

FALL 2018

M | SEAS

Stewards

A MAGAZINE FOR ALUMNI AND FRIENDS OF THE SCHOOL FOR ENVIRONMENT AND SUSTAINABILITY

EVERYTHING
UNDER
THE
SUN

plus:

RENEWABLE ENERGY IN PUERTO RICO

MICHIGAN SUSTAINABILITY CASES



DEAR FRIENDS:



As I welcome students and faculty to a new school year at SEAS, I can't help but feel great optimism. I came to Michigan in August 2017 on the promise of moving the needle toward a more sustainable, just society. What I have witnessed and taken part in since then has confirmed my hopes and exceeded my expectations.

If anyone can help move the needle on our world's greatest environmental and sustainability challenges, I am convinced it is the SEAS community of alumni, students, faculty, staff, partners, and friends.

As you browse these pages, you'll see what I mean. The work of SEAS in places like Puerto Rico (page 24) sets a model for sustainable development worldwide. The environmental case studies disseminated through the Michigan Sustainability Cases (page 10) help foster a more environmentally literate citizenry. Positions like those advanced by Professors Tom Lyon (page 8) and Joe Arvai (page 14) elevate the discourse on key issues that cross environmental, social, and economic lines.

Our feature story (page 16) is on climate change—the greatest of all environmental challenges. I've dedicated more than thirty years to the topic, and its solutions will integrate ideas and efforts from all across campus.

When I started to study climate change years ago, we were still exploring how serious it might be. But slowly, as my studies deepened, I concluded that climate change is really the greatest of all problems facing society. That realization set in decades ago.

Thankfully I wasn't the only one thinking along those lines. Our feature story highlights just a sampling of scholars across the University of Michigan who continue to focus their research on climate change. At U-M, we come at the problem from all angles and disciplinary traditions—sometimes independently, but more often together.

Meaningful engagement across and beyond academia drives our shared vision. We want the knowledge we create and the training we provide to benefit the widest possible swath of society. We want to bring more people to the table—indeed, all stakeholders—in our effort to foster a society that does not just react to environmental crises, but that sees them coming and heads them off at the pass.

The engagement starts with you. It has been my great pleasure to meet with many of you over the past year, both in Ann Arbor and in my travels across the country. I've been awed and inspired by the work that you do at every level, and in every sector, to support a planet that can sustain and nurture its inhabitants indefinitely.

Please take this issue of *Stewards* as a reminder that we are all in this mission together. And together, we have the passion and expertise to create a more sustainable, just world for generations to come.

Go Blue!

A handwritten signature in black ink that reads "Peck". The letters are stylized and cursive.

Jonathan T. Overpeck
Samuel A. Graham Dean and William B. Stapp Collegiate Professor of Environmental Education

P.S. I'm always interested in your ideas on how SEAS can engage beyond campus to serve society better. Please share your suggestions and other thoughts about the school by emailing seas-dean@umich.edu.

MISSION

To help protect the Earth's resources and achieve a sustainable, just society.

Stewards

A magazine for alumni and friends of the School for Environment and Sustainability

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NEW HORIZONS IN CONSERVATION:

Addressing Diversity, Equity, and Inclusion (DEI) Challenges

The inaugural New Horizons in Conservation conference held in Washington D.C. on April 18-20 represented a milestone in conservation history. More than 200 students, faculty, SEAS alumni, and leading conservation professionals—the majority of them people of color—gathered to “celebrate and assess” diversity, equity, and inclusion (DEI) in the environmental sector.

The New Horizons conference is the brainchild of Dr. Dorceta Taylor, James E. Crowfoot Collegiate Professor, author, and director of DEI at SEAS. As an early pioneer in the Environmental Justice movement, she has long been a powerful voice in the effort to increase diversity in the field of conservation.

“Despite the prevalence of complex global problems such as climate change,” Taylor writes, “the conservation movements in the U.S. and other post-industrial countries lack robust pools of ethnic minorities in their workforces.

“The students and young professionals who attended this conference represent the future of conservation,” Taylor continues, “They are multicultural, multi-faceted, and talented, and they are poised to take on leadership roles in this sector. Diversity benefits us all, and there is strength in it.”

SEAS alumnus José González (MS '09), founder of Latino Outdoors and a workshop panelist, shared his thoughts on the value of the New Horizons in Conservation conference.

“You can read about it, you can have one-on-one conversations on it, you can look at the studies, you can have the data and the research, but it really hits home when you are in a room where you can actually see this vision of the future,” said González.

“There was a sense of hope,” González added, “a sense of knowing that it’s going to be ok. If this is the present and future of the movement—even though it’s still going to be a lot of work—there’s a lot of hope that comes with that.”



DR. DORCETA TAYLOR



AARON MAIR, PAST PRESIDENT OF THE SIERRA CLUB



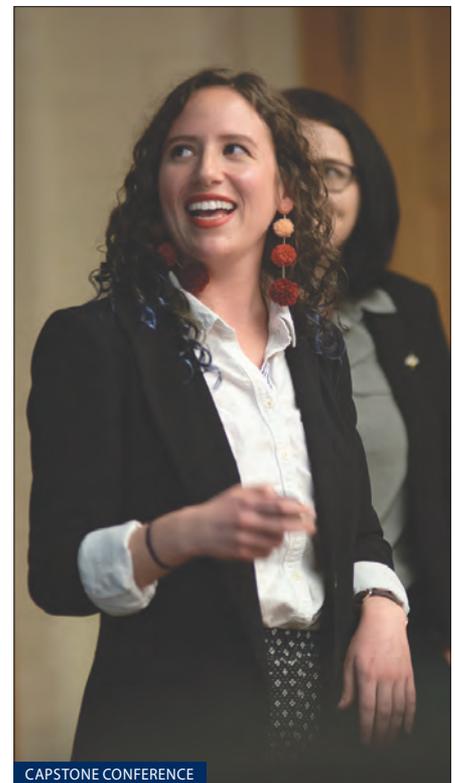
MOBILE LEARNING LAB PROJECT TAKES FIRST PRIZE IN BICENTENNIAL COMPETITION

INSIDE DANA

A tightly knit community is one of the hallmarks of SEAS, and co-curricular and social activities are at the center of SEAS life. In these recent photos, you'll recognize familiar traditions alongside new events. See how students, alumni, faculty, and staff have been coming together to create a more sustainable, just world—and to have fun along the way!



HONOR AWARDS CEREMONY



CAPSTONE CONFERENCE



WEGE LECTURE FEATURING BILL MCKIBBEN



2018 WINNER: INDIA STUDENT TEAM



WINTER SOLSTICE PARTY



SANDRA STEINGRABER (PHD '89) LECTURE



WASHINGTON DC CAREER TREK



CELEBRATING THE FUTURE

CLIMATE CHANGE SUMMIT

A celebration to mark the evolution from the School of Natural Resources and Environment (SNRE) to the School for Environment and Sustainability (SEAS) took place October 26-27, 2017, in conjunction with the University of Michigan's Bicentennial Fall Festival and Homecoming.

Special events included the Samuel A. Graham Lecture and Installation of Dean Jonathan T. Overpeck, the Climate Change Summit featuring rising stars in environmental sustainability, and a ceremonial ribbon-cutting at the Dana Building.

The festivities marked a new level of commitment from the University of Michigan to sustainability research and education that bridges disciplines across campus to address local and global sustainability challenges.

"U-M is uniquely poised to contribute key knowledge and know-how to meeting the climate challenge, and also to meeting other environmental and sustainability challenges on a list that gets longer with each passing year," said Dean Overpeck. "We can make the kind of impact that will provide a new model for other universities to follow." 🌱



DONALD C. GRAHAM (BSE '55, MSE '56, D.ENG. (HON.) '09)



RIBBON-CUTTING CEREMONY

U-M REGENT MICHAEL J. BEHM AND U-M PRESIDENT MARK S. SCHLISSSEL JOIN STUDENTS, ALUMNI, FACULTY, STAFF, AND FRIENDS TO CELEBRATE SEAS AND THE EVOLUTION OF U-M'S ENVIRONMENT AND SUSTAINABILITY PROGRAMS

NEW FACULTY

Karen Alofs is an assistant professor of Applied Aquatic Ecology. Her research is focused on understanding the effects of environmental stressors like climate change, invasive species, habitat fragmentation, and habitat degradation on biodiversity and ecosystem sustainability in freshwater environments.

Ivan Eastin is a research professor at SEAS. He studies how trade policies affect the international trade of wood products, as well as other factors that influence introduction and adoption of new wood products.

Pamela Jagger is an associate professor of Data Science. Her research is focused on the dynamics of poverty and environment interactions, environmental governance, and energy poverty and health in low-income countries.

Paul Seelbach is a professor-of-practice at SEAS. His experiences bridge the academic study of aquatic ecosystems to its application across a range of resource management agencies. He also serves the Michigan Department of Natural Resources, Office of the Great Lakes, as senior fellow.

Sam Stolper, assistant professor, is an environmental and energy economist. His research, teaching, and writing are aimed at the design and implementation of environmental policy that is both efficient and equitable.

RETIREMENTS

Jim Diana, professor emeritus of Fisheries and Aquaculture, taught aquatic sciences since he joined the U-M faculty in 1979. He was director of Michigan Sea Grant for nearly a decade, has authored more than 100 scientific publications, and received the Justin Leonard Award from the Michigan Chapter of the American Fisheries Society (2006).

Bobbi Low, professor emerita of Evolutionary and Behavioral Ecology, became the first full-time female faculty member in the School of Natural Resources in 1972. She received the Michigan Teaching Excellence Award (1990) and the Distinguished Graduate Mentor Award (2007), and authored numerous books, including *Why Sex Matters: A Darwinian Look at Human Behavior* (2000).

Don Scavia, professor emeritus of Environment and Sustainability, held a number of leadership roles at U-M, including as director of the Graham Sustainability Institute. His research led to the development of methods for predicting and managing the size of dead zones in the Great Lakes, the Chesapeake Bay, and the Gulf of Mexico, as well as toxic algae in Lake Erie.

Mike Wiley, professor emeritus of Aquatic Ecology, is known by a generation of students for his exceptional scholarship and mentorship. He received the Faculty Teaching Award from the Program in the Environment (2004) and the Justin Leonard Award from the Michigan Chapter of the American Fisheries Society (2011).

ACADEMIC LEADERSHIP

Jonathan T. Overpeck—Samuel A. Graham Dean; William B. Stapp Collegiate Professor of Environmental Education; Professor, Climate and Space Sciences and Engineering

Maria Carmen Lemos—Associate Dean for Research; Professor

Shelie Miller—Director, Program in the Environment; Jonathan W. Bulkley Collegiate Professor of Sustainable Systems; U-M Distinguished Faculty Fellow in Sustainability

Michael R. Moore—Associate Dean for Academic Affairs; Professor; U-M Distinguished Faculty Fellow in Sustainability

Ming Xu—Director, China Programs; Associate Professor

SEAS DEI STAFF



ACCOLADES

The Diversity, Equity and Inclusion (DEI) team at SEAS received U-M's Distinguished Diversity Leaders Award. The award was established to celebrate those who embrace the value of diversity and recognize how it helps set the university apart.

Professor Rosina Bierbaum was elected as a member of the American Association for the Advancement of Science (AAAS) Board of Directors.

Professor Bob Grese was awarded an Honor Award from the American Society of Landscape Architects (ASLA) with Carey Lundin (Viva Lundin Productions) for the film, *Jens Jensen: The Living Green*.

Professor Dorceta Taylor received the 2018 Women in Conservation Award from the National Audubon Society. She also received 2018 Audubon President's Award, the 2018 Freudenberg Lifetime Achievement Award by the Association of Environmental Science and Studies, and the 2018 Burton V. Barnes Award for Academic Excellence from the Michigan Sierra Club.

Professor Ming Xu was elected 2018 President of the Chinese Society for Industrial Ecology. He was also awarded the inaugural Nanova Frontier Research Award by the Chinese-American Professors in Environmental Engineering and Science (CAPEES).

Professor Don Zak was named Arthur F. Thurnau Professor by the University of Michigan to recognize and reward his outstanding contributions to undergraduate education.

WHEN CORPORATIONS TAKE CREDIT FOR GREEN DEEDS

THEIR LOBBYING MAY TELL ANOTHER STORY



BY TOM LYON & MAGALI DELMAS

Tom Lyon, University of Michigan (Dow Professor of Sustainable Science, Technology and Commerce; Professor of Business Economics; Public Policy Professor of Environment and Sustainability), and Magali (Maggie) Delmas, University of California, Los Angeles (Professor of Management, Institute of the Environment and Sustainability, Anderson School of Management)

This article was originally published in The Conversation (www.theconversation.com) on July 17, 2018. Professor Lyon is the president of the Alliance for Research on Corporate Sustainability. He and Professor Delmas received funding from the Borchard Foundation that supported research on corporate political responsibility. Professor Delmas is the past president of the Alliance for Research on Corporate Sustainability (ARCS) and remains affiliated with it.

