework was to copy words, sometimes a whole page with just one word,” says Professor He. “We spent hours and hours copying and memorizing words. But writing character is only one skill; there is also reading, listening, speaking and writing compositions as well as computing.”

In response to his students’ difficulties, Professor He began to develop methods that put less emphasis on copying characters in the first year. Professor He had students use computers more often, during which time they learned a system called pinyin. Pinyin allows students to type out the pronunciation of Chinese words in English, which are then automatically converted into Chinese characters by the computer.



“The new curriculum builds the connection between pronunciation and writing characters,” explains Professor He. “Writing characters by hand only requires drawing the characters. Even if you don’t know how to read, you still can draw. But with the new approach, you must pronounce the character correctly first in order to re-produce it with a computer.”

Professor He found in surveys that students taught with a more computer-oriented approach in their first year were much more motivated and satisfied by his courses. There has been, however, some reluctance to embrace his methods by other Chinese teachers.

“From a traditional point of view, I understand that many teachers learned Chinese a particular way, so they think their students should too,” explains Professor He. “But the purpose of learning to write as a language skill is for communication.”

Professor He points out that in Chinese history, new inventions have dramatically altered what has been considered a written language skill. The first known examples of written Chinese characters were carved on turtle shells and animal bones 5,000 to 6,000 years ago. Characters were later molded in bronze. Eventually characters were painted with brushes, on silk, bamboo and paper. Brushes were replaced by pens.

“Typing is another way of communicating,” says Professor He. “The only difference is the tool, whether it’s a pen or a computer.”

Professor He, his colleagues and students at URI are continuing their research of students’ responses to traditional first-year courses versus the computer-complemented first-

year courses. To date, surveys have shown students were more motivated, inspired and goal-driven in the computer-complemented courses than in traditional ones.

The URI Chinese Language Flagship Program has benefited from these pedagogical insights, says Professor He, especially in terms of engaging students while challenging them. For instance, his intensive summer program began using Chinese language instant messaging apps such as WeChat and QQ. Students’ hands-on experiences with fun new technology are also opportunities to practice essential language skills.

These experiences can also prove useful for students later on in the URI Flagship Program. In the capstone year in China, along with two language courses, students are required to take other courses of their second major such as biology or sociology completely in Chinese. During the second semester of the capstone year students begin internships with companies in China. URI students have worked with entities such as publishers, television stations and accounting firms.

Professor He says he also is seeing the URI Chinese Language Flagship Program make an impression on prospective students: “One student recently was looking at schools with flagship programs across the country. When he came to visit, I spoke with him about what we have done here, and how our program is moving forward.”

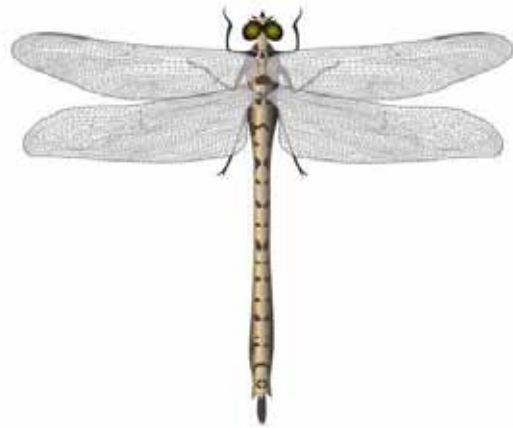
A big grin spreads across Professor He’s face as he adds, “He chose URI.”





# A Naturalist's *Cabinet of Curiosities*

written by Bruce Mason



Growing up in Grand Canyon and Yosemite National Parks provided Nancy Karraker with a picture-perfect playground in which to make hundreds of new friends – in the form of reptiles and amphibians.

Karraker, assistant professor of natural resources science at the University of Rhode Island (URI), was raised by park ranger parents who encouraged their budding naturalist to bring home everything, from buckets filled with frogs to garter snakes on the one condition that she let them go.

“I was totally independent as a child,” Karraker shares. “As a national park brat growing up, there wasn’t much to do, like go to the mall or to the movies, so my siblings and I explored the natural world around us. I can still close my eyes and see the wet meadow across from our house in Yosemite; it was just so filled with life.”

