

# EARTH MATTERS

The annual bulletin of the Institute at Brown for Environment and Society • Vol 4, FALL 2018



## LAB TACKLES CLIMATE CHANGE LEGISLATION LOCALLY AND GLOBALLY

How industrial history  
shapes environmental inequality

Understanding humanity by looking  
through birders' binoculars

Innovative technology aims to improve  
air quality predictions



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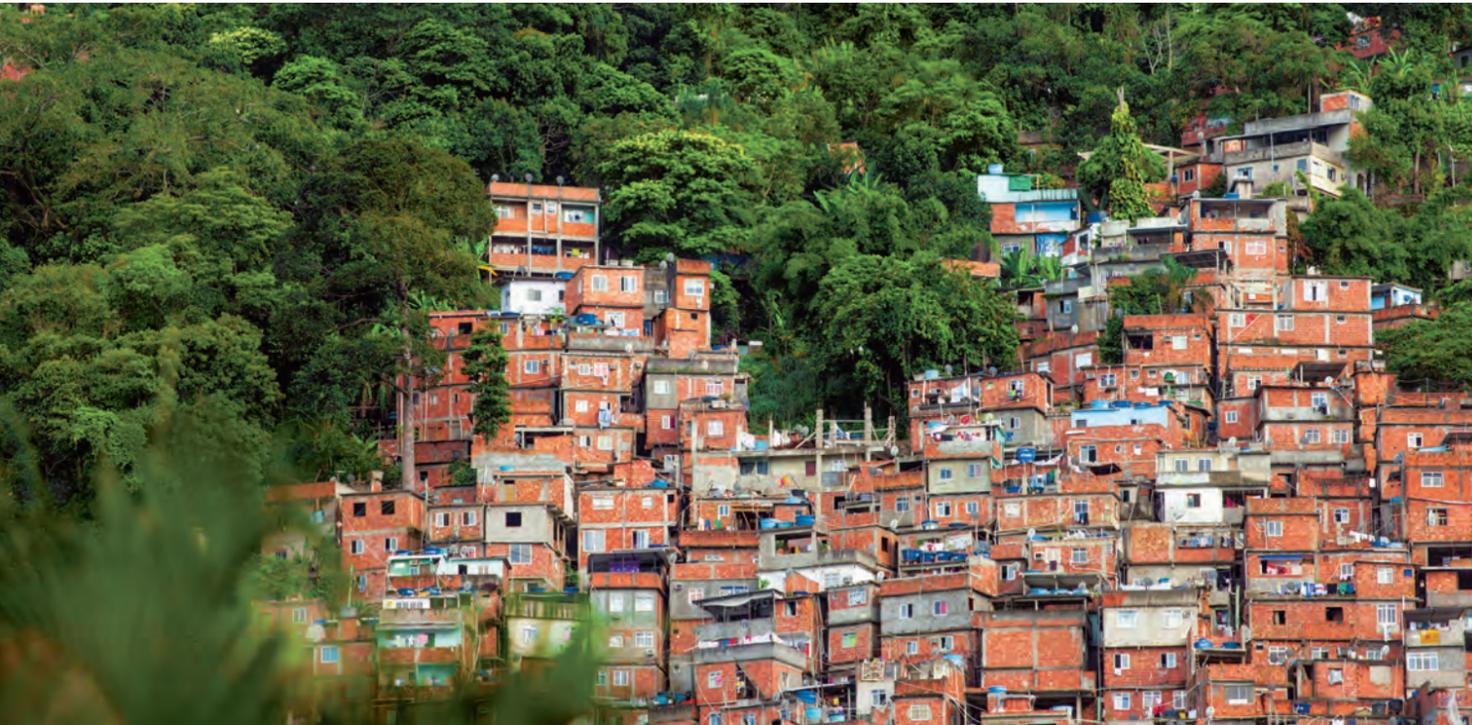
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- land change science
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## LETTER FROM THE DIRECTOR

*The cowman who cleans his range of wolves does not realize that he is taking over the wolf's job of trimming the herd to fit the range. He has not learned to think like a mountain.*

—Aldo Leopold

The legacy of environmental thinkers such as Thoreau, Muir, and Leopold became the chief manner in which the United States encountered the more-than-human world in the 20th century. Muir's late-19th century memoirs of the American West, accompanied by photographs of Yosemite and Yellowstone, evoked in European colonists and their descendants a profound sense of proprietorship over the natural domain of North America. Muir's vision lay the foundation for an ecological myth of "nature without humans." In national parks across the United States, this meant the removal of all human activity. The cattle owned by settlers acting on manifest destiny were as unwelcome as the towers of acorn stored by the Ahwahnechee.

The American wilderness myth has demonstrated a remarkable tenacity throughout a century that has otherwise focused on the control and mastery of nature. New generations of Americans have found inspiration in this view of wilderness, vast and untamed; simultaneously, the land has served as a foundation for the wealth of the nation. But a proposal has emerged in recent years:

that of *decoupling*—a program to develop workable prescriptions for the corollary "humans without nature." Many now suggest that decoupling is inevitable and, indeed, already underway.

Decoupling is a concept that demands profound inquiry. For example, the boundaries between the decoupled worlds of humans and nature will need to be governed, and will result in some degree of sacrifice. With the inevitable need to locate producing and polluting activities somewhere, there will be human settlements and natural systems exposed to hazards. Environmental justice activists have cogently demonstrated that decisions over the placement of these sacrifice zones disproportionately affect already-marginalized people. Authoritarian dispossession of biodiverse landscapes has a long history from colonialism to the gentrification of peri-urban areas. Furthermore, from water management to antibiotic resistance, progress has a history of further entangling humans in the natural world.

Answers call for a deeper understanding of the more-than-human, and how coupled human-natural systems can evolve with dignity and justice for all. To secure our shared future, this understanding is critical.

Amanda Lynch, Director

## ENGAGEMENT IN A WARMING WORLD: TACKLING CLIMATE CHANGE POLITICS FROM THE INSIDE OUT

“I am the luckiest person in the world because I get to do the things that I love and get paid for it.” So says J. Timmons Roberts, sociologist and Ittleson Professor of Environmental Studies. It’s cliché, but any listener can tell immediately that he means what he says.

Indeed, this is a professor whose “loves” include advocating for justice toward developing countries, participating in local democracy, and introducing students to the joys and satisfactions of engaged scholarship.

Roberts, who has been teaching at Brown since 2009, is famous on campus for *Engaged Climate Policy*, a popular and competitive undergraduate course that grants entry into his prestigious Climate and Development Lab and which, until recently, included an all-expenses-paid trip to the annual United Nations climate negotiations.

There, students would partner with one of Roberts’ doctoral students or postdocs to work alongside partners such as NGOs, international agencies, research institutes, and environmental organizations, usually based in Europe or in developing countries.

As Roberts explains, the Climate and Development Lab’s goal has been to provide research-based assistance to these partners based upon what the partner deems useful and what lab members find interesting.

“A lot of promises have been made over the 26 years of climate change negotiations to help developing

countries adapt to climate impacts and make the transition to clean energy,” says Roberts. “And a lot of the information the lab has produced has been about whether those promises are being met.”

For instance, in 2016, Roberts and five undergraduates teamed up with Saleemul Huq of the International Center for Climate Change and Development in Bangladesh—one of the lab’s engaged partners—to conduct research and write a paper that is now being used within the UN as it drafts new policies on climate finance.

After a workshop at the UN’s Bonn, Germany headquarters, their report was revised and reissued in partnership with the German Development Institute as two academic articles. These articles are now being cited in peer-reviewed journals, UN policy documents, and at the negotiations themselves.

“That is an example of the model of how my lab works,” says Roberts. “We work with partners, we identify something that’s timely and needed, we mobilize, we do the work together with them, we put it out in public,



Some members of the CDL at the largest climate change protest ever held in Latin America: Lima, Peru, November 2014. Left to right: Tory Hoffmeister, Timmons Roberts, David Ciolet, Cassidy Bennett, Ali Kirsch, and Keith Madden.

and we get feedback. And then we have a lot more information when we turn it into a peer-reviewed article or use it for material in books.”