Today most large companies like Exxon Mobil, Ford, and GM issue slick reports extolling their efforts to conserve resources, use renewable energy, or fund clean water supplies in developing countries. This emphasis on efforts to curb environmental harm while benefiting society is called corporate sustainability.

Once uncommon but now mainstream, this show of support for a greener and kinder business model might seem like a clear step forward. But many of these same companies are quietly using their political clout, often through industry trade associations, to block or reverse policies that would make the economy more sustainable. And because public policy raises the bar for entire industries, requiring that all businesses meet minimum standards, lobbying to block sound public policies can outweigh the positive impact from internal company initiatives.

This kind of corporate hypocrisy—what we call talking green while lobbying brown—is a form of greenwashing, in which companies trumpet their good deeds while hiding their efforts to block progress. As the past and present presidents of the Alliance for Research on Corporate Sustainability, we are concerned that this greenwashing may delay by years or even decades steps that might solve sustainability problems, such as slowing the pace of climate change or ending the ocean plastic pollution crisis.

We and our colleagues in the alliance have documented many business initiatives that fall short of the impact they claim. One of the best known was the chemical industry's Responsible Care program, created after an explosion at Union Carbide's plant in Bhopal, India, killed thousands of people in 1984. Strategy professors Andy King and Mike Lenox showed that participants actually made less progress in reducing their emissions of toxic chemicals than did nonparticipants. That prompted the industry to overhaul the program.

Or consider the Climate Challenge program. The Energy Department created this now-defunct partnership between business and government to encourage electric utilities to voluntarily reduce their greenhouse gas emissions. When one of us teamed up with management professor Maria Montes-Sancho to evaluate its track record, we found that there was no difference overall between participants and non-participants in their emissions reductions.

Both of these voluntary initiatives failed to solve environmental problems, so why were they created?

In the case of Responsible Care, chemical industry documents show that one of the program's main goals was preempting tighter regulations. Likewise, public statements the electric utility industry and the Energy Department made indicate that they formed Climate Challenge to stave off new regulations.

And following the Trump administration's plan to spike the Clean Power Plan, a federal rule that would have limited air pollution from power, utilities have essentially avoided federal climate regulation to date.

Even though these and other voluntary initiatives accomplish little of substance, they help call attention to the good steps industries appear to be taking instead of the environmental damage they are causing—which is exactly how greenwashing works.

TALKING GREEN WHILE LOBBYING BROWN

As we and our colleagues explain in an upcoming article in the business journal *California Management Review*, it is easy to get away with greenwashing in part because it's hard to detect what companies lobby for in the U.S., as there is no requirement to disclose the positions they espouse.

"Despite the statements emitted from oil companies' executive suites about taking climate change seriously and supporting a price on carbon, their lobbying presence in Congress is 100 percent opposed to any action," Sen. Sheldon Whitehouse, a Rhode Island Democrat, lamented in *Harvard Business Review*.

Exxon Mobil has clearly engaged in this double-talk. The corporation declared in its 2016 Corporate Citizenship Report that "climate change risks warrant action by businesses, governments and consumers, and we support the Paris Agreement as an effective framework for addressing this global challenge." Yet the nonprofit group InfluenceMap recently found that Exxon was one of the top three global corporations in lobbying against effective climate policy.

Exxon Mobil's hypocrisy may not be surprising given the company's long history of funding climate deniers. However, it is far from alone in talking green while lobbying brown. Indeed, even companies with much

stronger records on sustainability than Exxon do this, often through industry trade groups.

For example, Ford said in its 2017 sustainability report that "we know climate change is real, and we remain committed to doing our part to address it by delivering on CO2 reductions consistent with the Paris Climate Accord." GM's sustainability report stated that "General Motors is the only automaker on the 2017 Dow Jones Sustainability Index for North America, and is also on the World Index."

Yet as Alliance for Automotive Manufacturers members, Ford and GM both lobbied the Trump administration to weaken fuel economy standards—a strong tool for reducing vehicle emissions.

MORE POLITICAL TRANSPARENCY NEEDED

When companies hide their political opposition to sustainability policies, it deprives investors of the right to know how their funds are being used. This obfuscation also denies consumers the right to vote with their wallets for greener products.

We believe the best way to expose this duplicity is by requiring corporations to disclose more details about their political actions. For instance, new laws might demand that companies, both individually and as part of industry associations, make their lobbying stances public, and reveal which politicians they have called on to take a given position.

And companies could be forced to reveal what they spend on so-called "independent" political advertisements, also known as issue ads.

In the U.S., one good option would be to update the Lobbying Disclosure Act to require more detailed reporting, including spending on 'astroturf lobbying', the practice of using fake grass-roots groups to influence public opinion.

The private sector can take action too. In Europe, the Vigeo Eiris rating agency has begun to assess corporate political transparency. Such evaluations would become much more powerful if required by leading investment managers. That is why we see the recent call by BlackRock, the world's largest asset manager, for companies to "benefit all their stakeholders" as a step in the right direction. 📌



IN A GALAXY NOT SO FAR AWAY

GLALAXY CASE INNOVATION STUDIO

BY JIM MANHEIM

“Let us start what we have come into the room to do,” intones the voice of Nigerian singer-songwriter Fela Kuti at the beginning of each episode of the radio show *It’s Hot in Here*, whose tagline is, “Environmental News, Views, and Stone Cold Grooves.”

galaxy 2018

It was the show, airing each Friday at noon since 2008 on U-M's student-run station (88.3 FM or wcbn.org), that sparked Professor Rebecca Hardin's idea for the Michigan Sustainability Cases (MSC) in the first half of 2015.

That fall, Hardin's team won a \$1.6 million grant from U-M's Transforming Teaching and Learning for the Third Century Initiative to support the goal of creating case-based curriculum materials for environmental and sustainability education. In March 2016, the team began working with U-M's Office of Academic Innovation, which helps promote the incorporation of digital materials into university courses. The MSCs have been digital from the beginning, conceived as multimodal presentations that include text, "edgenote" glosses, photos, video, podcasts, and interactive exercises.

ENTREPRENEURIAL SPIRIT

The MSCs are a bit like a startup, bringing new people and new resources together with existing experts and established best practices. Through incremental innovation, they learn how to make the best impact on campus and beyond.

They spring from a long and lauded tradition of case-based teaching at SEAS, and have grown into a program with nearly \$2 million in funding and an audacious vision to remake the teaching of environmental sustainability. And with growth like that comes new questions: What makes a good case study? Who are we talking to, and why? How can we better connect students, scholars, and researchers with professionals, civic and state government, and social movement leaders from outside the University of Michigan? On a practical level, how can we make our interviews, videos, and narratives look good and command the attention of increasingly diverse audiences?

The MSCs are not fiction constructed to illustrate teaching points but real-life stories, each built around an individual who had to make a decision about whether to pursue the sustainability path. They explore not only new solutions, but the complexity of the problems facing decision-makers. Some of them describe situations in Ann Arbor and southeast Michigan, like an MSC about the cleanup of the notorious Gelman Sciences groundwater dioxane plume, or one exploring the issues facing a DTE executive who will decide whether a third Fermi nuclear power plant will be built near Monroe, Michigan. Others come from places as far away as West Africa, China, and Indonesia.

The MSCs are written by SEAS students for other students, and have involved SEAS graduates. The school's network of contacts and collective experience have proven important so far in finding case studies around the world. The plan is to have 100 MSCs by 2020, and SEAS is adding more all the time.

One MSC still in production takes us through all the choices that went into the successful effort to implement a zero waste initiative at the Big House (Michigan Stadium). But most of the MSCs don't have happy endings—or any ending at all, so far. They reflect the difficult, often messy processes by which sustainability initiatives are implemented around the globe.

SEAS hosted Galaxy 2018: A Sustainability Learning Exchange, June 7-9 in Ann Arbor. Galaxy was an academic conference in many ways, but it also set a precedent for more engaged ways to link teaching, research, and public engagement for sustainability.

At Galaxy's core was an intensive three-day workshop. A complement of interactive public events—a film screening and discussion, a charrette on local groundwater contamination, and an awards ceremony for Michigan Sustainability Cases—were designed to include a broad array of sustainability educators, as well as members of communities directly affected by environmental crises in southeast Michigan.

The event featured a few presentations led from a lectern, but attendees were more likely to write ideas on whiteboards, pair-off, role-play, and brainstorm in small groups. Sessions ranged widely from theory to practice, covering topics from *Elements of Case Design to Narrative and Storytelling to Pocket Production Techniques*. Attendees were invited to be the first users of the Gala platform's new author interface, which lets case authors upload their own content to the site.

Some public events welcomed audiences of more than 500, while a core group of roughly 30 beta-tested platform features, finalized case content, and networked with others seeking to improve communication around sustainability science, policy, and practice.

Founding partners who fielded teams for Galaxy include the City of Ann Arbor, the National Science Foundation's Social Ecological Synthesis Center, the Indian School of Business in Hyderabad, India, and the U.S. Forest Service's Urban Lab Network. Experts who coached the teams came from the SEAS faculty and staff and from libraries, centers, and departments across the U-M campus.

A driving force behind Galaxy was the recognition that people from all walks of life grapple with sustainability challenges and can help shape both learning tools and sustainability solutions. Galaxy's emphasis on the co-creation of knowledge signals the enthusiasm at SEAS to embrace—and indeed invent—21st century models of environmental education.



TOP: MEGHAN WAGNER, MSC PROJECT COORDINATOR, SPEAKS DURING A SESSION AT THE GALAXY CONFERENCE
 BOTTOM: A GALAXY SEMINAR PARTICIPANT ASKS A QUESTION ABOUT CREATING A CASE STUDY

They've already begun to be used. Instructors at U-M have helped refine the case studies by using them in class. And the "Wolf Wars" MSC, about the hunting of gray wolves in Northern Michigan, was translated into French and taught by a team of park administrators, professors, and vocational high school teachers at the Albert Schweitzer Hospital in Lambaréné, Gabon—a country where wildlife habitat preservation is a pressing issue encountered daily.

CREATING GALA

Gala (www.learn gala.com) is the name the MSC project team has given to the software platform they built from the ground up to host the MSC collection. When U-M's Transforming Teaching and Learning for the Third Century initiative offered SEAS the seed money for MSC, a local Michigan apple variety seemed a good emblem for a new tool to help teachers.

But the word also evokes a party or event in which people come together to celebrate and work for a common cause. SEAS, along with collaborators in U-M's Office of Academic Innovation and U-M's Center for Research on Teaching and Learning, is piloting a whole new kind of curricular tool, which not only enhances student and teacher experiences in the classroom but also connects that work productively to wider communities. This approach offers more sustained engagement with professional organizations for students, and fast-tracks research to become implemented solutions to sustainability challenges.

THE FUTURE

Galaxy (see sidebar on page 11) was the latest development in an effort to create a whole new way of thinking about sustainability and its place in the academy. The effort started at U-M, but has grown in its international implications—and the MSC team and SEAS are thinking it through as they go. Galaxy helped Hardin and her colleagues think about how the MSC program is developing, what it's becoming, and what's coming next.

MSCs have already been published in *World Development Perspectives and Sustainability: The Journal of Record*. For students in SEAS programs, they're invaluable as a pathway to professional advancement. But even more important has been how they get students off campus to meet people who shape the environment and its future. "It trains them to write in a new way—to tell a real-world story instead of offering academic discourse," said Hardin. "Most of the MSCs have been written by U-M students, and they've had to bring together various kinds of information in ways that they haven't been asked to previously—and aren't being asked to at other schools. The MSCs are a new way of teaching sustainability, certainly, and they're becoming part of a larger way of rethinking the nature and purpose of a university education."

The more you think about this effort, the more convinced you become that the sky's the limit—that what's being accomplished at SEAS could change the way sustainability issues are taught at educational institutions around the U.S. and around the world. SEAS is taking sustainability out of the realm of daunting facts and figures, and turning it into something much more than a buzzword.

Got an idea for a story that could work as an MSC? SEAS is accepting proposals on a rolling basis, and you can even get funding for some case development projects [www.teachmsc.org/action/make/proposal]. 

MEET THE MSC TEAM

Interdisciplinary folks with different backgrounds and cultures



Rebecca Hardin
Director



Meghan Wagner
Project Coordinator



Pearl Zeng
Web and Communications
Manager



Cameron Bothner
Software Engineer



Andrew Klooster
Writer and Editor



Ed Waisanen
Media Director



Megan Czerwinski
Assessment Specialist



Chris Askew-Merwin
Podcast Coordinator



Malavika Sahai
Podcast Producer



Leana Hosea
Media Fellow

Can film help save the environment?

A FILMMAKER'S STATEMENT BY LEANA HOSEA

"Poetry makes nothing happen," W.H. Auden famously declared. But can film change the world?

Like many other filmmakers harboring a desire to make a positive mark on society, I believe in its power to influence the collective human conscience. A recent wave of green films has done much to buoy this optimism. Al Gore's *An Inconvenient Truth* placed climate change squarely in the mainstream debate. The SeaWorld theme park is phasing out its captive orca program after the *Blackfish* documentary trained a spotlight on how these killer whales suffer in captivity. The *Food, Inc.* documentary examined the cost of industrial food production on the public and reportedly influenced important policies, such as the Child Nutrition Act Reauthorization and the Food Safety Act.