Karraker, who teaches herpetology (the study of reptiles and amphibians) and wetland ecology, boasts a diverse portfolio of research interests that encompasses the ecology of wetlands, aquatic invertebrates, amphibians and reptiles. The majority of her research projects display a strong conservation emphasis with a primary focus on quantifying changes in the demography of populations impacted by contaminants, climate change, disease, invasive species, land use change and over-exploitation.

From 2007 to 2011, she taught at the University of Hong Kong, where she continues to co-supervise graduate students and conduct research there. Other current areas of study include North America, China, Thailand, Malaysia and Indonesia.

Since 2010, Karraker has led an ongoing study at Fire Island National Seashore, New York, on the impacts of environmental change on the Eastern box turtle, an animal that can live to be 100 years old. The study

– which dates back to 1915 and was begun by John T. Nichols, former director of the American Museum of Natural History – continues a long-term mark-recapture study of Eastern box turtles at the William Floyd Estate, a unit of Fire Island National Seashore.

Every summer, Karraker, with assistance from 15 to 20 students and researchers from URI, University of Hong Kong, SUNY College of Environmental Science and Forestry, Yale University, SUNY Stony Brook University, Cornell University and the National Park Service, gathers population data about Eastern box turtles during a seven-day period to examine population trends and help the park manage maintenance activities such as mowing of fields.

“We wondered what the probability was of being killed if you are a turtle in a mowed field,” Karraker explains: “So, we conducted a study using cabbages, which are roughly the same size as Eastern box turtles, and randomly dispersed them into fields before a scheduled mowing. Based on this study we deduced that the probability of an Eastern box turtle being killed in a field is 40 percent. We also discovered that most of the turtles died due to the mower tires rather than the blade.”

Since 1915, more than 2,000 turtles have been marked, many of which have been recaptured numerous times. After one more year of survey, Karraker will work with National Park Service staff to begin examining relationships between population demography and land use change during the 100-year



Nancy Karraker

Assistant Professor, Natural Resources Science

time period. Karraker’s research combined with the survey results will help her build a management plan for the National Park Service to reduce turtle mortality.


Regarding her conservation efforts, Karraker’s work has shed light on the complications of resolving the endangerment of reptiles and amphibians associated with harvesting. As to whether farming certain species may help ease the problem, Karraker responded with some hesitance.

“Many cultures, such as people in China, Laos and Vietnam for example, view reptiles and amphibians as either as a primary source of protein or medicine,” she explains. “These cultures believe that wild turtles, for example, are much better for their health than any farmed animals might ever be. Also many turtle and frog farms end up becoming pools of disease; they are often overcrowded, contaminated and filled with stressed animals. Disease can quickly spread in these populations and many times animals escape only to introduce diseases to other naturally habituated populations.”

“I am a naturalist through and through. I want to see these same plants and animals that I love for as long as I live.”

- Nancy Karraker





“Imagine the number of mosquitos and flies and agricultural pests that frogs consume on a daily basis. At the end of the day, every single farmer is reliant on the frog.”

- Nancy Karraker

Karraker says teaching children a greater appreciation for reptiles and amphibians is a bright spot on the horizon toward improving conservation efforts, although education often can do little to alter a situation in a poorer socio-economic country. Still, she says, increasing awareness does have the power to slowly change perceptions of how vital reptiles and amphibians are to their ecosystems.

“Just think about pest control for instance,” explains Karraker. “Imagine the number of mosquitos and flies and agricultural pests that frogs consume on a daily basis. At the end of the day, every single farmer is reliant on the frog.”

Curious about other forms of life – including those that frogs eat – Karraker has even had a new species of fly she discovered in Thailand named after her — *Caiusa karrakerae*.