### FIRST AND WORST

Climate finance is an area of special expertise in the Climate and Development Lab. As Roberts explains, despite the fact that wealthy nations have historically emitted the most greenhouse gases, and are thus most responsible for climate change, it is the least developed countries and low-lying island nations that will feel the strongest effects.

“They didn’t cause the problem, but they’re dealing with the impacts first and worst,” he says. “And they’re not as able as we are to prepare for, to cope with, and to recover from the disasters.”

In wealthy countries like the United States, storm preparedness efforts comprise a constellation of services, such as sophisticated weather forecasting agencies, complex emergency management protocols, and sturdy shelters and evacuation routes.

In many developing nations, however, few if any of these systems are in place. Low-lying roads, poorly constructed residences, deeply entrenched socioeconomic inequalities, and weak civil society and governmental support combine to make intense storms far more impactful and devastating.

“There’s a complex web of social and political and historical factors that have driven people to be living in precarious places in developing countries,” says Roberts. “Millions and millions of people live without much means to respond.”

This is why the kind of work that the Climate and Development Lab does is essential.

“A benefit of attending to the costs of adaptation is to provide pressure, to help the wealthy countries see that it’s in their interest to prevent these impacts,” Roberts explains, “because it’s so difficult to adapt, it’s going to be wildly expensive, and there are some things you just can’t adapt to.”



Members of the Climate and Development Lab attend the November 2017 UN Climate Talks in Bonn, Germany. Back row: Emma Illick-Frank, Anna Messer, Stacy-Ann Robinson, Timmons Roberts, Ian Lefond, Gregory Hitch. Front row: Alex Barba, Allison Meakem, Lauren Maunus.

## CLOSER TO HOME

Now that the United States has announced its withdrawal from the United Nations' hard-won Paris Agreement, Roberts is changing the course of his lab.

“Really, the way countries behave is mostly determined not by what happens at the negotiations, but rather by what happens back home,” he says. “In the U.S., the action is in Washington, in the state capitals, and in the congressional districts—so that’s where I’m turning my lab to work now.”

In November, Roberts and the Climate and Development Lab will spend a week engaging in targeted events on Capitol Hill: a briefing in the U.S. Senate hosted by Senator Sheldon Whitehouse (RI-D), a public debate on an environmental issue, student-led interviews with key players, and more. He is hopeful that his lab will be able to get their research and policy briefings into the hands of Congresspeople and staffers who could help chip away at climate misinformation here in America.

The pivot in Roberts’ lab builds on years of work on climate change at the local level. He and his lab have

spent the last decade advocating for better legislation to curb greenhouse gas emissions in the Ocean State.

For instance, many Climate and Development Lab members have been actively engaged in drafting a proposal called *Energize Rhode Island*, a state carbon tax and dividend bill that Roberts, his students, and other concerned agencies helped draft and have been providing technical support for since 2014.

“This has not passed in any states yet in the U.S., but I think Rhode Island can be first,” he says. “That’s my goal—to show how great carbon pricing is, both for the state economy and for reducing our emissions, why it works, and why it’s helpful.”

Moreover, as Roberts explains, Providence makes for an excellent living laboratory.

“As I say, Rhode Island is a scale model of a state. If you want to convince the State Senate to create a new policy, you go to the Senate Environment and Agriculture Committee and it’s like talking to a group around a dining room table,” he laughs.



**Left photo:** Lauren Maunus and other IBES undergraduates attend the signing of Governor Gina Raimondo’s climate executive order in September 2017. Photo: Kai Salem. **Right photo:** The CDL stops for a selfie with two members of Congress at the UN Climate Negotiations in 2015. Back row: Jonathan Gewirtzman, Timmons Roberts, Senator Sheldon Whitehouse (D-RI), Kailani Acosta, Guy Edwards. Front row: Senator Cory Booker (D-NJ), Sujay Natson, Crystal Avila, Mili Mitra.

“It’s human-scale democracy, and it’s very satisfying. To me, it’s very hopeful. Legislators and agency staff know you, and they get to know the students.”

## ENGAGEMENT IS KEY

Having been a player in these types of negotiations at all scales, Roberts knows that both environmental activists and leaders have to be realistic about the challenges our power-driven society poses.

“We will solve the problem of climate change because we have to, but we’re not going to if we don’t understand how society makes decisions,” he says. “We can’t pretend that good science is going to drive good decisions, because it’s not happening. You *have* to understand the science, and we should be informed by the science—but we have to understand why the science isn’t getting into the policy.”

He is also confident that, although both possible and profitable, any transition away from fossil fuels would need to be made with a strong eye toward justice.

“If it’s not fair, it’s not going to happen quickly,” he says. “We have groups like coal miners who were not well-taken care of by the past administration, who

didn’t feel included in the decisions. They didn’t see a pathway to a good future, so they are part of a resistance coalition now.”

“Fossil fuel companies need to be pressured to stop undermining science-based policy,” he adds, “but they also need to see a pathway to a forward-looking business model.”

As a sociologist, Roberts has devoted his career to studying who wins and who loses in human society. And although he has big goals, he is realistic about what it will take to ensure those goals are achieved.

“I want to achieve net zero emissions by 2035,” he says. “In Rhode Island, we need to take away the subsidies from fossil fuels. I want to see the United States become a leader again on climate change. And I want to see the global community addressing this.”

“In other words, I have a lifetime of work,” he concludes, with a wry chuckle. “It gets me up in the morning. I know none of this is going to be easy. I think the odds are very low that we’ll succeed. But we have to try. If I didn’t try, I wouldn’t be able to sleep at night.” ■

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## GONE BUT NOT FORGOTTEN: OLD INDUSTRIAL SITES CAN LEAVE A LASTING IMPACT ON PROVIDENCE

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The Rhode Island of yesteryear was famous for its bustling manufacturing sector. Between the late-18th and mid-20th centuries, a world-class network of textile mills, jewelry-making factories, and other industrial facilities bloomed across the center of the state.



A child explores a canvas map of neighborhood industrial sites through time at the Providence Children's Museum. Photo: Clara Sears

Few of these manufacturing sites operate today, but the legacies of their historical activities likely live on in the local environment—whether city-dwellers know it or not. Sociologist Scott Frickel and his team are on a quest to catalogue not only active industrial sites, but also those whose doors closed during the second half of the 20th century, in an effort to shed light on the chemical contaminants that may pose risks to the modern inhabitants of the Ocean State.

Graduate student Thomas Marlow has spent his time in the Frickel lab poring over dusty manufacturing directories, combining their data with Geographic Information Systems technology, and refining computer code in order to craft an extensive database of every industrial facility that operated in the state of Rhode Island between 1953 and the present.

With the help of computer scientists from Brown's Data Science Practice, he created an algorithm that not only geocodes locations, but is also automated and has the potential to perform similar work on directories from other states.

“Our database is unique in its geographic specificity and the historical time period that it covers,” says Frickel. “No one else is working with site-specific data for every single facility that has operated over a 65-year period across an entire state.”

“What we can do with that level of comprehensive data is to really understand, in very spatially and temporally-specific ways, how environmental inequality changes.”

### DATA AND DEMOGRAPHICS

By combining their detailed industrial site data with historical census information, Frickel and his team can explore how neighborhoods change in relation to both active manufacturing sites and inactive, historical ones—what the team labels “relic” or “legacy” industrial sites.

For instance, between 1980 and 2010, an analysis of Frickel's data reveals specific environmental inequalities in the old manufacturing core of Rhode Island: both African Americans and Hispanics tend to live in neighborhoods with more active and relic industrial sites than whites.

And Frickel has also found something more novel—that environmental inequality looks different for some affected populations than it does for others.

For example, since 1980, African Americans in the Providence area have tended to live in neighborhoods close to both active and relic industrial sites. Hispanics, on the other hand, have tended to live in areas that are rife mostly with legacy sites—where there is much less current economic activity and much more densely concentrated historic contamination.

“This suggests that African Americans are living in more economically vibrant neighborhoods than Hispanics,” says Frickel. “On the one hand, they're living closer to currently-active industrial activities, so there are the risks that go along with proximity; but those kinds of places are also the kinds of places that regulators tend to pay more attention to.”

Frickel's research is innovative in its attempt to answer open questions regarding where environmental contaminants exist, what types of contamination persist, whether or how people are exposed to such contaminants, and which populations are most at-risk.