Clean water is the environmental threat that we are now waking up to, sadly thanks in some part to the disaster in Flint and the evidence of the spread of PFAS in Michigan's waterways, and indeed around the world. Water pollution accounted for the deaths of 1.8 million people globally in 2015, according to data from the World Health Organization and the Institute for Health Metrics and Evaluation. Added to this, NASA's Grace satellite data shows that the world's aquifers

are being exploited faster than they can be replenished.

This means we are quickly approaching a crunch point, with demand for clean water set to outstrip supply by 40 percent in just 12 years, according to the United Nations. As Michigan knows only too well, this is not only a developing world problem. The National Academy of Sciences reported that in 2015 as many as 21 million Americans were exposed to unsafe drinking water.

This is why I decided to put my BBC career on hold to make a film highlighting water contamination in America, *Thirst For Justice*. Awareness of what's in our water or what threatens its purity should be a priority. SEAS has shared this vision and awarded me the inaugural Media Fellowship. We are building open source multi-media learning resources to accompany the film, to further educate the public on how to mobilize to protect water sources for future generations. These global crises are going to be solved by scientists, educators, media workers, citizen activists, policymakers—and even poets—together, and SEAS is one such crucible for that collaboration.

Leana Hosea, inaugural Media Fellow at SEAS, Knight Wallace Fellow, BBC multi-media journalist [www.thirstforjustice.org].

I'M SUING SCOTT PRUITT'S BROKEN EPA

HERE'S HOW TO FIX IT



BY JOE ARVAI

MAX MCGRAW PROFESSOR OF SUSTAINABLE
ENTERPRISE AND DIRECTOR OF THE ERB
INSTITUTE FOR GLOBAL SUSTAINABLE
ENTERPRISE

AUTHOR'S NOTE:

A LONGER VERSION OF THIS ARTICLE
WAS ORIGINALLY PUBLISHED
IN THE CONVERSATION (WWW.
THECONVERSATION.COM) ON APRIL 4,
2018. PROFESSOR ARVAI STANDS BY THE
RECOMMENDATIONS PUT FORTH HERE
DESPITE SCOTT PRUITT'S RESIGNATION
ON JULY 5, 2018.

IN 2017, just a few days after Donald Trump was sworn in as president, a freshman GOP lawmaker, with only a few days of his own on the job, proposed House Resolution 861. Its language was ominous: "The Environmental Protection Agency shall terminate on December 31, 2018."

I was in my sixth year on the EPA's Science Advisory Board when H.R.861 was introduced. When I called senior EPA colleagues to assess the threat, I was assured that it would never happen; the nation's environmental laws, and the agency that makes and enforces them, could not be killed in two years by a ten-word resolution written by a rookie congressman.

Then along came Scott Pruitt.

Since taking over as administrator, Pruitt has overseen the nominations and appointments of a diverse array of lobbyists and corporate insiders, while at the same time letting key vacancies languish. He has put the brakes on enforcement, slowed or suspended progressive regulatory actions initiated by his predecessors, and defended draconian budget cuts proposed by the White House.

He also gutted the agency's science advisory boards, one of which I proudly served on. Pruitt's directive to "reform" the EPA's science advisory boards, which I believe is both unethical and illegal, led me to join a group of scientists who are suing the agency.

From where I sit as both a scientist and former EPA adviser, the motivation behind Scott Pruitt's actions is as clear as day: He isn't reforming the agency; he's trying to kill it.

The good news for the EPA is that a majority of Americans support its fundamental mission to protect the environment and public health. And, judging by recent reports, bipartisan calls for Scott Pruitt to resign are growing louder. But for the EPA to really rebound after Pruitt's repeated assaults, the agency will need to address some of its legitimate shortcomings.

DETACHED FROM REALITY

In spite of the chaos and controversy that's swarmed around Scott Pruitt's EPA, those of us who care about the agency have to be honest with ourselves and admit that the agency isn't entirely free of responsibility for the situation it finds itself in.

Going back several administrations, the EPA has done little to harden itself against the criticism that it's detached from the social and economic realities faced by many Americans. This, in turn, has opened the agency to repeated attacks from those who incorrectly believe that protecting livelihoods and businesses means repealing "job killing" environmental regulations. It's rhetoric like this that created an opening at the head of the EPA for a conservative activist like Scott Pruitt.

When the time comes, resuscitating the EPA will be an urgent—but not unprecedented—task for new leaders in government. The easiest part of the job will be replacing Scott Pruitt, if he's still around, with an administrator who doesn't have disdain for EPA's mission and who doesn't mistrust its employees. Another easy step will be to initiate a thorough house cleaning. Pruitt appointees who would like us to believe that certain chemicals and pesticides aren't toxic must go. Appointees whose integrity is compromised by conflicts of interest must also be fired.

BALANCING ENVIRONMENTAL, SOCIAL, AND ECONOMIC CONCERNS

The hardest part of the job will be reinventing an agency that is in dire need of reinvention. The EPA's dual-purpose mission of protecting the environment from people and protecting people from a damaged environment must remain intact. But the way in which the EPA balances environmental protection with the hopes and needs of ordinary Americans must

change in the same way that the rest of us who work in the environmental sciences have had to change.

In my job, we don't just talk about "the environment" anymore; we talk instead about the need for making trade-offs across environmental, social, and economic goals. In other words, we talk about sustainability.

Step one is to establish better relationships with the communities the EPA serves. The risks that a reinvented EPA will be responsible for managing—from the environmental and public health impacts of climate change to polluted water systems in cities like Flint—must be jointly defined by EPA staff and the citizens who pay their salaries. Likewise, how the magnitude of these risks is measured must be based on science and, importantly, people's values.

I can already hear strident environmentalists bristling at the suggestion of letting public values decide. But they needn't be afraid; public values already decide. How we think about environmental health is based entirely on our values.

What we deem to be a "healthy environment" is a constructed, values-based judgment. What we really mean is, healthy enough so that we can feel comfortable with how much of the environment we're prepared to give up in return for other things—social and economic—that we also value, but for different reasons.

A reinvented EPA must also forge stronger partnerships with business. Corporate America needs the EPA as much as the EPA needs corporate America. Consumers are demanding more leadership from companies when it comes to sustainability, and they are punishing companies—by withholding their money—that don't deliver on this new social contract.

In my experience working at the intersection of sustainability and business, I've been repeatedly told by executives that it's much easier for them to justify leaving potential earnings on the table in the name of environmental and social progress when they are compelled to do so by regulation. Here's where better partnerships between companies and a revamped EPA can help. Corporate America and the EPA must work together over the long term to craft sensible and, importantly, adaptable regulations that are responsive to changing environmental, social, and economic conditions.

Taken together, the American people will benefit from a reinvented EPA because the agency will do a better job of responding to their needs and concerns. Businesses will benefit because they'll be better able to plan for the shocks brought by new regulations. And the EPA will benefit because it will have powerful new allies—companies and more supportive voters—to help it achieve its mission.

All of this will mean less helter-skelter at an agency that's essential for American progress. And, importantly, it will mean that we'll never again see the perceived need for another Scott Pruitt. ♻️





U EVERYTHING UNDER THE SUN

BY DENISE SPRANGER

The sea slides over the asphalt of a city street. A scrawl on desert parchment marks the dry echo of a river. Bears don't bother to hibernate, say neighbors in the great Northwoods. While those other bears, so white and fabled, roam stranded on melting ice floes.

Like the waters that seem to be sloshing around in all the wrong places, it's almost too much to absorb. Katrina, Irma, Maria, and Florence are names we know, and so is the impact of countless fires. But the subtle unraveling of our ecosystems bobs like a discarded cork in the news cycle, or barely surfaces in the red tides of algal blooms.

Underlying it all is a human question: Are we too big to fail? Scientists say: Don't bank on it.

But we do have a choice: Remain indifferent. Or get to work.

THE University of Michigan has risen to the challenge. As a preeminent research institution, its contributions to climate science continue to advance knowledge—and create solutions—across disciplines.

To underscore that commitment, U-M President Mark Schlissel announced his signature to the “We Are Still In” pledge in 2017, stating that the university will “support climate action to meet the Paris Agreement.” At SEAS, renowned climate scientist, Jonathan T. Overpeck, was appointed the Samuel A. Graham Dean, bringing a fresh vision for the road ahead.

We spoke to the dean and more than a dozen faculty members at U-M whose work on climate change takes them into the field, the lab, and into the White House—and who are making an impact in communities here and abroad. We asked them to share their unique perspectives as we tackle the new demands of our changing world.

Naomi Levin is an associate professor of geology and the associate chair for graduate studies in the Department of Earth and Environmental Sciences. She is also on the faculty of the Program in the Environment (PitE).



Her research group centers on understanding how terrestrial landscapes and organisms respond to past climate change. Their work involves a combination of geologic fieldwork, isotopic lab work, and modern analog studies.

“It’s very easy from your armchair to say, ‘Well, we survived global changes before.’ So I ask you, would you really want to be living in what is now Europe during the Ice Age? No, you wouldn’t.

“My research takes a very long view of climate change in the time span of human evolution, so broadly the last 10 million years. But things really began picking up in the last five million years or so. The big question is: What was the role of climate in human evolution, and why should we care?

“To answer that, the carbon dioxide story is particularly compelling. Carbon dioxide levels have oscillated between 180 parts per million (ppm) and 280 ppm for the last one million years and likely back to 2.5 million years. That range includes the glacial and interglacial periods. So within this narrow window of 180 – 280 ppm is the difference between being covered in ice and not being covered in ice. That was the world that we knew up until the last 150 years since the Industrial Revolution. Now, with carbon dioxide levels at over 400 ppm, we’re outside of that world. We are, in a real sense, changing the conditions in which we evolved.

“Having this geologic perspective doesn’t create solutions, but it may be a piece of the communication. How do we get people to engage with these issues? How do we get people to conceptualize what they mean? A big part of the climate change story is understanding what’s happening now relative to what has happened before. And for some, it may be easier to embrace the realities of climate change from a distance, say, of two and a half million years.”

Maria Lemos is a professor and associate dean for Research and Engagement at SEAS, and the co-director of the Great Lakes Integrated Sciences and Assessments (GLISA). Her research focuses on how to increase the use of scientific knowledge, especially climate information, for reaching society’s sustainability goals. Her empirical work has spanned different decision contexts including agriculture (farmers in Brazil and farmers and extension agents in the U.S. Midwest), urban adaptation (city officials in the Great Lakes region and five megacities in Brazil), and water and coastal governance (water and coastal managers in the U.S. and in Brazil).



“In the trenches, whether we call it climate change or ‘extreme weather,’ people are still making decisions about preventing flooding, combating droughts. While I think it’s very important that people are doing research on public opinion to shift the credibility issue and fight climate change denialism, I’m not in that business. I’m in the business of meeting people midway who are already convinced that they have huge problems, are trying to solve them, but don’t have the means.

“The kind of product that we foster in GLISA is co-created with our users. We ask them what they need, and produce customized climate and climate-related information for them. What piques my curiosity now is how we might take this model that has been very successful on a smaller intervention level—and scale up. How can we expand the number of people we reach? That’s where social science can help us understand why and how different approaches of knowledge production and use work.”

“We keep talking about the need to accelerate prevention and adaptation to climate change, but we must find ways to bridge the core research that we do with the people who will need this information. I think that SEAS has a fantastic role to play because we already understand the need to engage. We have students working with communities, and faculty who are committed to be in on those dialogues.”

- Dr. Maria Lemos



Rosina Bierbaum is a professor at SEAS. Her research is on the interface of science and policy—principally on issues related to climate change adaptation and mitigation at the national and international levels. From 2001-2011, she served as dean of SEAS. She is the chair of the Science and Technical Advisory Panel of the Global Environment Facility and served on President Obama’s Council of Advisers on Science and Technology (PCAST), as an adaptation fellow at the World Bank, led the Adaptation Chapter for the Congressionally-mandated U.S. National Climate assessment, and was a review editor for the Intergovernmental Panel on Climate Change.



“My role has changed over time—from researcher to policymaker to educator. I’m now doing more with the international community, and trying to translate science into usable information for practitioners. For example, at the U.N. Investor Climate Summit, I spoke about the impacts of climate change on the business community. Their investment in renewable energy and sustainability-focused efforts is now reaching 30 trillion dollars, which indicates a great amplification of interest. That instills hope that we can combat climate change in time.

“My hope is also based on the fact that people are literally in the streets again. They were out in force demonstrating for science, and for action on climate change. I think that perhaps in the past citizens were more complacent, and assumed that our leaders in the Congress and the White House would take care of environmental crises for us. It’s very clear now what ‘We the people’ means. We the People need to be involved!

“Burgeoning state, local, and university activities are also encouraging. Many cities now have sustainability initiatives and even sustainability managers—some of these leaders are from SEAS. And cities are where protecting people and infrastructure are front and center.”