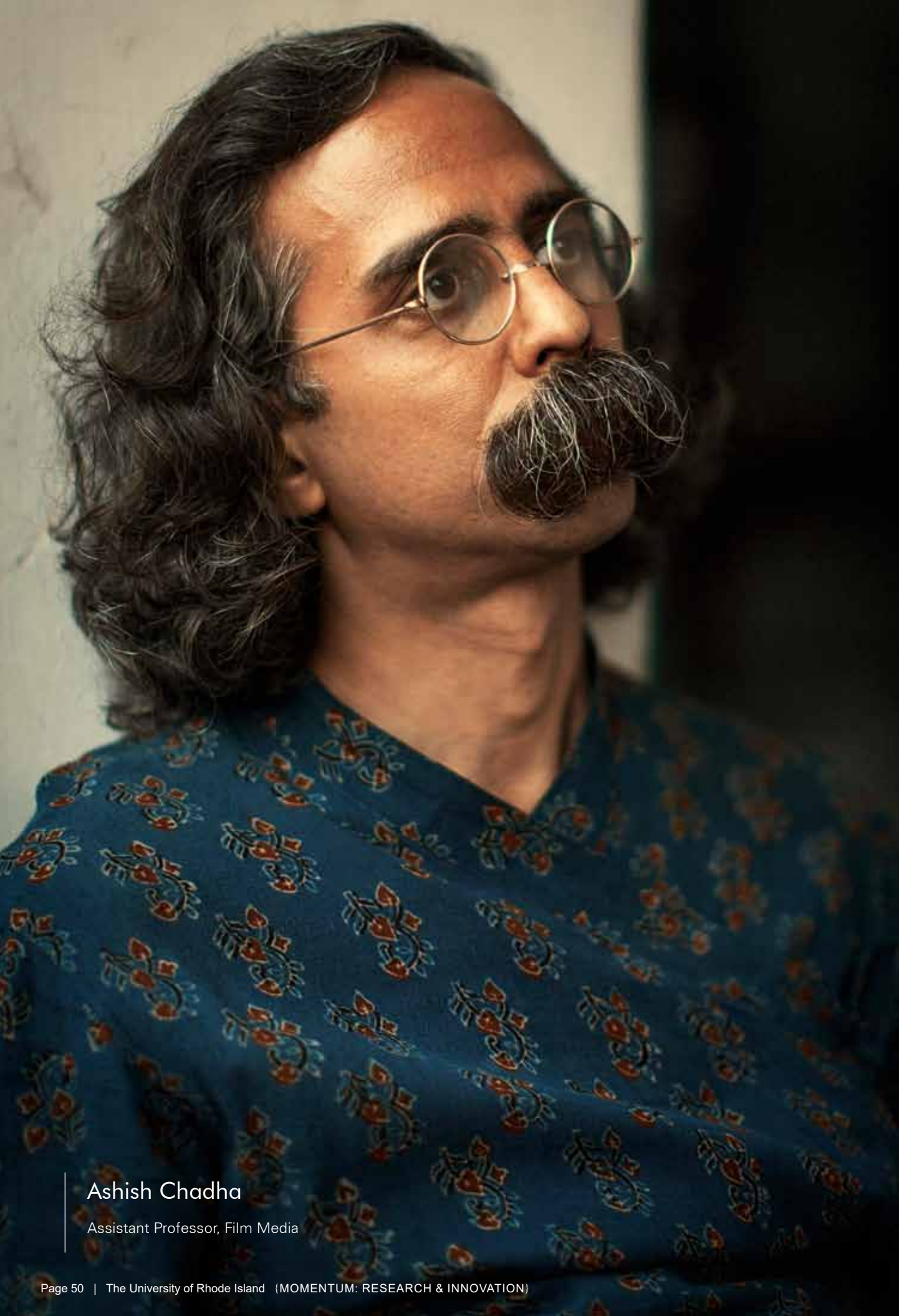


Her future plans include continued research in Thailand and Indonesia. She is especially keen on providing opportunities and making resources available for young female scientists.

“I am a naturalist through and through,” says Karraker. “I want to see these same plants and animals that I love for as long as I live.”







Ashish Chadha

Assistant Professor, Film Media

Photo by Abhinav Goswami



# Death *is not* an END

*It is just another way  
of dealing with life*

*written by* Bruce Mason





photo from the set by Dibyendu Dutta

"I'm not a filmmaker. I am a film artist."