“Group by group, we can think about historical changes in active and legacy industrial activity,” says Frickel. “We can really begin to tease apart the nature of the inequality that exists, and how that inequality is changing for different social groups over time.”

### HEALTH AND HAZARDS

But Frickel and his team want to do more than understand the nature of environmental inequality in Providence—they want to put their database to work addressing it. Indeed, the lab is now working with regulatory agencies to connect its analytical potential with tangible public health benefits on the ground.

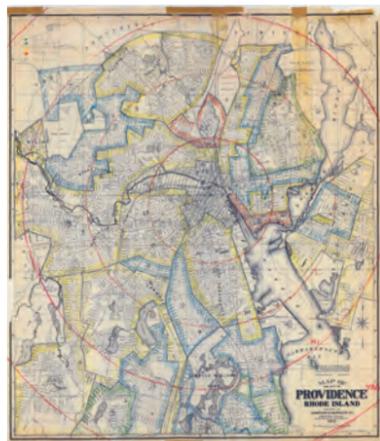
Historically, such agencies have tended to focus mainly on large, active industrial sites—not the older and often smaller hazardous sites that Frickel and his lab are uncovering.

“We don't know a lot about the contamination on these sites. They come and go, other things get built on top of them, and cities chug along. Nobody's paying attention,” he explains. “Our work really shines a spotlight on a gaping hole in regulatory policy and regulatory knowledge and practice.”

A birds-eye view of downtown Providence in the 1930s (**top**) and 1960s (**bottom**) reveals radical environmental and social changes. Photos: Providence Public Library/ City of Providence



A color-coded bank map (**below**) from the 1930s, revealing Providence neighborhoods categorized by industrial hazard level. This practice, known as redlining, enabled banks to limit lending in certain neighborhoods, reinforcing racial segregation in patterns that still exist today. Image: Home Owners Loan Corporation



One way that Frickel and his team have introduced their work to the regulatory sphere is through a recent collaboration with the Rhode Island Departments of Health and Environmental Management.

Together with postdoc Jennifer Guelfo, database creator Marlow determined which public water sources would be at greatest risk for contamination by an emerging class of industrial chemicals called per- and polyfluoroalkyl substances, or PFAS.

These dangerous chemicals, which could once be found in everything from non-stick coatings to fire extinguishing materials, were used at Rhode Island manufacturing sites from the mid- to late-20th century and are still extremely persistent in water systems.

Using the team's recommendations as a guide, the Rhode Island agencies tested the most at-risk public wells and groundwater recharge stations for contamination.

To Frickel, this partnership illustrates the practical power of his team's database.

"We've already had an instance where this knowledge has been used at regulatory agencies to help them do their job," he says.

### DISSEMINATION AND CITIZEN SCIENCE

Analyzing local drinking water isn't the only way that Frickel's work has been trickling down into the local community. He and his team are also hard at work making all of their data accessible to the public via an interactive website that is slated to launch by late 2018.

By exploring maps and other visual graphics, Providence citizens will be able to drill down into their very own neighborhoods to see how the places they call home have changed over the decades.

"My hope is that we will be partnering with other institutions in the city to get our information out into

neighborhoods," says Frickel. "To use the website and the geospatial data as a starting point for conversations with neighborhood groups and a seedbed for collaborative citizen-science types of projects."

Frickel and his team hope to engage in talks with Providence Mayor Jorge Elorza, aiming to employ his office's neighborhood liaisons to help generate an interest in what Frickel calls "public environmental history."

"I really see the data that we're bringing to bear on this as a platform," he says. "Other kinds of crowdsourced knowledge can be brought onto the website to build it up, and it becomes a real community resource that way."

And it isn't just adults that Frickel and his team hope to reach. Last summer, the Providence Children's Museum piloted an exhibit that featured the team's industrial site data spread out over a huge, painted canvas map of its very own neighborhood: the old Jewelry District.

"They laid it out for kids to run around on, look at, and ask questions about," says Frickel. "The larger hope is that our data will get incorporated into a permanent exhibit at the museum so it will inform not just the little kids that visit the museum, but the parents and families that bring them there."

Indeed, Frickel's work has implications for all of the city's populations: adult residents who are concerned about persistent chemicals in their neighborhoods, policymakers who need to know about potential sources of environmental contaminants, and children whose own adulthoods may be marked by emerging contaminants as climate change and increased flooding expose hazards that lurk in abandoned, riverside factories.

"When we think about the impacts of a changing climate, legacy contaminants are going to factor in in important ways," says Frickel. "I think that's another area where we'll be able to help provide a base of knowledge that will help policymakers when they get around to trying to mitigate its effects."

But all of this groundbreaking work starts with the data.

"As a social scientist, I'm really interested in what cities are, how they work, and how they change in relation to the natural environment," Frickel concludes. "This database is going to allow us to do that at a fine grain of historical detail that nobody has ever attempted before. That's very exciting to me." ■

### postdoc spotlight



**Stacy-ann Robinson** knows firsthand that small island nations face outsized consequences when it comes to climate change. In her home country of Jamaica,

rising and warming seas are threatening the already-fragile human and natural environments, and the work of adapting to these and looming future changes is both expensive and complex.

Robinson, now a Voss Postdoctoral Research Associate in Environment and Society, is hard at work deconstructing global policies that address climate change, and their effects on vulnerable places and populations. She began acting as a "voice" for small islands at the

international level while representing Jamaica in the Second Committee of the United Nations General Assembly, and quickly realized that island nations hold a unique, and often overlooked, geopolitical position on the world stage.

As Robinson explains, although there are enormous differences between the adaptation capacities of developed and developing nations, there are also inequities between developing nations that are surrounded by land and those that are completely surrounded by water. In short, island nations face unique and pressing challenges that are not only inadequately acknowledged, but often misunderstood amidst outlooks that she calls "idealized visions of island resilience."

"Further, decolonial island studies and rethinking the ways in which islands can

be understood, on and in their own terms, are gaping gaps in the academic literature," she says. "It is my hope that my teaching and scholarship, appropriately positioned at the intersection of environment and development, will make a significant contribution to advancing these discourses—all while promoting enduring narratives of resilience and transformation."

"The varying adaptive capacities in these countries, based on differences in economic, political, and institutional and social circumstances and factors, make a 'one size fit all' approach less than optimal," she concludes. "I believe my work lends a voice to the most vulnerable in our world and helps find answers to what is probably the most pressing problem of our time: climate change."

# Earth, Itself 2018: WATER'S EDGE



1. Attendees admire a selection of items from the John Carter Brown Library's Spring exhibition *Bodies of Water/Bodies at Work*. Photo: Amanda Siegel



2. Filmmaker Myron Dewey discusses drone technology's vital role in the dissemination of Indigenous forms of aesthetic protest against the Dakota Access Pipeline. Also pictured are panelists Jennifer Weston and Lisa Parks. Photo: Amanda Siegel



3. Essayist Akiko Busch, poet Arthur Sze, and author Zoe Nyssa share a laugh during the final post-panel discussion. Photo: Naomi Pedroza



4. Poet and Professor Emeritus Forrest Gander shares an excerpt of his work at the closing reception. Photo: Naomi Pedroza



5. IBES graduate affiliate and special mention awardee Emily Joyce presents her innovative research at the annual poster competition. Photo: Amanda Siegel



Join us for next year's **Earth, Itself** event in **April 2019**  
*Blue Sky: reason and imagination is an interdisciplinary exploration of the future, including both the fanciful and the urgent and practical ways in which we need to manage Earth and our citizenship.*

## INTRODUCING: SAMIAH MOUSTAFA, VISITING FELLOW



Physical geographer **Samiah Moustafa** has joined the roster of IBES Fellows as Visiting Assistant Professor of Environment and Society.

Moustafa, who earned her PhD from Rutgers University in 2017, has been interested in science ever

since she was young. Her interest in environmental science was not limited to one particular time or space; she explains that pursuing a career as a physical geographer has allowed her to take advantage of the field's wide breadth.

"The interdisciplinary and multi-methodological nature of these disciplines ultimately encouraged me to pursue a graduate degree in Geography that focused on understanding how anthropogenic climate change impacts high-latitude regions, and particularly, the Greenland ice sheet," she says.

Moustafa is thrilled to join IBES for its collaborative potential.