Julie Cole is a professor of Earth and Environmental Science at LSA. Her work explores past environmental change by developing paleoclimatic data from corals, caves, and other sources. Current projects focus on areas and systems with substantial ecological or human impacts, including El Niño and Indo-Pacific variability, drought in western North America, monsoons, and coral reef environments.



“We’ve lost roughly half the world’s reef corals in the last 50 years, and we’re on track to lose most of the rest as warming accelerates and storms get stronger. What many people don’t realize is that something like a quarter to a third of all marine species spends some part of their life on the coral reef. So reefs are hugely important for marine biodiversity, but also for economies and communities. They provide shoreline protection, tourism dollars, as well as a source of nutrition. The Great Barrier Reef notwithstanding, reefs are mostly found in small island states that don’t have a lot of resources financially. Combine that with sea level rise, and those communities are really in trouble.

“The reef crisis has galvanized a lot of people to think about ways that we can use science to combat the problem. That’s why in addition to my research in the Galapagos and Australia, I’ve also been working at the Biosphere 2 in Arizona where we’ve been building experimental reefs. But I admit that it’s hard to imagine any solution that scales up enough if we continue on our current climate trajectory. The real solution—to this and all the pervasive problems driven by climate change—is a carbon-free energy system. We just need to face it.”

CLIMATE 2.0

A MATTER OF DEGREE

The planet’s average surface temperature has risen about 1.62 degrees Fahrenheit (0.9 degrees Celsius) since the late 19th century. Most of the warming occurred in the past 35 years, with 2016 being the warmest year on record since records began in 1880.

OCEANS 16

In 2016, global average ocean temperatures experienced a record high, leading to coral bleaching. The extended heat periods during that year killed off approximately half of the Great Barrier Reef, the largest and most extensive reef system in the world. In addition, the absorption of CO2 has increased the acidity of ocean waters by 30 percent since the Industrial Revolution.

RISING TIDES

Global sea level rose about eight inches in the last century. The rate in the last two decades, however, is nearly double that of the last century.

ARCTIC MELTDOWN

In 2016, annual Arctic sea ice averaged 800,000 square miles below the 1981-2010 average, making this the second smallest annual ice coverage on record. As global warming continues, large reserves of organic matter frozen in subarctic permafrost will thaw and decay, releasing additional CO2 and methane to the atmosphere. With the decrease in polar ice, less sunlight is reflected and the oceans absorb even more heat.

GOING TO EXTREMES

Incidents of extreme weather are projected to increase as a result of climate change. Increasing temperatures in the Arctic are affecting the path of the jet stream, the severity of storms, and the length of individual weather events such as rain, storms, and drought.

Sources: NOAA at climate.gov
climate.nasa.gov/evidence
 Center for Sustainable Systems Fact Sheets

CLIMATE JUSTICE

The World Health Organization estimates that climate change will cause an additional 250,000 deaths per year between 2030 and 2050.

Though wealthy, developed nations like the U.S. emit larger concentrations of greenhouse gases (GHG) per capita, developing nations experience the worst effects of climate change relative to wealthier countries due to their limited resources and ability to adapt.

Low-income communities are more likely to be exposed to climate change threats (e.g., flooding, storms, and droughts) due to inadequate housing and infrastructure.

People living closer to the coast and small island nations are more vulnerable to severe storms, sea level rise, and storm surges as a result of climate change.

Indigenous populations that rely on subsistence farming practices for food have limited options for adapting to climate change threats.

Areas with weak healthcare infrastructure—mostly in developing countries—will be the least able to cope with catastrophic effects of climate change such as heat waves, droughts, severe storms, and outbreaks of waterborne diseases.

- **Center for Sustainable Systems**

Climate change disproportionately impacts vulnerable and marginalized communities. Urgent response is needed to ensure that local climate planning efforts move to address these disparities, rather than perpetuate them, by drawing on local and expert public health knowledge.

- **Graham Sustainability Institute**

Greg Keoleian is the Peter M. Wege Endowed Professor of Sustainable Systems and co-founder and director of the Center for Sustainable Systems. His research focuses on the development and application of life cycle models and metrics to enhance the sustainability of products and technology. He has pioneered new methods in life cycle design, life cycle optimization of product replacement, life cycle cost analysis and life cycle-based sustainability assessments ranging from energy analysis and carbon footprints to social indicators.



“The main contributors to carbon emissions are transportation, food production, and the heating and lighting of buildings—both commercial and residential. We have students conducting research in all of those areas. For example, we have **Jim Gawron’s** work on connected and automated vehicles with Ford (see page 28), as well as PhD candidate **Cailin Buchanan (MS ‘18)** and research assistant **Krutarth Jhaveri (MS ‘18)** who have contributed to the development of green principles to guide the light-weighting of vehicles—such as cars, trains, ships, and planes—to conserve energy.

“We also have students working with research specialist **Marty Heller** evaluating the environmental impacts and nutritional health of diets in the U.S. In the area of buildings, we have students like PhD candidate **Lixie Liu** who led a study that examined cost, energy use, and greenhouse gas emissions for different types of 60-watt-equivalent bulbs to guide consumers on bulb replacement decisions.

“I like to work with young people. They’re the ones who will be leading and implementing changes to improve sustainability, and they’re excited about the future. You can see a generational shift happening. Many of them say that they don’t want to own a car. They’d rather live in a city and walk to work, or take a bike or public transit.

“Nevertheless, our emissions are going up, and we still live in a very consumption-based society. For most people, greenhouse gas emissions is not high on their list when they’re making decisions about purchasing vehicles, about buying a house, about what food they’re going to eat. That’s why we need stronger policies and market signals that encourage more sustainable choices and behavior. We also need more research and education in systems analysis, and that’s why I’m here. We have a lot of work ahead of us at SEAS.”

Richard Rood, a professor in the College of Engineering, teaches a class, in concert with SEAS, on the interface of climate change with all aspects of society, and specifically climate change problem-solving. His current physical-climate research is focused on bridging the study of weather and climate.



“When I came to U-M in 2005, there was a conference on campus on climate change organized by the Erb Institute and the Ross School of Business. And it was apparent that the campus was not especially aware of the climate science that was going on across the river in what is now the Department of Climate and Space in the College of Engineering. After the conference, three students came up to me and said that they needed a course in climate change that worked across many disciplines.

“I’ve been teaching that course now since 2006, and I’ve seen what is, at least anecdotally, a significant change in students. The students that I meet now are more aware, far more interested in taking on problems

and far better prepared than I was at that age. They're far less naive about not only environmental issues, but also less naive about how complex systems of people work.

"One thing we talk about in class is that scientists are part of the community, part of society. They're not above society nor are they merely observers. So I think that having a scientific voice represented in policy, in management, and in planning is just rational."

Seth Guikema is an associate professor in the Department of Industrial and Operations Engineering and the Department of Civil and Environmental Engineering. His research is highly interdisciplinary. Much of his group's recent work is focused on the problems of urban and infrastructure resilience and sustainability in a changing climate. It is grounded in risk analysis, particularly data-driven risk analysis and complex systems simulation.



"Yes, there is uncertainty about what the impacts of climate change will be on communities and on infrastructure. But there will be impacts and we need to start acting now.

"Recently at U-M we've had several projects that try to understand how communities respond to repeated hazards. For example, Ocean City, Maryland sits right on the Atlantic coast. After a hurricane, people may do certain things. They might strengthen their house, or install backup generators. In the case of Miami in 1992, Hurricane Andrew was the impetus for changes in building codes, and the utilities responded.

"So communities do evolve over time. On the other hand, people are moving in who don't share this history with storms, and don't understand the potential vulnerability. Another issue we consider is risk perceptions. For example, in the case of coastal flooding, once you put a sea wall in, people may feel more protected—and move into areas behind that wall. Now we have a much larger population at risk in the case of an even larger flood that tops that sea wall.

"We're doing agent-based modeling work to understand how these different factors influence people, how this affects their behavior, and how it affects what they do to reduce their vulnerability. Then we can recommend policy interventions to guide all that in a more sustainable direction."

Paige Fischer is an assistant professor at SEAS. Her research group focuses on human dimensions of environmental change. The primary goal of her research is to increase scientific understanding of human behavior as it relates to the sustainability of socio-ecological systems.



"I study and teach about how people perceive and respond to environmental change. Most of my work is in the context of forests, and particularly in the area of wildfire. My research on adaptation centers on understanding what motivates people—individuals and families more than institutions—to reduce the risk of uncharacteristically large wildfires. That has a big relationship

to climate change, as changing temperatures and precipitation are driving larger and more destructive wildfires, especially in the western United States.

"It's important to understand that adaptation differs from short-term coping. An example of 'coping' might be, 'Let's just suppress those fires.' In contrast, adaptation is a long-term endeavor, such as planting species that can survive in future conditions, or allowing fires to burn, and learning how to live in a fire prone environment.

"I think the notion that so many people don't believe in climate change may be something of a myth. We just held nine focus groups with landowners throughout the Northwoods, and we didn't use the term 'climate change' at all. We just asked open-ended questions about what kinds of things have changed, how they've been impacted, and what they've done in response.

"In every group, people volunteered that the changes they were being affected by could be related to global warming. They told us that winters are warmer. Bears aren't hibernating. They see changes in trees species and more tree pests and diseases. They're noticing little things that are changing over the decades."





“As the atmosphere warms, it can hold more moisture, so it demands more moisture. It pulls it out of the vegetation and the soil, as well as the reservoirs, lakes and rivers. It means that places that are dry are getting drier, and in the U.S., that’s particularly true in the Southwest and California. People refer to this as ‘drought,’ but it’s really aridification—a trend towards hotter and drier conditions. In essence, a huge swath of America is going to have less water and less healthy vegetation—contributing to more frequent and more destructive wildfires.”

- Dean Jonathan T. Overpeck

Allison Steiner is an associate professor of Climate and Space Sciences and Engineering in the College of Engineering. Her research focuses on biosphere-atmosphere interactions, regional climate modeling, chemistry-climate interactions, atmospheric aerosols, biogenic trace gas emissions, and boundary layer meteorology.



“As an atmospheric chemist who studies both chemistry and climate, I can point to a couple of ways that we’ve made progress. If you look at air quality in the United States over the past 20 years, there have been some dramatic improvements in air quality—which is obviously beneficial to human health. That was largely due to government regulatory decisions about nitrogen oxide emissions that influence smog. Regulations also required cars to be more fuel-efficient.

“But climate is a very different beast. I’ve been working with Dr. Maria Lemos, along with others, on an NSF funded project. We’ve been looking at the influence of climate change on the harmful algal blooms in Lake Erie. We know that the nutrient load from agricultural run-off promotes the blooms, and increases in precipitation—due to climate change—will carry more of the phosphorous in the fertilizer into the lakes. So initially, we thought that timing the fertilizer loads between major rain events might reduce the run-off, and as a result, the blooms.

“The other consequence of climate change, however, is that the lakes are warming. So my perspective now is that these temperature changes are going to outweigh the precipitation changes, and that has some interesting implications. If the temperature of the lakes is five degrees Celsius warmer than it was 20 years ago, it’s not clear that reducing run-off is going to be enough to control these blooms.”

Ines Ibáñez is an associate professor at SEAS. Her major research interests focus on the current challenges that plant communities are facing in the context of global change, i.e., climate change, invasive species, and landscape fragmentation.



“We may be able to predict what will happen in the long term, but we don’t know what is going to happen in the short term. Here is where abrupt threshold dynamics may take place—where we reach a certain point in environmental conditions and there is a brisk change in how ecological systems respond to it. And there are many global change factors other than climate driving these dynamics, such as pollution, invasive species, and landscape fragmentation. They’re all taking place at the same time, and are creating novel conditions for which we don’t have any contemporary or past analogue. This means we cannot use our past knowledge to predict the future knowledge. We are in a completely new space.

“But I think that everybody understands that environmental problems are affecting us all now, and that our society wants to resolve these issues. Look at how mayors, states, and companies are taking action, despite the current administration, and proposed deregulations by the EPA. That’s why I’m very optimistic, because we don’t depend on a top-down approach. People are educated enough—and this includes corporations and local politicians. It’s not going as fast as we would like it, but it’s moving.”

Andy Hoffman, the Holcim Professor of Sustainable Enterprise, holds joint appointments at U-M's Ross School of Business and SEAS. In his research, he uses organizational, network, and strategic analyses to assess the implications of environmental issues for business.



"There are several future scenarios to consider. You can have a dystopian world where there's continued fragmentation, and no acceptance of the problem. The elites continue to make money, and there's no concern for the small island states that will be under water. That's one possible scenario. A second is what we call 'market rules' where we address climate change, but only if it makes money for companies. This is a very real possibility, but only a partial solution. It will slow down the velocity with which we're running into a brick wall, but we won't reverse course. A third is what we call the 'technology fix' where technology will save the day. Essentially, we'll geo-engineer the planet. Like market rules, that will alter the velocity, but not change our behavior. Both of these are band-aids to continue living the way we're living.