According to Ashish Chadha, an assistant professor of film and media at the University of Rhode Island (URI) the primary distinction between a filmmaker and a film artist is that a filmmaker produces work for the marketplace while an artist produces work for the sake of art; that is, a filmmaker is arguably a product of what the industry demands whereas a film artist creates cinema for cinema itself.

"I think of my films as far removed from the capitalistic exploitation system and the marketplace," Chadha says. "Through my work I am resisting this form of capitalism, where everything has a market value. I work outside the industrial, corporate mode and make films as an artist would make an artwork."

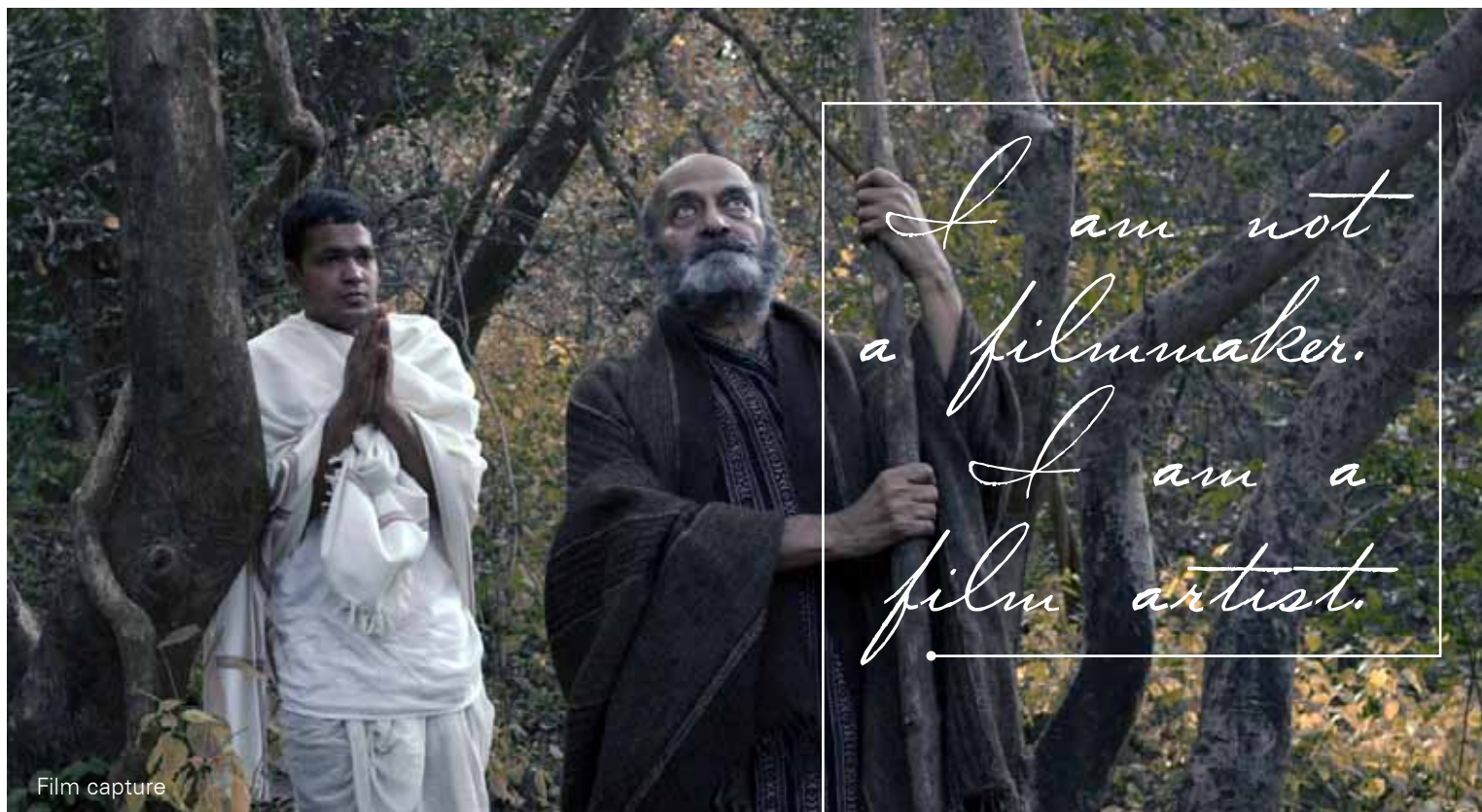
Chadha largely finances his own work, which grants him the freedom to manifest his visions wholly to life — on his own terms, unfiltered, uncompromised and uncensored.