"The institute offers the opportunity to support critical research," she says. "In my case, understanding how the Arctic is responding to atmospheric warming, and its implications to sea level rise—and how this system will impact the natural, human, and social systems."

"Understanding these pressing issues from multiple lenses is now possible from the diverse expertise of my colleagues in the institute," she adds. "I look forward to working with institute scholars to understand and solve some of the world's most pressing environmental issues."

### graduate student spotlight



Once upon a time, **Kimberly Neil** dreamed of becoming a wildlife veterinarian. But then she fell in love with research—in particular, genomic rabbit research.

Neil's current work looks at two similar species: the New England cottontail, and the Eastern cottontail. As she explains, with the exception of a few, isolated populations, the native New England cottontail has all but disappeared from the region that inspired its name. Meanwhile, the nonnative Eastern cottontail, which was introduced to the area in the early-mid 1900s, has thrived.

For Neil, it all starts with a piece of genetic material harvested from each rabbit species, thanks to her collaboration with scientists at the University of Rhode Island, Roger Williams Park Zoo, and Queens Zoo, as well as nearby state wildlife biologists. In the lab, she extracts DNA from each sample and uses high-throughput gene sequencing technologies to sequence the rabbits' own immune system genes, as well as bacterial and parasite genes present in the rabbits' microbiomes.

"From an applied conservation viewpoint, we know very little about immunogenetics or disease in either of these species," says Neil. "My research draws from conservation genetics, disease ecology, and evolutionary ecology to understand immune system genes, potential pathogens, and bacterial

community—or 'microbiome'—of these two species."

Neil hopes that her research will inform conservation at the local level, but also the wider field of genomics regarding immune genes and the microbiome—not just in rabbits, but in other animals as well.

"The conservation challenges associated with the New England cottontail, and the Eastern cottontail—managing imperiled and introduced species, respectively, captive breeding, translocations—are of worldwide relevance," she says. "Understanding how potential pathogens and immune genes involved in survival vary in these cottontails is highly relevant to other species as well."

## ABRAMS AIMS TO FUEL ENGAGEMENT AT INSTITUTE

On April 9, 2001, Earth—sunny-side up—glossed the cover of Time magazine, sizzling in a cast iron pan above the then-weighty headline “Global Warming”. Inside the issue, brand new research from the Intergovernmental Panel on Climate Change revealed a set of foreboding global climate projections through the year 2100. In one of the possible scenarios, large swaths of the Earth would be uninhabitable within a century.

As Wendy Abrams recalls, this was the date she became a climate activist.

“I had four children under the age of 6 and I thought, ‘God willing, my kids are going to live 99 of the next 100 years. This is their lifetime,’” she says. “That was really my tipping point. And I went from being completely uninvolved to becoming obsessively involved.”

Abrams, a former corporate communicator, immediately offered her services to the non-profit Environmental Defense Fund and flew to New York to meet with the organization’s development department. At the conclusion



“I was really drawn to seeing kids experience the Globes with awe,” says Abrams. Here, a young child attends the Chicago opening in 2007. Photo: Wendy Abrams

of her trip, a staff member said to her, “It’s so nice to have an environmentalist like you.”

“I literally looked over my shoulder and said, ‘Who are you calling an *environmentalist*? I’m not an environmentalist,’” she recalls.

“I realized then that what we need to do is redefine ‘environmentalist.’”

In Abrams’ view, climate change is not a special-interest issue.

“An environmentalist can be, and is, a businessperson, a soccer mom, a priest, a legislator,” she says.

“Everybody who lives on this planet should care about this.”

But as Abrams explains, people tend to feel hopeless and paralyzed when confronted with the enormity of the consequences of climate change. So in 2007, she launched *Cool Globes*, a public art display designed to encourage attendees to take bite-sized actions to protect the planet.

Each of the installation’s more than one hundred Earth-shaped sculptures was decorated by a different artist, and each proclaimed a single way to reduce emissions. From investing in geothermal energy to turning down the thermostat at home, Abrams and her team identified solutions both big and small to pair with the globes.

“Some of them were so simple,” she says. “The idea was that everybody can do something, to make the issue less overwhelming and daunting.”

The exhibit, which premiered in Chicago, featured an advisory board full of prominent environmental leaders and political figures like then-Senator Barack Obama and Robert F. Kennedy, Jr.. *Cool Globes* has since become a national and international sensation, hitting the streets in Boston, Los Angeles, Jerusalem, Warsaw, Copenhagen, Geneva, and more.

For Abrams, the project was a success—not only because of its worldwide fame, but also because it reaffirmed her belief that, despite political inaction, there are many people who still care about protecting the environment.

“If we find ways to give people a channel to act, they will,” she says.

She compares *Cool Globes*’ dedicated and inspiring group of artists, activists, and leaders to the innovative and ambitious students that make Brown so well-known.

“There are incredibly smart, talented people at Brown who want to do great things,” she says.

Indeed, Abrams is committed to helping Brunonians achieve their goals and make a positive impact on the world. Through her investment in IBES’s new Program for Environmental and Civic Engagement (PECE), Abrams is already facilitating environmental entrepreneurship and community engagement in a tangible way.

Abrams hopes that her contribution will help students maximize their social impact, particularly on the issue of sustainability in a warming world. But she doesn’t want to limit her support to students pursuing environmental studies and science alone.

“I want the students who are studying architecture to understand why they need to make their architecture green,” she explains. “And I want students who are doing product design to design products that are more sustainable. I want students who are going to be doctors or lawyers to see it through the lens of sustainability.”

“I think this generation doesn’t need to be educated on the science as much as they just need to be empowered to act,” she says.



Abrams speaks at the Los Angeles opening in 2009, alongside Governor Arnold Schwarzenegger and Mayor Antonio Villaraigosa. Photo: Christine Belgrad

For Abrams, action doesn’t have to take the form of some huge, international project. Even a simple activity such as registering to vote can be, as Abrams puts it, “a game-changer.”

Despite her personal successes, she is certain that, by backing young people who want to make a difference in their world, she is supporting some of the most important work of all.

“I don’t need to come up with the answers. I just need to help fuel their energy,” says Abrams. “They will do great things if we can help them get to the starting line.” ■

# SECURITY, SUSTAINABILITY, AND THE SACRED

Postdoc champions Indigenous right to traditional foods

At age 19, Mariaelena Huambachano immigrated to New Zealand. Born and raised in Chorrillos, Peru, she had never thought much about her own Indigenous heritage—until she found herself in a small Māori town. There, she struck up a conversation with a local man about a crop she herself knew well: the *kūmara*, or sacred sweet potato.

Huambachano realized then that there was a strong spiritual and cultural connection between her own Peruvian ancestors and the Māori, and decided to dedicate her career to studying Indigenous ways of knowing about the environment and food security.

As she explains, the Indigenous understanding of the environment is holistic. To native peoples, the land isn't simply a piece of soil that needs to be exploited to solve food challenges. Instead, the land is both an agricultural space and a sacred space, and both human and nonhuman relations work together to steward it.



Huambachano works in the maramataka (food garden) of Wai A Ariki Food Forest Onerahirahi community, on the North Island of Aotearoa-New Zealand. Photo: Mariaelena Huambachano

Indeed, Indigenous perspectives on food security are much more than agricultural practices; they emphasize Indigenous peoples' collective self-determination and cultural rights for the respect, nurturing, and preservation of the land.

But modern industrial food production has disrupted this environmental synergy for many Indigenous groups, with dire consequences for health and well-being.

"In New Zealand, I found this food security paradox," says



**Top image:** Mariaelena Huambachano converses with a group of 'Andean seed keepers,' or ladies of Choquecancha (Quechua Communities), who live at an altitude of 3,800m in the highlands of Peru. Photo: Mariaelena Huambachano. **Bottom image:** A collection of Quechua native seeds. Photo: Mariaelena Huambachano

Huambachano, who recently concluded a postdoctoral research position at Brown in American Studies and Ethnic Studies. "It is this amazing country—one of the largest world producers of dairy products. And yet, Māori communities are suffering from obesity."

"And in the Peruvian highlands, there are a variety of Indigenous crops," she continues. "Biodiversity is so vibrant and unique. But Quechua and Amazonian communities are suffering from malnutrition and water scarcity."