"The fourth, which is more utopian, we call 'cultural re-enlightenment.' That means to fully come to terms with life in the 'Age of Humans'—what some geophysicists are calling the Anthropocene, we need a social shift akin to the Enlightenment of the 17th and 18th century.

"The late author Thomas Berry wrote that every generation is faced with a great challenge. He called it the 'Great Work.' He went on to say that 'the nobility of your generation will be determined by how you respond to that challenge.' So I challenge my students to consider this: What world do you want it to be? That is your Great Work."

Jonathan T. Overpeck, the Samuel A. Graham Dean of SEAS, is an interdisciplinary climate scientist. He has active climate research programs on five continents, focused on understanding drought and megadrought dynamics (and risk) the world over, and has also served as the lead investigator of Climate Assessment for the Southwest and the SW Climate Science Center – two major programs focused on regional climate adaptation.



"Climate change is the mother of all environmental challenges. Its scale globally—and its magnitude locally—combine to make it the threat that will overwhelm every other environmental problem, either now or sometime in the future. In a sense, climate change is supercharging our climate extremes—our heat waves, our tropical storms, our droughts, our floods, and it's happening all over the planet.

"But when it comes to the environment, we must never give up. Our job at SEAS is not just to communicate what we think the 'state of the knowledge' is on climate change. Communication is important, but we need to go further than that. We need to build relationships with people in society. Then we can collectively decide what the most important challenges are, and work together to create the best solutions. What we're creating here is hope for the next generation and the next generations after that." 🌱

EDUCATION & THE ARTS

In her course, "Culture, Nature, and Landscape," associate research scientist at SEAS, **Sara Adlerstein**, tasked her students to create picture books for children that conveyed information about climate change in a simple and engaging way. The goal was to empower children to be part of the solution.

"Bringing the humanities into our environmental programs is essential. We need to be able to convey the essence of what we do as scientists to everyone—not just other scientists. Art can be used for advocacy, as well as a way of healing. Art can also be a way of educating people."

Another of Adlerstein's projects brought students into local elementary and secondary schools to lead classes about climate change.

Children were then invited to submit artwork that expressed their own feelings about climate change, and what actions they could take to help. The children's work was featured in the exhibition "Youth and Climate Change" at the Dana Building's Art and Environment Gallery.

"These projects were a great opportunity to enhance collaboration between communities, teachers, children and artists," said SEAS alumna **Brooke McWherter (MS '18)**. "Climate change was not in the common narrative when I was a child, and it seems to me that only recently we realized that this was something we should talk about with our children. They're going to be impacted by it and it's important that they understand what's going on, and learn how they can help to reduce those impacts."



FINDING ENERGY AFTER MARIA

BY NARDY BAEZA BICKEL

Don Julio looks down the hill where he once produced pineapples, oranges, mandarins, bananas, and plantains. In the shadow of these crops, he says, grew Selección Puerto Rico, the best coffee in the world.

“Before María, it was beautiful. It was a pleasure being here,” says the 75-year-old farmer. “It was clean. Now, it’s all *bejuco*. Just weeds.”

A team of researchers from the University of Michigan hope farmers like Don Julio will benefit from a project to enhance the resilience and sustainability of the agricultural sector in the wake of Hurricanes Irma and Maria. The storms decimated much of the island’s coffee, plantain, and citrus crops last year, causing an estimated \$2 billion in damages to Puerto Rico’s agriculture.

The project would use a gasifier to turn coffee husks, clippings, and other agricultural waste into fuel that will power hybrid microgrids. They expect to use the byproduct of the process, called biochar, to improve soil quality.

Lead researcher Ivette Perfecto, a professor at SEAS, says the team envisions long-term impact on the island’s energy and agricultural landscape through the project, which received seed funding of \$50,000 from SEAS and was recently awarded \$200,000 by U-M’s Graham Sustainability Institute.

“The effect of the hurricane opened people’s eyes regarding the vulnerability of an outdated energy system, the dependency on fossil fuels, and the dependency on imported food,” Perfecto said. “There is an opportunity now to transform the energy and agricultural systems on the island into sustainable systems based on renewable energy and agroecology. And we are ready to contribute to that transformation.”



IN AN ENERGY DESERT, AN OASIS

Perfecto and her partner, John Vandermeer, a professor in LSA's Department of Ecology and Evolutionary Biology, originally planned to visit Puerto Rico in fall 2017. They intended to collect data for a project focusing on the conservation and biodiversity of Puerto Rico Model Forest, which supports people living and working in the forests on which their livelihoods depend.

"But about a week after we started, the hurricane happened," Perfecto says. "People were looking for water, for food, reopening roads. There was no way we could collect data."

Immediate plans for travel were scratched and Perfecto and Vandermeer instead joined the Puerto Rican diaspora in a campaign to provide solar lanterns to the people of Adjuntas. The community-based organization Casa Pueblo, which led the creation of the Puerto Rican National Model Forest (Bosque Modelo Nacional de Puerto Rico), organized the campaign.

The organization, which has relied on solar power since the 1990s, became an energy oasis for the community immediately after the hurricane, says Casa Pueblo director Arturo Massol Deyá. They were able to support an enclave of ten houses with a solar emergency system to power small refrigerators for medicines, as well as dialysis equipment and respiratory therapy equipment.

"Since then, we've been changing the energy landscape in Adjuntas," Massol Deyá says.

They added solar panels to small businesses—a barbershop, a mini market, a warehouse—and installed 55 solar refrigerators in surrounding communities. As the hurricane season gets started, there's a little more resilience in the community, Massol Deyá says.

"We now have an oasis for food, for power, for communications, for entertainment, for economic activation everywhere in the community," he says.

As the U-M researchers evaluated their options, Casa Pueblo became a natural ally to develop a project on sustainable energy. After many conversations, Perfecto, Vandermeer, and José Alfaro, assistant professor-of-practice at SEAS, traveled to Adjuntas in December to meet with Massol Deyá, as well as colleagues from Universidad de Puerto Rico Mayaguez, Universidad de Puerto Rico Utuado (UPRU), and Organización Boricúa, which promotes sustainable agricultural practices.

"They came with this idea that Puerto Rico not only has an abundance of sun, wind, and water, but also of biomass that some call waste," Massol-Deyá says. "They said 'that's not waste, that's fuel.' That reconceptualization opened our eyes."

PROVING THE CONCEPT

It's a hot summer day at UPRU, and U-M student Michelle Farhat is carefully mixing oil into a plastic tub containing coffee husks. She turns on the pelletizer machine and starts pouring the mix down the feeder, using a piece of metal to push any material that gets stuck.

Located about 65 miles from San Juan in the central mountains, this is the only UPR campus serving a primarily rural population. The yellow buildings contrast with green hills in the background as the college's goat bleats, seeking attention.

"If they are good, they don't break when you squeeze them," Alfaro says, as he takes a pellet, squishing it into powder with his fingers. "We need to find the right consistency."

Farhat gets back to work, this time adding water to the mix as she writes down the ratio of water or oil, continuing to test the pellets for firmness.

A group of eight U-M graduate students initially built a gasifier in Matthaei Botanical Gardens in Ann Arbor before traveling to Utuado this summer to set up shop behind one of the buildings at UPRU. There, they planned to build a basic gasifier as proof of concept, with the idea that, in the future, local workers would build them, creating a small industry in the region.

"The idea was to create this kind of rough gasifier that wouldn't take too much time or too much effort to put together with materials that could hopefully be easily found here in Puerto Rico," said Farhat, a dual-degree master's student in engineering sustainable systems. "It's kind of a quick and easy way to get renewable energy at their home, especially since the grid here hasn't been super reliable."

"It has definitely been more challenging than we expected," Farhat says.

To feed the gasifier, students collected biomass and, after drying the materials in a kiln they built themselves, they used a pelletizer to homogenize the size and density of the material. As they tried different approaches, they also incorporated material without pelletizing to be used in the gasifier. That's when the fun really started, Farhat says.

"It's just been our team kind of putting all the pieces together and troubleshooting," she says. "I guess the process is kind of finicky and it's pretty dependent on the temperature. It's just been a lot of trial and error."

The students hope to gasify enough material to produce biochar, which will be added to different farmlands to measure its impact on soil properties—quantity of nutrients, carbon sequestration and structural properties—as well as soil organisms, such as earthworms, macro arthropods, and microorganisms.

BUILDING A NETWORK TO CREATE A GRID

The road from Utuado to Adjuntas, a 13-mile ride through the central mountains, is breathtaking. Plantain trees rise from the creeks and big Flamboyán trees with bright red flowers stand up in the distance. Brightly colored homes—yellow, pink, blue—intermittently line either side of the road.

But reminders of Hurricane Maria are everywhere: mattresses piled up next to an empty house, bamboos torn and broken by the fierce hurricane winds, dead powerlines dangling over the road and, every now and then, a headless palm tree.

As work on the gasifier continues in Utuado, U-M researchers plan to bring a commercial model to set up at a farm near Adjuntas, and another possibly in the town, to expand Casa Pueblo's efforts to add gasifier-produced electricity to their solar-powered grid. This allows for less reliance on batteries, the most expensive and shortest lasting part of the solar power system, Alfaro says.

"If we set it up here, we can build a microgrid to expand to the houses nearby," says Massol-Deyá, standing outside a 'colmado', a micromarket already powered by Casa Pueblo's solar panel. He also talks about installing the gasifier in Casa Pueblo, where they could use the organization's excess power to feed other homes and businesses; at a farm by the radio station on top of a mountain; and in other communities that might benefit from the project.

Also excited upon hearing of the project is Rogelio Pérez, whose home is in San Sebastián, located not too far from Utuado and Adjuntas. He, his extended family, and several neighbors were devastated by Hurricane Maria.

"The project could expand to other towns that have the same problems to bring electrical power to places that are difficult to access because they're in the mountains, like Lares, San Sebastián, Las Marías, Maricao, Yauco," he says, rattling out names as fast as he can. "And you can develop an industry and then we can create a business to export it to other countries."

Alfaro says he understands the sense of urgency of those living on the island, where when a tree fell in March, 840,000 consumers were left without power.

"In general, sustainable energy is an important thing, but there is a specific reason for Puerto Rico that's even more pressing," Alfaro said. "By having this type of renewable energy and by having microgrids at the point of consumption, you're able to create a system that is less likely to be completely out or have a total failure like we saw after Maria."

Don Julio, the farmer, says he remembers stories of when the area's river powered a lot of the island and would like to see the region become energy independent. But he fears that, unable to keep up with the farm by himself and after a second year without a harvest, he might have to sell to the highest bidder. He leans on the hoe he's using to clear up the ground, looking at his farm.

"I do wish you would have seen it then," he says, nostalgically. 🌱

AT THE UNIVERSITY OF PUERTO RICO AT UTUADO, SEAS STUDENT MICHELLE FARHAT (MS '19, MSE '19) HELPS CONSTRUCT A GASIFIER TO CONVERT COFFEE HUSKS INTO USABLE FUEL



GRAHAM SUSTAINABILITY INSTITUTE WELCOMES NEW DIRECTOR



Jennifer Haverkamp, an internationally recognized expert on climate change, international trade, and global environmental policy and negotiations, is director of U-M's Graham Sustainability Institute (GSI) as of October 1, 2018. Haverkamp will carry the title of Graham Family Director. She is the third director of the Graham Sustainability Institute and succeeds Donald Scavia, who led the institute until 2016.

As director, Haverkamp will lead GSI in facilitating sustainability-focused collaborations among faculty and students from many disciplines across campus with external stakeholders, including communities, non-governmental organizations, government agencies, foundations, professional organizations, and the private sector.

Haverkamp has served as visiting professor-of-practice and distinguished practitioner-in-residence at Cornell Law School, as well as executive-in-residence at the David R. Atkinson Center for a Sustainable Future, also at Cornell University. She served as special representative for environment and water resources, with personal rank of ambassador, in the U.S. State Department. She led the international climate program at the nonprofit Environmental Defense Fund, and served in the Office of the U.S. Trade Representative, the U.S. Environmental Protection Agency, and the Justice Department's Environment and Natural Resources Division.

Haverkamp earned a law degree from Yale Law School, was a Rhodes Scholar earning a master's degree in politics and philosophy at Oxford University, and majored in biology at The College of Wooster, on whose board of trustees she has served for many years.

UPCOMING SEAS CONFERENCES



SUSTAINABILITY + DEVELOPMENT

November 9-11, 2018
Ann Arbor, Michigan
umsustdev.org



NEW HORIZONS

April 24-26, 2019
Hyatt McCormick Place
Chicago, Illinois
seas.umich.edu/events/nh2019



GALAXY 2019

June 2019
Sustainability Learning Exchange
Ann Arbor, Michigan
galaxy.learn gala.com

DRIVEN BY SUSTAINABILITY

BY DENISE SPRANGER



JIM GAWRON

“There’s a lot of talk about whether the big ‘connected and automated vehicle’ (CAV) deployments and successes are going to come out of Silicon Valley or Southeast Michigan and Detroit. Considering all the investment by Ford and GM, my bet is on Detroit. I see southeast Michigan becoming the epicenter of taking the world into this next revolution of mobility—not only to create a more convenient and safer transportation system, but one that is also more environmentally sustainable.”