Before joining URI's faculty five years ago, Chadha earned a Ph.D. in cultural anthropology from Stanford University and taught at Yale University. In addition to his film and anthropology background, Chadha — a lifelong student and scholar of Gandhian philosophy — often mobilizes on campus awareness of Mahatma Gandhi's thinking on nonviolence.



photo from the set by Dibyendu Dutta





Film capture

“For me Gandhian thought and philosophy forms the core of my being. Although I do not employ it in my classroom work in an ostensibly or obvious way, it informs my teaching practice,” Chadha says. “However, my film making practice is greatly informed by Gandhian thought, especially in the way I shoot and produce my work. I make it a conscious practice to produce my film within a slim budget, that it is shorn of any excess.”

Chadha’s films are highly formal meditations on ritual, time and death. They are rooted in Indian religion, philosophy and history, in an aesthetic

idiom that he refers to as mythic realism. He describes this form of cinema as “a filmic intersection of the mythological genre and the neo-realistic aesthetic” and explains that early cinema in India was rooted in mythology until it was displaced by melodrama and social drama in the 1930s.

Yet, in the 1980s — with the rise of television — the mythological genre in Indian film resurfaced and captured the imagination of the nation. Chadha, who grew up during this time, draws much of his inspiration from this genus of film; he describes his filmmaking process as a “practice that engages, experiments, transforms and reconfigures this genre of cinematic representation.”

Chadha’s films cast the mythic from the safe haven of paradise to a place of everyday human banality.

“Death is the subtext to all my films in a certain sense,” he explained. “Isn’t all our desire about escaping death? Because life is so seductive that you don’t want to die ever. For me death is another beginning of life. We live in a culture in fear of death and that

is the cause for our misery. The recurrence of death in my work is because I do not see death as an end, but as a productive possibility of infinity.”

Chadha’s films have been shown worldwide in film festivals, galleries and museums. He has made three feature films — *Shadows Formless* (2007), *Katho Upanaishad* (2011) and *Rati Charayvuh* (2013). *Rati Charayvuh*, 105 minutes in length, was remarkably captured in one single shot. Most recently, his short film *Vakratunda Swaha* (2010) was long listed for the Skoda Prize for Indian Contemporary Art, 2011, and was featured at Taipei Biennial 2012.

Currently, Chadha is busy working on four films, each of them in various stages of production. He is shooting two films, the first of which explores the concept of reincarnation and rebirth, and the second — which is based in his home city Calcutta — a political picture. A third film he is currently editing was shot for a year and a half mostly in the Hindu



Film capture



Film capture



photo by Harikrishna Katragadda



photo by Sabyasachi Das

town of Virndavan and is ruled by the themes of love, longing and indescribable sadness of living. The fourth, a film called “*Kali of Emergency*” in the final stages of post-production, is a film he has been working on for the past seven years.

Describing “*Kali of Emergency*,” Chadha says, “It deals with metaphysical turmoil in times of political emergency, and the idea of divine intervention. It is based on the belief of Kali. She is the Goddess of death and destruction in Indian religiosity and she is also the presiding deity of Calcutta.”

Although he has been influenced by many filmmakers, Chadha says that the Soviets Andrei Tarkovsky and Sergei Parajanov, along with the Italians Passolini and Godard are among his strongest influences. Indian film makers such as Ritwik Ghatak, Mani Kaul and Kumar Shahani have a great impact on Chadha’s work as well.

Influences aside, Chadha is keen to note that he creates as an artist and not as a filmmaker. “I’m always playing with continuity. If you see a Picasso painting, you’d know it’s his. Similarly, if you see a Chadha film, you’d know that it’s mine.”





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