According to Huambachano, food insecurity among native peoples stems from colonialism and the associated confiscation of land by Western settlers. In Peru, for example, Spanish colonization came without respect for Indigenous sovereignty.

"Dispossession of the land is linked to loss of traditional knowledge practices when it comes to harvesting the land," she explains. "This also had a huge impact on Native Peruvian people's well-being, because the sustainable way that they are used to producing food supports the growth of food that is healthy for the spirit, the soul, and the body. They had a way of caring, respecting, having this mutual relationship with the environment—and that's been disrupted."

Moreover, says Huambachano, this intimate relationship with the land has been replaced for many Indigenous communities with commodity foods.

"Especially in North America, Native communities suffer disproportionately from type 2 diabetes, and one of the reasons is due to the disruption of their 'collective food relations' caused by government imposition of processed foods in their diets" she says. "In New Zealand, it's the same."

"And it does not just affect Indigenous communities," she adds. "If we think about it, we just have the option to go to supermarket. We're limited with our accessibility to sustainable foods. We don't have control over the food systems. We

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## SQUAWK OF THE WILD: HOW ONE INSTITUTE HISTORIAN LEARNS HISTORY BY STUDYING BIRDS

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It is 1998 and Nancy Jacobs stands awestruck at Lake Baringo in Kenya, floored by the immense wisdom of a local bird guide. Globally known as a birdwatcher's paradise, the lake is home to more than 350 species of birds—and the guide seemed to know all of them.



An African Grey Parrot. Photo: Pixabay

“I thought, ‘*how* do you know all these birds?’” she recalls. “Is it what you learned from your grandparents? Is it what you learned in the countryside? Or, did you learn it from ornithological books so that you could become a guide?”

“And then I thought, *how do any of us know what we know?*”

### WAYS OF KNOWING

Jacobs, a social historian by training, focuses her studies on South African history and was one of the first in her field to deliberately focus on the environment there atop the more classical themes of race and class. She would ultimately go on to write the book *Birders of Africa: History of a Network*, a 325-page treatise on understanding both birds and the people who knew them well.

In her book, Jacobs explains that, historically, there have been three ways of knowing about birds in Africa. There is ornithology, the predominantly white, scientific discipline characterized by classification and attribution.

There is vernacular knowledge, the sometimes variable, tacit, field-based understanding of birds that exists in various forms all over the world and comprises what is important to know for everyday life. In Africa, Jacobs found that this might mean migration schedules, ways to prevent airborne attacks on farm animals, or an understanding of the one bird whose heart makes a particularly potent love charm.

And there is recreational knowledge, which includes the helpful guidance and handy tips that birders pass down to one another without necessarily knowing where those tips originated.

“I didn’t want to talk about ornithology as being the ‘correct’ way of knowing about birds while vernacular was something secondary,” says Jacobs.

In fact, vernacular experts objectively did know more than ornithologists did—about *living* birds.

“For the longest time, ornithology, which you’d think might be the most privileged and authoritative ways of knowing about birds, was just about classifying

dead birds’ bodies,” she says. “Whereas the vernacular knowledge in Africa was about living animals, and something a lot closer to ecology.”

Jacobs’ analysis is bolstered by a series of biographies of both ornithologists and vernacular birders, whose surprisingly real and intimate relationships were made all the more complex by their existence within a powerful system of class, race, and colonial control.

“All over the world there was a difference between scientific knowledge and vernacular knowledge,” she says. “But once you put race and colonialism on top, as happened in Africa, the politics become exceptionally power-laden.”

For example, colonial ornithologists relied on vernacular experts, who would hunt and preserve the bodies of birds, so they could ship them back to European museums and cement their own work within a burgeoning scientific taxonomy.

At the same time, scientists were writing about the inferiority of African knowledge about nearly everything, including birds.

“Ornithologists were completely dependent on African knowledge about the birds in order to construct their own knowledge, but they had to draw lines to distinguish themselves from what they said was inferior,” says Jacobs.

### AS THEY LIVE AND BREATHE

After publishing *Birders of Africa*, Jacobs set her sights on a new project: one that wouldn’t be so reliant on either culturally-laden remembrances of living animals, or accessible, but lifeless, written accounts of dead birds in drawers.

And on a sunny day at India Point Park in Providence, inspiration struck. A young man walked by, and on his shoulder sat an African Grey Parrot.

“I thought, ‘That bird is African! And that bird is here!’” she recalls. “It was like when I was at Lake Baringo and I saw the bird guide. Everything opened up.”

Jacobs knew that not only did this parrot hail from the forests of Africa, where she was already accustomed to studying environmental history, but that its knack for



**Left image:** The African Grey Parrot has been a popular pet for centuries, as illustrated in many classic works of art such as this 1666 oil painting, *Young woman in a window feeding a parrot* by Caspar Netscher. Image: Public domain. **Right image:** Cookie the African Grey with Mary Jo Ballator, owner of the Ash Canyon Birding Accommodation in the mountains of southeast Arizona. Photo: Dave Jacobs

human language made it an incredibly popular pet all over the world.

“Suddenly I thought, ‘I can write a global history of this bird,’” she says. “And the bird would be alive.”

As Jacobs explains, African Grey Parrots are vocal learners. And although they may not always mean what we would mean by saying certain words, they are remarkably adept at recognizing context and using human words and phrases at the “right” time.

One former owner of an African Grey recounted to Jacobs how her parrot would associate the sound of a passing train with her father’s impending arrival from work and would call, “Polly want a drink!,” followed by a drawn-out trill reminiscent of swirling whiskey, ice, and soda.

But their fondness for people is far from innate. Breeders foster this affection by separating chicks from their parents at a young age and hand-feeding them so that they imprint on humans. This makes them animated and interactive pets, but it also induces within them an intense reliance on human partnership.

Unlike a dog, who comes into a household, locates the Alpha creature, and takes its place in the pack accordingly, parrots join a family as perceived equals through a process called pair bonding.

“A parrot will come into your home and choose its person, and in a sense the parrot will think of that person as its mate,” explains Jacobs. “And once that happens, you’ve got this situation with a creature that is incredibly needy, and really smart, and wants you and only you all the time.”

“They are really dependent and emotionally intimate animals,” she says. “Some people are able to give the birds all they ask for, but it takes a huge commitment.”

Jacobs recalls tales of birds who feel starved for attention who scream, pluck out their own feathers, or even mutilate themselves.

“When they’re plucked like chickens and squawking, they’re not such appealing pets,” she says. “The lucky ones are sent to sanctuaries, like Foster Parrots in Hope Valley, Rhode Island.”

“Parrot keeping can be really tragic,” she concludes.

#### A SHIFTING NARRATIVE

Meanwhile, in the forests of Africa, parrots pair-bond with other parrots; but that doesn’t mean that they do not interact with humans. At the Dja Faunal Reserve in central Cameroon, Jacobs interviewed forest-goers who shared their experiences with the African Grey.

“They had lived with the birds for years and observed a lot about them,” she says. “They hadn’t worked out



Nancy Jacobs interviews a group of locals during her research in Cameroon. Photo: Dave Jacobs

analyses of standard deviations of observed data, but they could tell me stories. And stories are what I work with.”

Whether warning other animals of human presence, scolding humans for straying too far into forbidden territory, or coming to a lost human’s aid and guiding him home, parrots reportedly communicate intimately and effusively with other beings who share their forest.

Could it be that humans are meant to observe, and not to keep—to have relationships with the African Grey, but only at a distance?

As Jacobs explains, it isn’t that simple. The late twentieth-century boom in natural resources traded from Africa included parrots and plantation crops grown on land formerly inhabited by parrots. Habitat loss and rampant trapping for the international market mean that, despite their prevalence in homes around the world, they are actually endangered in the wild. This once-wild species has become a commodity in our economy and an extension of our social networks.

“This is the African Grey Parrot’s anthropocene,” she says. “Every decade, a smaller and smaller proportion of the species actually lives in the wild, where the parrots control their own lives. So it’s important for the future of the species that they’re living with us—but we’re not particularly good at caring for them.”

As Jacobs explains, for centuries birds have entered into communion with people both at will and by force, and in ways that may ultimately come to define their continued existence. And they have served as the linchpin about which culturally loaded human relationships thrived.