—Jim Gawron (MSE ’11, MS/MBA ’19)

Jim Gawron’s passion for mobility transformation is not new, though initially his interest travelled in a different orbit, quite literally. When asked to describe himself in fifteen words or less, Gawron didn’t skip a beat. “A rocket scientist turned environmentalist creating a more sustainable world through the power of business.”

Though Gawron smiled as he said it, he wasn’t kidding. After earning his master’s degree in space engineering at U-M in 2011, he worked as a systems engineer in the aerospace industry for five years—leading a team that developed a satellite picked up by NASA on a \$55M contract to Orbital ATK.

Bringing his considerable talents down to earth, Gawron is now pursuing a dual degree (MS/MBA) at SEAS and at the Ross School of Business through the Erb Institute. In 2017, Gawron was selected as one of 1,000 Global Talents from over 165 countries to participate in a nine-day sustainability innovation lab in Denmark, sponsored by the United Nations and several major

corporations. He is now serving in his second role at Ford as an Autonomous Vehicle Strategy Intern.

Gawron’s expertise—and enthusiasm—prompted Dr. Greg Keoleian, director of the Center for Sustainable Systems, to invite him to lead a new study on the sustainability impacts of CAVs as part of his master’s thesis.

The results of the first phase of the study, published in *Environmental Science and Technology* in February, explored the tradeoffs of self-driving vehicles—the benefits, the efficiencies, and the current detriments, like the added weight of onboard computers, increased electricity demands, and aerodynamic drag of sensors.

“In phase two of the research,” said Gawron, “we started looking at actual deployments—specifically how CAVs would be used in a fleet—and projecting emissions over the entire mobility system. Looking through that lens, there are significant differences in impacts between private use, ‘ride hail,’ and ‘ride share.’”

Autonomous fleets have already hit the road in places like Phoenix, where Waymo is testing its self-driving minivans on public streets. Not far behind, General Motors plans to launch its own commercial driverless taxi service in 2019-20, and Ford is ramping up for 2021. Gawron noted that Ford plans to use their recent purchase of Detroit’s Michigan Central Station—a building abandoned now for three decades—as an “innovation hub” for teams working on mobility transformation.

While the future of CAVs has covered the distance from “impossible” to “inevitable” in little over a decade, sustainable outcomes will require sustainability professionals across a myriad of fields, including engineering, design, GPS technology, urban planning, and business.

“Energy efficiency is key,” said Gawron, “and so is strategic deployment.” In areas of urban sprawl, coordinating

ride share fleets of electric CAVs with existing metro systems could solve the “last mile” problem for commuters, reduce congestion, and eliminate the wasted miles drivers spend circling for a parking space. Using the services of a CAV fleet instead of privately owned vehicles could also slash transportation costs by 50 percent for city commuters.

Gawron noted that the phase two research results—expected to be published early next year—showed up to an 87 percent potential decrease in overall energy and emissions compared to the baseline scenario of conventionally driven SUVs, trucks, and sedans. “If we move to an all-electric fleet of these autonomous vehicles that are shared and deployed in smart strategic scenarios, there’s definitely that opportunity—especially when you look in the long term over the next 35 years—with the projected decarbonization of the electrical grid.”

There are challenges, of course. One found by Gawron’s research team turned out to be the “unintended consequence” of energy usage and emissions from the bandwidth required for high-definition mapping. Gawron hopes that the CAVs can eventually be designed to be more self-sufficient.

Keoleian noted that the three other members of the research team—analysts and researchers at Ford—are all U-M alums, including SEAS alumni **Robert De Kleine (MS/MSE ‘09)** and **Hyung Chul Kim (PhD ‘03)**, and Ross School of Business alum **Timothy J. Wallington (MBA ‘03)**, who also serves as an External Advisory Board Member at CSS.

“It’s a really exciting time in transportation with so many innovations happening,” said Gawron. “I’d really like to be a part of that, right here in Michigan.”

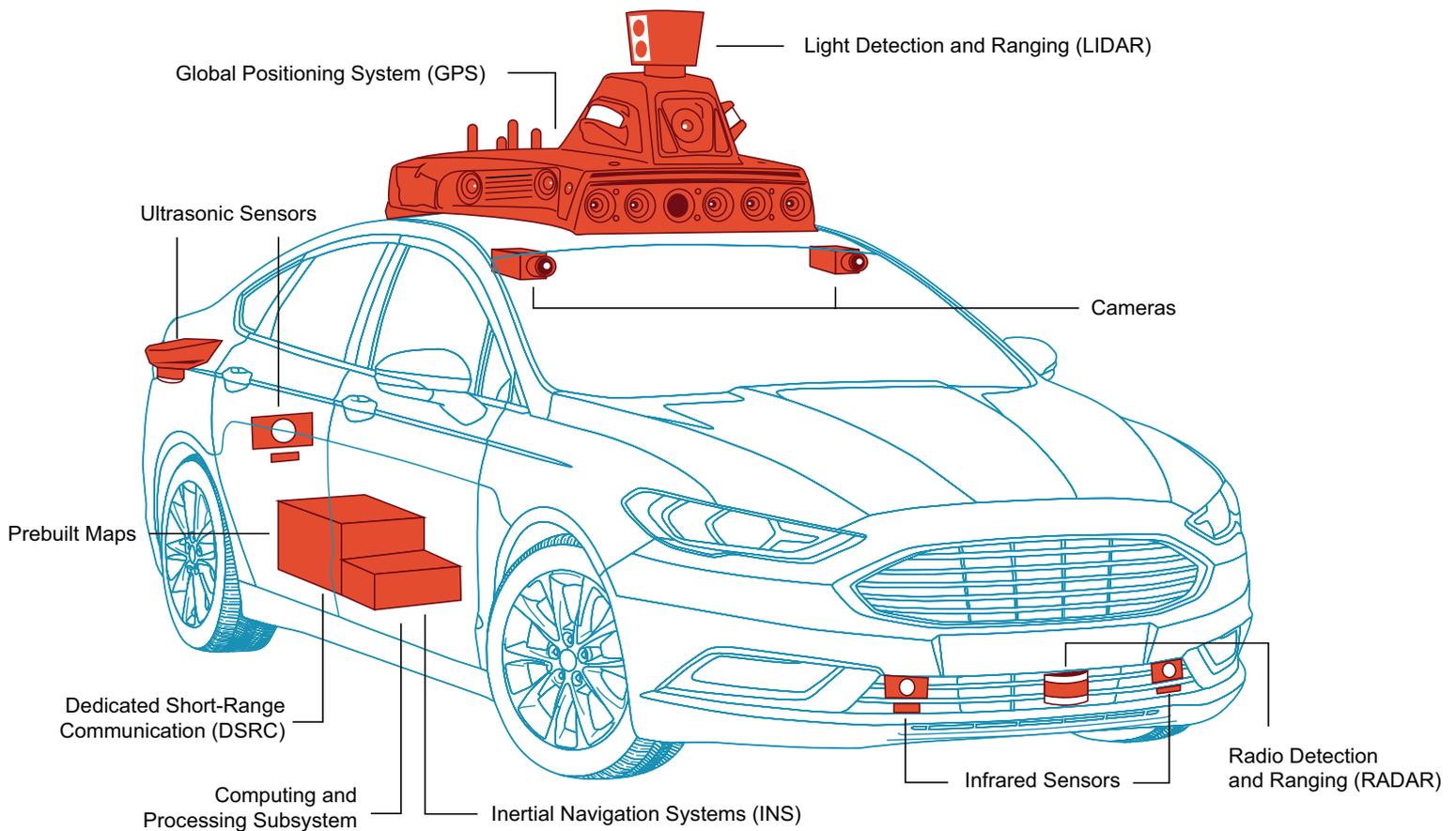


Figure courtesy of Environ. Sci. Technol., Morteza Talebat

COST, AVAILABILITY OF ENERGY-EFFICIENT LIGHTBULBS VARY WITH POVERTY LEVELS

LED BY PROF. TONY REAMES



Energy-efficient lightbulbs are more expensive and less available in high-poverty urban areas than in more affluent locations, according to a study conducted in Michigan’s Wayne County, where 22.4 percent of households live below the federal poverty level.

In the U.S., lighting accounts for about 20 percent of the average household’s energy bill, and residential lighting is undergoing a rapid transition toward greater energy efficiency. But for many households—especially the poor—the upfront costs of upgrading from an incandescent or halogen bulb to more efficient compact fluorescent lamps or LEDs is a significant barrier.

Researchers explored disparities in the availability and price of energy-efficient bulbs by surveying 130 stores across Michigan’s most populous county, Wayne. Their findings were published May 15, 2018, in *Applied Energy*. SEAS professor and director of the Urban Energy Lab, Tony Reames, is the study’s lead author, with co-authors Michael Reiner, a dual-degree student at SEAS and U-M’s College of Engineering, and M. Ben Stacey, a dual-degree student at SEAS and U-M’s Taubman College of Architecture and Urban Planning.

The researchers found that the cost to upgrade from a conventional incandescent bulb to a highly efficient light-emitting diode, or LED, was twice as high in the highest-poverty areas. At the same time, the price for less-efficient incandescent and halogen lamps (IHLs) decreased as the poverty level increased.

According to the authors, those disparities could lead residents of poorer neighborhoods to continue buying IHLs and thereby miss one of the simplest ways to cut home energy bills: residential lighting upgrades.

“The lightbulb price and availability patterns we found point to potential barriers to the adoption of energy-efficient lighting in higher-poverty neighborhoods,” said Reames. “The ability to benefit from the transition to more energy-efficient lighting is not equitably distributed, and those disparities raise energy justice concerns.” 🌱

SHALE GAS VS. COAL

LIFETIME TOXIC RELEASES FROM COAL MUCH HIGHER

Despite widespread concern about potential human health impacts from hydraulic fracturing, the lifetime toxic chemical releases associated with coal-generated electricity are ten to 100 times greater than those from electricity generated with natural gas obtained via fracking.

LED BY PROF.
SHELIE MILLER

In recent years, the combination of horizontal drilling and hydraulic fracturing (commonly known as fracking), have helped unlock vast stores of natural gas in shale formations. Increased shale-gas production created a boom in some parts of the country, but has also led to concerns over potential contamination of drinking water and possible human health impacts related to hydraulic fracturing.

Given those concerns and the ongoing shift to shale gas, SEAS professor and director of the Program in the Environment, Shelie Miller, led a comparative analysis of the harmful health effects of electricity produced from shale gas and coal. The goal was to place their relative impacts in context.

In this lifecycle impact assessment, Miller and co-researchers used Pennsylvania as the point of origin for both shale gas and coal, since both energy sources are abundant in the state. The study considers the amount of toxic chemicals released into the air, soil, and water, during both the resource extraction and electricity generation phases of both technologies. It concludes that the potential human health impacts of electricity from coal are much higher.

"This analysis does not imply that concerns associated with shale gas production are unfounded, only that the overall toxic load of coal is definitely greater," Miller said. "And while the study doesn't address this directly, we should be pursuing renewables more aggressively if we really want to decrease the human toxicity burden of our energy system."

The study was published October 10, 2017, in *Environmental Science & Technology*. The work was supported by the University of Michigan Water Center, U-M's M-Cubed program and a grant from the National Science Foundation. 



LED BY PROF. INEZ IBÁÑEZ

MICHIGAN'S SUGAR MAPLES WILL STRUGGLE IN A WARMER, DRIER FUTURE

Though Michigan's sugar maples benefit from the growth-promoting effects of nitrogen compounds in the environment, those gains will not fully offset the added stresses of growing under a drier climate in the future, according to a study led by SEAS professors Ines Ibáñez and Don Zak.

Sugar maples, known for their fiery fall foliage and as the main source of maple syrup, are a dominant tree species in the northern hardwood forests of eastern North America. They are found mainly in moist, well-drained soils and are drought-sensitive.