Indeed, the birds themselves are living beings; but they are also a vehicle for greater understanding of our own species and our place amidst the complexities of history.

“Birds matter because they’re subjects in relationships,” she says. “When you’re thinking about animal history, you can write about politics as being a multi-species negotiation. Human differences—between Africa and the rest of the world, classes, and cultures—matter a lot, but intra-human politics connect to multi-species interactions.”

“You learn new things about people when you broaden your scope,” she concludes, “but you also learn new things about life when you say, ‘it’s not only people I have to learn about? A whole new world of the past opens up when we try to shed some of our anthropocentrism.’”

“And as a historian, I’m satisfied that those are good stories to tell.” ■

## student spotlight

**Keren Alfred '18**, a native of Jamaica, is passionate about conservation in the island nation's mountain ranges—particularly the Blue Mountains and John Crow Mountains, both located in the eastern part of the country.



Through summer research and independent study, Alfred combined local knowledge and scientific knowledge of endemic plants through the creation of unique, botanical illustrations. Her goal, she wrote, was to “use visual art as a medium to bridge gaps between science and people by highlighting cultural intersections.”

After taking James Kellner's *Community Ecology* course, Alfred decided that she wanted to find an engaging way to communicate the intricacies of plant structure and function to others.

“I thought that looking at the connections plants have to culture would be a good approach, and that led me to ethnobotany,” she recalls. “I tied in botanical illustration because that helps people to identify the plants, and taps into a centuries-old field of study.”

Alfred knows that her work provided a way for fellow Jamaicans to connect with their own, local environment.

“Based on conversations with friends back home, I realize that many of them were interested in my project and wanted to see my finished product,” she says. “While it is a small step, I think it's a great starting point for me. I realized that there are creative solutions to get people to engage with the environment—and that I can start by working in my own country.”

*Security, Sustainability ... continued from page 15*

lost autonomy and our control to decide what we want to eat, and to know how food has been produced.”

In short, Indigenous food security frameworks are not only more environmentally sustainable than industrial ones—they are also better for human health, overall.

But can Indigenous food systems feed a world population that is rapidly rising toward 8 or 9 billion? Huambachano says yes.

As she explains, Indigenous agroecology, which is grounded in local knowledge and reflected in small-scale Indigenous food security frameworks, enables farmers to feed themselves, their families, and their communities without compromising the sustainability of the ecosystems such as land and water. In contrast, industrial food systems not only rely on unsustainable practices, but do so in a world filled with hundreds of millions of malnourished and ill people.

Huambachano cites urban agriculture, farmers markets, and food justice movements such as La Via Campesina, a transnational network of farmers and fisherman, as signs that there is, indeed, momentum toward embracing a more just food security system.

But, she admits, being optimistic isn't easy.

“It's hard, and at times you feel isolated,” she says. “You have to continue when you have these global corporations, and you have these monopoly foods, and you have

these state actors that don't really respect the knowledge provided by Indigenous communities.”

“But on the other hand, it's not just me who feels like this,” she continues. “It's other people too, who I meet in sustainability or food sovereignty conferences, or at the United Nations meetings. That's when we build up coalitions and build up solidarity. So it's a slow process, but we continue to work to preserve our collective rights to food—as well as to support Indigenous peoples' rights to self-determination over their land, and thereby, well-being.”

Huambachano explains that although there is movement toward respecting and championing the rights of Indigenous peoples to food security, it isn't yet enough without buy-in from state actors and leaders.

“I would like to see a larger, more visible change,” she says. “I'm happy to provide evidence and research and reports and ideas. But that would be my goal, for our voices to be heard at the international level, and also by main leaders that can make the change.”

“Everyone has the right to food, but not just any food—not just food that is mass-produced and doesn't have any health value or any quality,” she concludes. “We want healthy and culturally-appropriate food, which is what we deserve and is our human right.” ■

# HACKING THE HUMAN BODY

Postdoc uses computational methods to inform better public health

Postdoctoral research associate **Samantha Kingsley** is an epidemiologist with a passion for using complex data to answer pressing questions about public health.

After spending years in the lab, examining cells under a microscope, Kingsley decided that she wanted to apply her knowledge of biotechnology to the public sphere.

She ultimately earned her Master's of Public Health and PhD at Brown after conducting doctoral work that looked air pollution and its effect on birth outcomes through the lens of *epigenetics*—a mechanism that can control gene expression without altering genetic sequences, and that can change in response to environmental exposures.

Kingsley found that living closer to roadways and having greater exposure to common air pollutants did, indeed, have an impact on the placental epigenome and birth weight.

She also studied the effect of air pollution on an epigenetic mechanism called *imprinting*, a process by which one copy of certain genes is silenced. In imprinted genes, only the maternal copy or the paternal copy is expressed. And if



the wrong one is turned off, it can cause a range of growth-related disorders in the offspring.

Kingsley wanted to know whether changes in expression of these genes could be to blame for changes in birth weight experienced by babies of mothers exposed to smoggy air.

She looked at imprinted genes that were associated with birth weight and found that many of these same genes were differentially expressed in mothers who were exposed to air pollutants during their pregnancies.

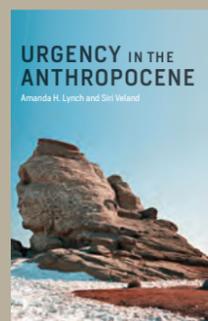
“Imprinted genes are usually associated with growth disorders,” she explains. “So it was interesting that we were seeing links with being a little small or a little large for gestational age.”

After earning her PhD, Kingsley became a postdoc in the lab of Assistant Professor Joseph Braun, an epidemiologist who studies the effects of exposure to environmental chemicals in pregnant women and children.

Her work has shifted from studying the effects of contaminants on

*continued on next page*

## IBES fellows' books out this year



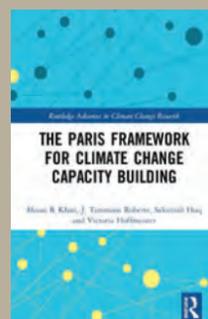
**URGENCY IN THE ANTHROPOCENE**  
Amanda H. Lynch and Siri Veland  
November 2018, The MIT Press

What if the Anthropocene is not a race against catastrophe, but is instead an age of emerging coexistence with earth system variability? In *Urgency in the Anthropocene*, Lynch and Veland utilize a variety of perspectives to examine the interplay between our new state of ostensible urgency and the means by which this urgency is identified and addressed.



**SITES UNSEEN: UNCOVERING HIDDEN HAZARDS IN AMERICAN CITIES**  
Scott Frickel and James R. Elliott  
July 2018, Russell Sage Foundation

In *Sites Unseen*, Frickel and Elliott investigate the industrial history of four different cities in order to determine the fate of land that formerly housed manufacturing facilities. They find that creating sustainable cities requires deep engagement with industrial history as well as with the social and regulatory processes that continue to remake urban areas through time.



**THE PARIS FRAMEWORK FOR CLIMATE CHANGE CAPACITY BUILDING**  
Mizan R. Khan, J. Timmons Roberts, Saleemul Huq, and Victoria Hoffmeister '17  
March 2018, Routledge

In *The Paris Framework for Climate Change Capacity Building*, Roberts and coauthors unearth the ineffective and unsustainable practices of capacity building by bilateral and multilateral agencies in developing countries in the last decade, the gaps and lacunae in those processes, and the way forward. The authors argue that activities in this area have been disparate and uncoordinated, and have failed to build and leave a sustainable long term system in place.

### Hacking the Human Body, continued

children in-utero to studying young children who are exposed to environmental chemicals of their own right. She is now engaged in an analysis of the so-called “metabolome” of 8-year olds, the vast set of chemical compounds found in the body as it tries to break down food, medicines, and environmental contaminants.

The contaminant she is most interested in PFAS, a group of chemicals that includes environmentally ubiquitous industrial surfactants such as perfluorooctanoic acid, or PFOA.

Many studies have shown a link between exposure to PFAS chemicals and having a higher BMI or more fatty tissue. Kingsley wondered whether something about the way the body reacts to these chemicals might be to blame.

Indeed, her preliminary analysis indicates that PFOA exposure is associated with the metabolism of lipids.

“We’re seeing that with PFOA exposure, there are different biological pathways that are being affected, and many involve lipid and amino acid metabolism,” she says.

Information about the children’s metabolomes comes to Kingsley in the form of mass-to-charge ratios, numerical identifiers that depend on the physical characteristics and behavior of each chemical compound. Her task is then to painstakingly identify each metabolite based on its number—sometimes for the first time.

“After that,” she says, “we can do a network analysis to see whether any

of these metabolites are connected in some way, biologically—are they on the same pathway?”

“It’s definitely computationally intensive,” she laughs.

Despite her different research tracks, each of her projects has shared a common theme: connecting high-dimensional data with important public health issues.

“We’re trying to look at epigenetics and metabolomics as a way to understand what’s going on,” she says.

The more Kingsley and her colleagues can understand about the way the human body processes environmental contaminants, the better informed society can be about writing regulations that prioritize public health.

“I became interested in environmental health because when you think about making policy changes, it can have a huge impact on people’s lives,” she says.

People can make all sorts of small changes in their behavior and surroundings, she explains—for instance, choosing to buy BPA-free water bottles, or buying organic produce.

“But you’re still exposed to air pollution, and you’re exposed to these chemicals in water,” says Kingsley. “If you can make small changes on a public scale, you’ll have a greater impact.”

“There’s only so much you can do individually to reduce your exposure,” she concludes. “So regulations are important in order to improve public health.” ■

# OUT OF THIN AIR

## Postdoc deconstructs the atmosphere to improve simulations

As a young child in China, Jiajue Chai wondered why the air quality was so variable. One day it was crystal clear, the next dusty, and the next so hazy that it was difficult to breathe. And so, from Taiyuan to Beijing, Syracuse to Providence, and all over the United States, he has been working toward figuring that out for himself.

Chai is a postdoctoral research associate in the lab of Meredith Hastings, Associate Professor of Earth, Environmental and Planetary Sciences and pioneering biogeochemist. In 2014, the Hastings Lab developed a novel technique for separating different isotopes of nitrogen from nitrogen oxides, or NO<sub>x</sub>: a component of the atmosphere that is responsible for smog, acid rain, and more.

By analyzing the types of nitrogen present in air samples from different environments across the country, Hastings, Chai, and the rest of the lab are piecing together a method of identifying what types of reactive nitrogen come from what sources.

Chai’s current research focuses on a molecule known as nitrous acid, or HONO.

HONO is important because it is a major precursor to OH, the so-called “atmospheric vacuum cleaner” that



Chai probes NO<sub>x</sub> and HONO emissions from agricultural soils in State College, PA.

reacts with, and thereby starts to clean up, many of the primary pollutants in the lower atmosphere, and potentially generate a large number of secondary pollutants.

But scientists don’t fully understand where HONO comes from. Its primary sources—wildfires, soil, and vehicle emissions—have been somewhat identified; however, these sources don’t account for the amount of HONO that researchers like Chai observe in the atmosphere.

“Air quality models always underpredict and underestimate

the HONO we observe in the field,” he says. “That means there are significant, missing HONO sources in the model. We want to find those sources, constrain them, and quantify them so as to improve the air quality model predictions.”

Chai’s work requires traveling all over the country, using a customized instrument to collect air samples from different places, and transporting them safely back to the lab. He then uses the state-of-the-art technology at Hastings Lab to make two crucial measurements: how

Out of Thin Air, continued

much HONO is in the air, and what composition of isotopes makes up the HONO.

He explains that the instrument, which he designed and created himself, enables him to collect this data in a novel way.

“The whole idea is not brand new, but the combination is new—especially the application for isotopic signature determination,” says Chai. “This is the first system with the capability to determine the HONO isotopic signatures of oxygen and nitrogen.”

“It’s ‘ho-new,’” he laughs. “And it has very high detection limit, because the HONO concentration in the air is very low.”

So far, his analysis has revealed that different sources of HONO in the air do, indeed, have different isotopic profiles. Last summer, Chai deployed his instrument at a biomass burning site in Montana and a manure fertilized farm in Pennsylvania.

“The isotopic signature from soil is quite different from that of the biomass burning,” he says. “That can potentially be distinguished.”

In order to pick up the isotopic signature of vehicle emissions, Chai has also driven his system across highways up and down the east coast, and has stationed it at an air quality research station right here in Providence. This year, he plans to deploy the instrument at another biomass burning site in the western United States.

Once he has collected enough data to tease apart the isotopic signatures of fire, soil, and vehicle emissions, he plans to begin collecting air samples and determining how much of the HONO in the air has been contributed by each of the sources.

“The next step is that we can sample the air from anywhere,” says Chai. “Then, we can put all the source signatures into a mixing model, which can tell us the relative contribution from different sources.”

Chai’s research will have implications for other atmospheric scientists; however, he also believes that policymakers can and should use this information to inform laws and best practices.

“Understanding the chemistry of soil emissions can serve as a benchmark for determining which sort of fertilizer we want to use and which type of soil management we want to use,” he says. “And many of the biomass burnings in the US are prescribed fires, which are used for soil management. This can all provide useful information for air quality control.”

Moreover, his research is important for its significance to human health. With any luck, future atmospheric scientists will not need to get share Chai’s own experience enduring the effects of poor air quality in order to follow in his footsteps. ■

## graduate student spotlight



As an outdoorsy native of Maine, **Sarah Cooley** has never been a stranger to mountains, forests, or waterways. But a high school backpacking trip to Alaska solidified her love for the natural world, and her fascination with its endless transformation.

“I was amazed by the wildness, remoteness and rugged beauty of Arctic landscapes,” she says. “I became particularly interested when I learned that these landscapes were critical indicators for understanding climate change.”

Cooley, a graduate student in the lab of visiting faculty member Laurence C. Smith, has channeled her enthusiasm for the wild outdoors into a research project that employs remote sensing technology to better understand the ways that lakes and rivers are changing in the Arctic. Her unique, automated approach mines data from high-resolution satellites called CubeSats, enabling her to map changes over larger areas and smaller timescales than ever before.

Cooley hopes that this work will ultimately advance her field’s understanding of seasonal changes in Arctic surface water extent, especially as climate change accelerates these variations.

“This project will help improve our understanding of which areas may be particularly vulnerable to declines or increases in water availability as the climate warms,” she concludes. “Changes in Arctic water availability related to climate change and thawing permafrost have numerous implications for ecosystems and the global climate—as well as for the hundreds of thousands of people living in Northern regions who depend on lakes and rivers for food, water, and transportation.”

## INTRODUCING: KAI BOSWORTH



Human geographer Kai Bosworth has always been fascinated by environmental social movements surrounding land ethics, especially in the rural American Midwest and West.

Now Visiting Assistant Professor of Environment and Society, Bosworth has brought to the Institute his study of the new forms of environmentalism

emerging from struggles over oil pipelines. His research strives to understand the ways in which such movements confront issues of racism, nationalism, and settler colonialism in North America.

As Bosworth explains, recent anti-pipeline activism across the Great Plains has kicked off a new paradigm of social movements. While Native American nations in the region have long opposed extractive industry through their historic land base, new environmental organizations opposing the Keystone XL and Dakota Access pipelines have been largely middle-class, rural, and white.

“For many of the individuals and groups interested in protecting land and water, transformative demands for environmental justice—especially those made

by Native Nations—appeared to be difficult or challenging,” he says. “My research investigates why this is the case, and how such a response could be countered in such ‘people’s movements’ or forms of environmental populism.”

Bosworth hopes that his research will reveal what environmental activism looks like on the ground, the coalitions that help it to work best, and what actions can be taken to change its orientation to justice.

In his view, he says, “we should be particularly interested in how the strategies of the climate justice movement, at least in North America, have been transformed through building power with Native American nations and grassroots community organizations, rather than policymakers and lobbyists.”

## student spotlight

Rhode Island now has the opportunity to take better care of its bees, thanks to pioneering work by **Kobi Weinberg '20** (left) and **Brett Cotler '20** (right). Weinberg, an IBES undergraduate, and Cotler, a concentrator in Applied Math, spent last spring working with the Audubon Society of Rhode Island to evaluate local beekeeping practices.