Some climate forecasts for the Upper Great Lakes region in the coming decades call for warmer temperatures and an increased likelihood of summer drought—conditions that could prove stressful for sugar maples and other trees. But as the climate continues to change, forests worldwide are also being exposed to rising levels of growth-boosting nitrogen compounds generated by motor vehicles, power plants, factories, agriculture, and

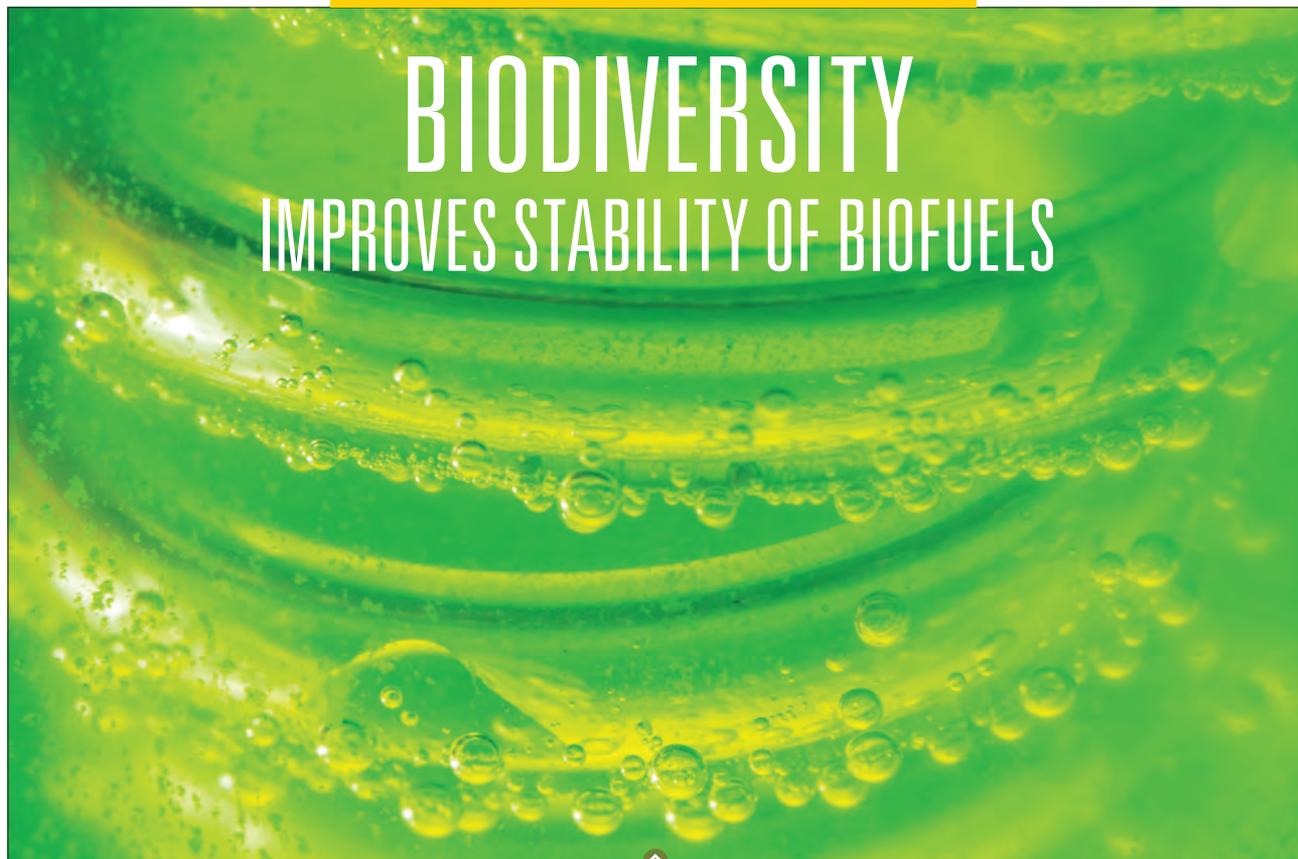
other human sources. This human-derived nitrogen is considered a pollutant but also has a fertilizing effect on trees, promoting growth.

Climate scientists and forest ecologists have long wondered whether the fertilizing effects of human-derived nitrogen would be enough to offset added stresses produced by a warmer, drier climate. The new study by Ibáñez and Zak—published January 17, 2018, in *Ecology*, and based on 20 years of data from four forest sites in both Michigan peninsulas—concludes that nitrogen deposition from human activities, “will not fully compensate for the negative effects of growing under the drier forecasted climates.”

“The added nitrogen helps a little bit, but not enough,” said Ibáñez. “Carbon sequestration is a huge service provided to us by forests and is very important for any kind of climate regulation into the future,” she said. “If droughty conditions reduce the productivity of Michigan forests in the future, their ability to sequester carbon will suffer as well.” 🌱

LED BY CASEY GODWIN, PHD, WITH PROF. BRAD CARDINALE

BIODIVERSITY IMPROVES STABILITY OF BIOFUELS



ALGAE-DERIVED BIOCRUDE OIL IS BEING STUDIED AS A POTENTIAL RENEWABLE ENERGY ALTERNATIVE TO FOSSIL FUELS. BECAUSE THEY GROW QUICKLY AND CAN BE CONVERTED TO BIO-OIL, ALGAE HAVE THE POTENTIAL TO GENERATE MORE FUEL FROM LESS SURFACE AREA THAN CROPS LIKE CORN.

A diverse mix of species improves the stability and fuel-oil yield of algal biofuel systems, as well as their resistance to invasion by outsiders, according to the findings of a federally funded outdoor study. The study was led by SEAS postdoctoral fellow, Casey Godwin, and included SEAS professor and director of the Cooperative Institute for Great Lakes Research (CIGLR), Brad Cardinale. Aubrey Lashaway and David Hietala, both of U-M, and Phillip Savage of Pennsylvania State University, were also authors of the study, published June 18, 2018, in *Global Change Biology—Bioenergy*.

The research team grew various combinations of freshwater algal species in 80 artificial ponds at U-M's E.S. George Reserve near Pinckney, Michigan. This was the first large-scale, controlled experiment to field-test the widely held idea that biodiversity can improve the performance of algal biofuel systems.

Overall, the researchers found that diverse mixes of algal species, known as polycultures, performed more key functions at higher levels than any single species. But, surprisingly, the researchers also found that polycultures did not produce more algal mass, known as biomass, than the most productive single species, or monoculture.

"Our findings suggest there is a fundamental tradeoff when growing algal biofuel," said Cardinale. "You can grow single-species crops that produce large amounts of biomass but are unstable and produce less biocrude. Or, if you are willing to give up some yield, you can use mixtures of species to produce a biofuel system that is more stable through time, more resistant to pest species, and which yields more biocrude oil." 🌱

Beyond Dana STORIES OF OUR STATE



BREWERY VIVANT SUSTAINS PEOPLE, PLANET, PROFIT

Feat. Kris Spaulding (BS '97)

When SEAS alumna Kris Spaulding started Brewery Vivant, she did so mindful of the possibilities to create a sustainable business with inspiration sparked at the University of Michigan.

impact.govrel.umich.edu/beer-the-change

HISTORIC LELAND FISHERY PRESERVES A MICHIGAN WAY OF LIFE

Feat. Nels Carson (BS '05)

Taking over his family fishery, SEAS alumnus Nels Carson leaves his mark on the local economy, state tourism, and Michigan waters.

impact.govrel.umich.edu/carlsons-fishery

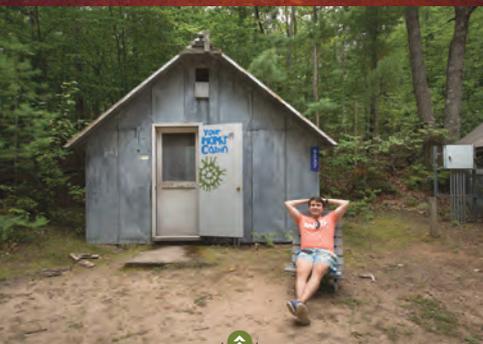


DEADLY RIP CURRENTS

Feat. Prof. Jim Diana

After nearly drowning, a U-M staff member teams up with Jim Diana and Michigan Sea Grant to turn survivor guilt into action.

impact.govrel.umich.edu/rip-current



STUDENTS VISIT THE U-M BIOSTATION DURING SEAS ORIENTATION IN AUGUST 2018

DEAR FRIENDS:

It was just before the start of school and the weather in Pellston, Michigan, was not cooperating. Rains pounded the drafty cabins at the University of Michigan Biological Station. The newest class of students—from all regions and backgrounds—were attending orientation, experiencing their first taste of our community.

Whether you graduated from SEAS, SNRE, SNR, or the School of Forestry, memories of good times with your classmates in the field are surely among your fondest. The annual campfire at Saginaw Forest (now in its 112th year), orientation at the Biostation, Woody Plants with the legendary Burt Barnes—these are the stories of our shared history, told and retold again.

The members of our incoming class know they are joining an alumni community that includes accomplished leaders making an impact on environmental sustainability at the highest levels. Alumni like....

- **Bill Bahnzaf (BSF '67)**, past president of the Sustainable Forestry Initiative, which oversees the most widely used forest certification standard in North America
- **Michael Dorsey (BS '93, PhD '05)**, recipient of Rotary International's highest honor—the Paul Harris Medal for Distinguished Service to Humanity
- **Kerry Duggan (MS '06)**, partner, sustainability, Ridge-Lane Limited Partners; named to Crain's Detroit Business 2018 list, "40 Under 40"
- **Mona Hanna-Attisha (BS '98)**, physician, scientist, and activist who blew the whistle on the Flint water crisis; named one of *Time* magazine's "100 Most Influential People in the World"
- **Mark Retzloff (BS '70)**, pioneer in the organic and natural foods industry, chairman of Natural Habitat Group's board, co-founder of Alfalfa's Market and Aurora Organic Dairy
- **Joe Tate (MS/MBA '17)**, Marine Corps veteran, business leader, current Democratic nominee for State Representative of Michigan's 2nd District

But now, having experienced new student orientation at the Biostation like so many of you, these students realize that it starts on the ground. It starts with a foundation in applied ecology. It starts with a commitment to learn across disciplines. It starts with stellar faculty who become lifelong mentors.

Our capital campaign, focused on student support, is nearing completion and we are closing in on our goal. To those who have participated, I offer my heartfelt thanks. To those who have yet to give—now is the time to join our community of support. Our present environmental challenges are so urgent that our actions in the immediate future will have an impact on generations to come, and Michigan is leading the solutions.

Please make a gift to help secure the SEAS experience for future leaders and change agents. Together, we can tackle the most pressing challenges and transform our world.

Best,

Scott C. Bertschy
 Director of Development and Alumni Relations
 bertschy@umich.edu
 (734) 763-1577



CLASS NOTES



ANN ARBOR



SEATTLE



TRAVERSE CITY



SAN FRANCISCO



PORTLAND

IN MEMORIAM



Mark Brush, who graduated from SNRE in 2000, died in March 2018 of glioblastoma multiforme (brain cancer). Mark was director of digital media at Michigan Radio. He is survived by his wife, Andrea Tom; children Cecelia and Elias; parents Sally and Tom; and siblings Andy, Bart, and Lisa.



Doug Glancy, who graduated from SNRE and the Ross School of Business in 2007, died in December 2017. Doug worked at the intersection of climate, policy and business, first as co-founder of the Climate Speakers Network and later with Climate Reality. He is survived by his siblings Joan "Jody" Glancy, Alfred "Rob" Glancy IV, and Andrew "Drew" Glancy; and parents, Alfred R. Glancy III and Ruth Roby Glancy.

Louisa Pieper, who earned an MLA from SNR in 1974, died in August 2018. Louisa was known as a tireless advocate for historic preservation and someone who spent decades working to connect Ann Arbor to its past. She is survived by her husband, Al Pieper; daughters Lisa (Scott) Pieper-Brown and Gillian (Karen Pike) Pieper; sister, Joan (John) Reeves; and six grandchildren.



Photo courtesy of OldNews.AADL.org

From alumna Sara Segal (BS '66, MS '69)

"A group of SNR grads from the mid-1960s gathered in Lewiston, Michigan, in August 2018. The LVs (Les Voyageurs, established 1907 in Ann Arbor) and friends represent many years of environmental careers. These colleagues used their U-M natural resources training to make the world (in the USA and Canada) a little better place. Two vintage prints of Voyageur canoes were presented by Huck ('66) & Mary (Cameron) Gaylord ('65) and will find a home in the LV Cabin along the Huron River. Bill ('65) & Laurae Fortner Welch hosted the group—feasting and singing—at their cabin in Johannesburg, Michigan. It was a wonderful gathering!"



TOP ROW: GERRY LEE, ELAINE HOFFMAN, TERRY HOFFMAN, MARY GAYLORD, MIKE BUSS, BILL WELCH, ROSE REDDING, JIM REDDING
 BOTTOM ROW: ROGER LANE, JILL COHEN, NATE JOHNSON, HUCK GAYLORD, JOANNE BUSS, LAURAE FORTNER WELCH, SARA SEGAL
 NOT PICTURED: JERRY & LINDA KEISER

share your NEWS

Send updates and photos about your new job or personal achievements. Visit seas.umich.edu/alumni and fill out the online update form or write to:

School for Environment and Sustainability

Attn: Alumni Relations
 440 Church Street
 Ann Arbor, MI 48109-1041

We look forward to hearing from you and spreading your news.

MANY VOICES OUR MICHIGAN

We will be updating the SEAS Diversity, Equity and Inclusion Strategic Plan and value input from our alumni!

Please visit our website to take the Alumni DEI Survey and share your thoughts.

https://umich.qualtrics.com/jfe/form/SV_5dtgqySWrmfoRYF

THE PERFECT PATH

BY RACHEL BEGLIN
PIT E BA '18

Rachel Beglin (BS '18) is a graduate of PitE with a specialization in Wildlife Conservation and a minor in Law, Justice, and Social Change. She plans to serve in the Peace Corps in Panama, and subsequently to pursue a law degree.