Through carefully-designed surveys and interviews, Weinberg and Cotler collaborated with the Audubon Society to collect a wealth of information from beekeepers, such as bee health and food availability, beekeeper experience and training, and more. The duo also examined policy documents from other nearby states to supplement their survey and interview results.

In September, Weinberg and Cotler presented their work to Rhode Island’s Pollinator Working Group in an effort to improve beekeeping practices in the Ocean State.

But why do bees matter? As Weinberg explains, pollinators like bees not only help maintain ecosystem diversity, but are also vital to food production.

“Based on a report from the Intergovernmental Platform on Biodiversity and Ecosystem Services, the annual economic value of pollinators is \$235-577 billion,” he says.

“I believe that pollinator health will become increasingly important to maintain crop yields,” adds Cotler. “Additionally, I think pollinator health is an environmental concern that does not receive adequate attention.”

The team hopes that their work will encourage Rhode Island policymakers to give bees and other pollinators the recognition they deserve.

“Bees get a bad rap,” says Weinberg. “I enjoy changing people’s perceptions, helping them see bees more favorably.”

# WHERE THE WILD THINGS WERE

Postdoc examines farmers' decisions in rainforest-turned-pastureland

Centuries ago, the eastern coast of Brazil was home to a flourishing rainforest twice the size of Texas. Today, that forest—called the Mata Atlantica, or Atlantic Forest—is a shadow of its former self. Hundreds of years of deforestation and development have reduced the Mata Atlantica to just 15% of its historical extent, causing mass habitat loss and threatening its globally-unmatched biodiversity.

Many of the largest patches of remaining forest are in the state of Bahia, in northern Brazil. There, sociologist Leah VanWey and ecologist Stephen Porder are spearheading a project that attempts to foster reforestation efforts by making payments to local residents.

Postdoctoral research associate and human-environment geographer **Kira Sullivan-Wiley**, who is supported by a partnership between IBES and the Nature Conservancy, is conducting complementary surveys in the region.

“My work looks at reforestation decisions and land management behavior in that region by farmers who aren't necessarily part of the payment project,” she says. “I look at latent interest in reforestation, or the way people perceive forests and engage with forests—not when



Kira Sullivan-Wiley returns from an interview with José, a farmer in Bahia with 2 hectares of land. Many of José's crops can be seen here, including beans, corn, cassava, bananas, and sugarcane, as well as cocoa and a smattering of other native trees. Photo: Kira Sullivan-Wiley

they're part of an intervention, but just day-to-day because they're farmers.”

As Sullivan-Wiley explains, reforestation has multiple benefits to land managers, even beyond the financial incentives that VanWey and Porder's project promises. Indeed, planting more trees improves water quality on the land, and can also help to bring owners into compliance with the government's forest code.

Moreover, it provides a way for farmers to generate a sort of social benefit.

“People generally want to do things that are good, but they don't want to be taken advantage of,” she says. “And so one of the interesting things about a payment project is we can nudge them in that direction—so they get the emotional benefit of doing something good, but without the initial cost to themselves.”



This plantation in Bahia grows organic cocoa in a *cabruca* system, a method designed to preserve some native forest while also producing high quality cocoa pods. Opposite the plantation, land has been cleared for pasture. Photo: Kira Sullivan-Wiley

Social scientists engaged in the formal payment project must talk with land managers about the technical requirements necessary to earn a financial incentive—for instance, how many hectares worth of trees they must plant on their land.

In contrast, Sullivan-Wiley makes it a point to talk to them more conversationally about their views on forests and the state of the environment. She has found that this makes a difference in their responses.

“We found some interesting results about the emphasis that people put on the importance of cultural and social issues, as opposed to financial, economic issues, depending on the context in which you're discussing reforestation,” she says. “When people hear that there's going to be an intervention, I think they have an expectation that it's going to be technical, it's going to be economic... whereas that's not all you can do with an intervention.”

As Sullivan-Wiley explains, in more relaxed conversations, land managers tend to talk more openly about generational differences, environmental changes they have witnessed firsthand, or the social

and cultural norms that appear to get in the way of reforestation efforts.

“When you are just having a discussion about how to move forward and achieve reforestation, they talk about a much wider array of things that you can do and ways to move forward,” she explains. “I find that promising, because I think it means that we can change a lot more about how we design interventions to achieve better results. There's this whole realm of potential interventions that deal with social and cultural change that aren't being tapped into, and I think have a huge amount of potential.”

Sullivan-Wiley interviews farmers and land managers for a living: that is, people who make decisions about their land every minute of every day. But even still, her questions sometimes catch them off-guard.

She describes one interaction in which she asked a land manager a series of questions about nature: *Are trees part of nature? Is air part of nature? Are houses part of nature?*

She arrived at the question, “Are people part of nature?” And her interviewee, who had previously been so certain, faltered.

“He took a solid minute and a half to answer,” she remembers. “You could see him really trying to engage with the subject that we were asking about. And I love those moments as an interviewer, because people are reflecting. They're really trying to figure out, *what is it that I believe?*”

For Sullivan-Wiley, illuminating the rationale behind peoples' land management decisions is key.

“Biogeochemistry, the carbon cycle, the water cycle—all these global phenomena are really driven by how people are managing land,” she says. “And so understanding how and why they're managing land affects everything, everywhere.”

But she is also driven by the sincere belief that negative relationships between people and their environments can, and should, be repaired—for the benefit of both parties.

“They're both motivations. Depending on the day, I find one or the other more compelling,” she laughs. “But I think it's important that we look forward to a time when the relationship that people have with the environments they live in is a better one, and I see the work that I do as part of that long-term goal.” ■

## INTRODUCING: CURT SPALDING



Former U.S. EPA Administrator for New England **H. Curtis “Curt” Spalding** has joined the Institute as Professor of the Practice of Environment and Society.

Prior to his seven years serving in the Obama Administration, Spalding spent over eighteen years as executive director of local non-profit organization Save The Bay.

“Joining IBES is the opportunity I was looking for,” Spalding says. “My career has been about helping highly talented people in environmental organizations achieve their goals for the betterment of communities

across New England. Continuing that commitment with IBES is a wonderful opportunity.”

Spalding’s accomplishments include development of the Save The Bay Center in Providence, RI, as well as ecosystem plans to restore and protect New England’s iconic waters—including Lake Champlain, Cape Cod, the southern New England coast, Long Island Sound, and Great Bay.

In all aspects of his work with Save The Bay and the EPA, Spalding explains that he emphasized whole-system thinking and resilience. He is passionate about community engagement, and has led initiatives to clean up Brownfield and Superfund sites, as well as to shore up at-risk neighborhoods in the face of climate change.

Indeed, through myriad roles of advocate, policy analyst, and administrator, Spalding has worked to revitalize New England cities and to create healthy and prosperous places to live.



### MAKE A GIFT

*Gifts to IBES are used to provide domestic and international research experiences for undergraduate and graduate students, prototype new research ideas, empower students to pursue learning opportunities, and more.*

For more information on giving to IBES, please contact Courtney Cassidy at 401-863-6592 or [Courtney\\_Cassidy@brown.edu](mailto:Courtney_Cassidy@brown.edu).



## DID YOU KNOW? IBES faculty are leading the charge to slow the University’s greenhouse gas emissions.

At Brown, about 1/3 of emissions come from the purchase of electricity—which, in Rhode Island, is supplied overwhelmingly by the combustion of natural gas. Another 1/3 of the University’s emissions arise from the combustion of fossil fuels on campus, largely for heating. The last third of Brown’s emissions are attributable to a mix of sources required for University operations such as commuting, travel, and waste. Assistant Provost for Sustainability Stephen Porder and Associate Provost for Space Leah VanWey have been heading committees in conjunction with Facilities leaders, administrators, and other faculty on campus to purchase electricity from renewable sources like solar and wind, draft options for reducing the University’s dependence on fossil fuel combustion, and create Brown’s first Sustainability Plan, which will outline principles and specific actions the University plans to pursue in the area of sustainability in the coming years. Feedback on a draft plan will be solicited over the 2018-19 academic year.

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**Front cover:** Samiah Moustafa assists as a team member installs sensors to measure changes in water depth during fieldwork in southwest Greenland. Photo: Samiah Moustafa  
**Back cover:** A tree fern, native to Aotearoa-New Zealand. Photo: Mariaelena Huambachano

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