Joining the PitE community was one of the best decisions I made as an undergrad. PitE is the ultimate liberal arts environmental education. It fluidly incorporates the culture of the environment, the stories and history, the qualitative, the psychological, the justice and equity, as well as the science, the ecology, the statistics and the data, the GIS and the labs and the specimens. The flexibility to pursue either a B.A. or a B.S. and the fact that students on both tracks take classes and work together makes for a far more enriching and diverse education than pursuing environmental science or studies separately.

What PitE excels in is making the classroom a place of cooperation. Because we know that it's going to take all of us to do something about these trying environmental times, there is a beautiful, encouraging atmosphere in PitE. We are thrilled when labs, senior theses, and projects reach their goals! If someone incorporates natural healing in the hospital and someone changes a farmer's perspective on predators and someone campaigns for regional transit in Detroit, we all celebrate. Everyone has a place in this wonderful, global movement for a more just, more sustainable distribution of resources, and a brighter, cleaner, healthier future.

There is so much energy and power in PitE. I love how much people in this program care about the world around them. There is a certain selflessness that

we all carry with us. I have seen PitE students stand together, steadfast against an administration that denies climate change. I have seen PitE students organize conferences and teach-ins, work to protect the water from Flint to Lake Michigan, protest and fundraise and volunteer to restore greater harmony between human beings and our environments. I have seen students turn plastic into guitars; I have seen students road trip to Mackinac Island to film a documentary on Line 5; I have friends who organized our university's first weeklong celebration of veganism.

From the outside, some people may see studying the environment as very doom-and-gloom. While there are definitely sad days for environmental students, when you enter the Dana Building—the hub of environmental academics on campus—it is anything but hopeless. The tables of the Ford Commons are full of collaboration. Someone is having a meeting about the Campus Farm, and someone is composting in the kitchen; there's flannel, mason jars full of coffee, and always a friendly face. It is the professors, academic advisors, and the students in this department who have supported me in this environmental journey, who have given me the hope that this field so perpetually requires, who have shown me the healing that can take place in a community dinner, in office hours, in meditation and, yes, even literal tree-hugging. PitE reopens the idea of what is normal, what is shared, and what is community. ♻️



FIELD WORK IN COSTA RICA



BUILDING THE CAMPUS FARM STRAW BALE HOUSE

BY SHANNON SYLTE
SEAS MLA '19

A NEW VISION

Shannon Sylte (MLA '19) is interested in participatory design of public space as a medium to foster community resilience and improve urban ecological integrity. Her research employs digital landscape visualization to support decision-making.

I was drawn to the School for Environment and Sustainability because of its diversity, academic rigor, and wealth of resources to help me achieve my goal of becoming a landscape architect. Upon entering the SEAS community, I was immersed in an environment of passionate and supportive faculty and master's students.

The School for Environment and Sustainability has opened up opportunities that I didn't know existed and motivated me to focus my academic experience on a subject I had never been exposed to: participatory design. As a first-year student in the Master's of Landscape Architecture (MLA) program, I often found myself stuck when it came to public space design. I wanted to know what the current and future users of these spaces wanted instead of creating assumptions around their needs. My interests led me to join Dr. Mark Lindquist in the Landscape Informatics Lab to assist in the development of a game engine-based 3D visualization design software. The aim of this tool is to support collective decision making around open space and green infrastructure design by utilizing visualization to communicate design decisions across diverse stakeholder groups.

Research with the Landscape Informatics Lab introduced me to cutting edge 3D modeling and digital tools that can enhance a designer's analysis of the landscape and communication of design ideas. Learning how to use these tools was just the beginning of my academic research. The visualization software

developed quickly during my first year working in the lab and I became deeply interested in understanding its application in real world community development and design settings.

The lab's partnership with the Eastside Community Network in Detroit catalyzed my involvement in applying and analyzing the software. As a Graham Sustainability Institute Dow Master's Fellow, I pitched a project to fellows from various schools throughout the university. The pitch centered upon further improving the visualization software and using it in a series of design workshops. Four other Dow Master's Fellows decided to support this project and so began the year long project that would use the software to co-design green infrastructure on vacant lots on Detroit's Eastside.

The Dow Master's Fellowship project has evolved into a robust research initiative that includes social and technical components. The social piece of the project involves training residents to use the design software to enhance design outcomes by tapping into local expertise and empowering Detroiters to visualize and co-create open space and green infrastructure design. The technical side of the project involves incorporating environmental sensors to support air quality tracking. The hope is that these co-created designs will be implemented and the sensors will be able to track air quality improvements as a result of the installation over time.

My decision to attend SEAS has undoubtedly elevated my capacity to positively impact communities by approaching sustainability projects with an interdisciplinary foundation. Through my experience within the school and the extensive alumni network beyond Ann Arbor, I know that my career after graduate school will be immensely fulfilling and impactful to a broad array of sustainability initiatives. 🌱



LANDSCAPE INFORMATICS LAB



SOFTWARE DEMO IN DETROIT

WHY I CHOSE SEAS



Dominic Bednar
PhD candidate

I was interested in a SEAS master's degree in Sustainable Systems because of its central focus on the environment and energy systems. What kept me here at Michigan is the support I've received from my thesis advisors (now my dissertation co-chairs), the resources U-M provides, and the potential of my research to have an actual and far-reaching impact.

While I am the only Black PhD student in the program, thankfully, U-M's diverse community of graduate students of color is a rich example of the intersection of scholarly/practical work in the fight for social, environmental, climate, and energy justice.



Saachi Kuwayama
MS candidate

My ethnicity and race are huge parts of my personal identity. I am half Indian, half Japanese-American, a woman, and the child of immigrants. As such, I am underrepresented in the environmental field, which was founded—and has long been dominated—by non-minority scholars and activists. Being interested in environmental justice studies, SEAS was attractive as one of the few graduate programs in the country that offers a specialization in that discipline.



Priscila Papias
MS '18

I chose SEAS because I was attracted to its interdisciplinary nature and a track focused on equity and justice. Being a person that holds identities that are underrepresented in the environmental field has made me become more aware of issues with environmental equity. I have learned to look at the details that cause inequities, like the allocation of educational resources and advertisement of employment opportunities.



Malvika Sahai
MS '18

After learning about the concepts behind environmental justice (EJ) in my freshman year of my undergrad degree at Virginia Tech, I became familiar with the works of Drs. Dorceta Taylor and Paul Mohai. The idea of studying and working alongside these influential EJ faculty members was motivating. SEAS became a fantastic resource for me to develop relationships with professors who inspire me to move equity into every sector of the environmental field.



WELCOME BACK M | PitE

A WARM WELCOME BACK TO OUR COLLEAGUES AND UNDERGRADUATE STUDENTS IN THE PROGRAM IN THE ENVIRONMENT (PITE)

The newly remodeled PitE/OAP suite (1520 Dana) is the program's hub and new administrative home.

HOUSE OF STRAW

U-M students, led by Professor Joe Trumpey of SEAS and the Stamps School of Art & Design, recently completed a new straw-bale building at the U-M Campus Farm on the grounds of the Matthaei Botanical Garden.

The structure is an example of sustainable construction. It is made of 18-inch-thick straw bales sheathed in layers of adobe on a concrete foundation. Solar panels sit atop the building's metal roof, making it the first off-the-grid building on the Ann Arbor campus. It is also the University of Michigan's first student-built structure on the main campus.

Trumpey and his class built its sibling last year at U-M's Biological Station in Pellston, Michigan. In Ann Arbor, the building is situated among fields of vegetables and hoop houses on the student-run Campus Farm.

The straw-bale structure will anchor the farm, providing formal and informal meeting space for students, faculty, staff, and visitors. The project received funding from the Planet Blue Student Initiative Fund, the Office of the Provost, and MDining, which purchases produce from the Campus Farm and plans to host farm-to-table events at the structure in the future.

"The most important thing about this project was the outside-the-classroom experience, the hands-on learning of skills as opposed to knowledge," said undergraduate Kristen Hayden. "Just knowing you can do things for yourself—I can build my own house after this, you know?"



STUDENTS WITH JOE TRUMPEY'S GREEN BUILDING CLASS MIX ADOBE FOR THE STRAW BALE BUILDING THEY BUILT ON THE U-M CAMPUS FARM AT THE MATTHAEI BOTANICAL GARDENS

DR. MONA HANNA-ATTISHA VISITS SEAS

LEANA HOSEA, SEAS MEDIA FELLOW, SAT DOWN WITH THE WHISTLEBLOWER ON FLINT'S WATER CRISIS TO TALK ABOUT HER ALMA MATER, HER NEW MEMOIR, AND HER RELENTLESS FIGHT FOR FLINT'S CHILDREN.

Without Dr. Mona Hanna-Attisha, the authorities might still be denying there was ever a problem with Flint's water. After the city's water supply was switched to the Flint River, residents' desperate pleas that something was wrong with their water were ignored. Even after Dr. Marc Edwards of Virginia Tech proved that Flint had elevated levels of lead in its water, the authorities still did not act. Dr. Mona Hanna-Attisha's research provided the crucial evidence that the water was actually increasing blood lead levels in Flint's children. In her new book, *What The Eyes Don't See: A Story of Crisis, Resistance, and Hope in an American City*, she tells the story of why she decided to risk her reputation and career in service to her patients.

Hosea: Can you tell me the meaning of the title of your book?

Hanna-Attisha: Very literally, your eyes do not see lead in water. It's invisible. It's odorless and tasteless. You don't see the consequences of lead exposure for years. I never thought that water could be a source of exposure, so I missed many diagnoses because my eyes never saw what my mind never knew.

Hosea: What kind of obstacles did you face from the authorities?

Hanna-Attisha: I consider myself the last domino in the story. When I presented the data that children were being poisoned from this water crisis, I was attacked. The State said some 'wonderful' things about me: that I was causing hysteria—which is awesome because it's sexist too; that their numbers weren't consistent with my numbers. So it was that machine of deny, dismiss, do not investigate.

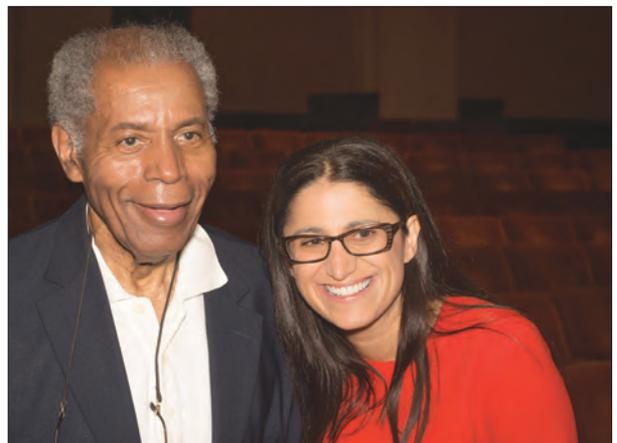
Hosea: Is there a particular person who really touched you?

Hanna-Attisha: In my book I talk about two sisters who I cared for before I knew there was a crisis, when I was encouraging them to drink the water.

Hosea: How are they doing now?

Hanna-Attisha: They're doing good. It takes long-term continuity of care. I suddenly went from holding one tiny hand at a time, to holding the hands of an entire city of kids. So we have put into place things that aren't being done anywhere in the country right now. We have two brand new child care centers. We have near universal preschool and Medicaid expansion. Lead is an irreversible neurotoxin, but you can do other things that promote children's development.

Dr. Mona Hanna-Attisha was the featured speaker on September 12, 2018, as the second in a two-part event on environmental justice presented by SEAS.



“ I came to Michigan SEAS because I wanted to continue my work as an environmental advocate, working under the leaders of the Environmental Justice movement. I was really so blessed to have these great mentors. We stand on the shoulders of giants, on those that came before.

- Dr. Mona Hanna-Attisha '98



Photo by Dave Brenner SEAS

TOP: DR. MONA WITH HER MENTOR PROFESSOR BUNYAN BRYANT
BOTTOM: DR. MONA MEETS WITH PITE AND SEAS GRADUATE STUDENTS DURING A SPECIAL Q&A SESSION ABOUT THE FLINT WATER CRISIS AND HER NEW BOOK

SPECIAL EVENTS



YOU'RE INVITED! ALUMNI AND FRIENDS ARE WELCOME AND ENCOURAGED TO PARTICIPATE IN THESE AND OTHER COMMUNITY EVENTS

OCTOBER 9

Fifth Annual Fast Food for Thought



NOVEMBER 6

DEI and Environmental Justice Speaker : Dr. Michael Dorsey, Interim Director, Joint Center for Political and Economic Studies



NOVEMBER 9-11

*Sustainability and Development Conference
umsustdev.org*



JANUARY 10

Whittemore Lecture: Adrienne Grêt-Regamey



FULL SCHEDULE OF EVENTS @
seas.umich.edu/events



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STUDENTS VISIT WILDERNESS STATE PARK DURING THE 2018 SEAS ORIENTATION

ARE YOU CONNECTED?

SEAS *Connect* is a monthly e-newsletter that brings alumni, students, faculty, and friends even closer together. In every issue, you'll read about what your classmates are up to, hear from your favorite professors, find out what's going on in the Dana Building, and learn how to get involved.



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