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The CSTPR blog, Prometheus (http://ciresblogs.colorado.edu/prometheus), was revived in 2016 to feature content from CSTPR core faculty, affiliates, postdocs, and visitors to serve as a resource for science and technology decision makers. This dynamism reflects the new energies and pursuits taking place in and around CSTPR. Below we feature one of the recent blog posts from new CSTPR core Faculty member Matthew Burgess.

Elon Musk Deserves the Nobel Peace Prize

by Matthew Burgess and Ian Burgess

Elon Musk has been in the news a lot recently, for ill-advised tweets, for smoking pot during an interview, and for his reported sleep problems (perhaps the cause of his other problems). But Musk has also arguably done more than any other single person to advance renewable energy, at a time when we urgently need action on climate change. For this, we think he deserves the Nobel Peace Prize.

Major moral honors are still rarely given to innovators, especially those in private business. Considering how many improvements to global living standards have been made or proliferated by private innovations (e.g., many pharmaceuticals, vaccines, mass production, industrial farming, the printing press, the light bulb, cars), it is surprising that the Nobel Peace Prize has only gone to a business leader once (in 2006 for developing-world microfinancing).

In 2007, Al Gore and the Intergovernmental Panel on Climate Change (IPCC) shared the Nobel Peace Prize for scientifically describing the threat of climate change and for bringing the issue to the forefront of public consciousness. But arguably, that was the easy part. De-carbonizing the global economy, without causing tremendous human suffering and conflict in the process, is the real challenge.

Amidst all of the recent disasters that have put climate in the news—Hurricanes Florence, Maria, Harvey, and Irma, fires, and droughts—it would have been easy to miss some major good climate news: Britain, France, India, and several other countries announced last summer that they will ban selling internal-combustion vehicles in the next few decades. More countries will likely follow suit. These announcements signal more than a commitment to climate action. They signal a confidence in the feasibility of mass-market electric cars.

Elon Musk is a big reason for this confidence. Not only did he oversee the quantum leap in battery and powertrain technology needed, but he released Tesla's patented designs for any competitor to copy. Of course, using electric cars won't reduce emissions unless the power grid is also powered by renewables, rather than by coal and other fossil fuels. But Musk has made important contributions here too with SolarCity (now owned by Tesla), making it easier for homes and businesses to harvest and store solar energy locally. In the past year, SolarCity has invested heavily in boosting Puerto Rico's solar power capacity, as part of the rebuilding effort following Hurricane Maria.

THIS ISSUE

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http://sciencepolicy.colorado.edu/ogmius

Elon Musk, NVIDIA / flickr, CC BY-NC-ND

It will take a society-wide effort to solve the climate problem—to shift the entire economy to renewables and mitigate whatever damages are not prevented. Efforts cannot be society-wide if they are partisan, yet polls suggest climate change still is partisan. It becomes more partisan when it is framed as a moral conflict between political tribes, rather than as a monumental technological and societal problem with no easy solutions. Burning fossil fuels is warming our planet, but this low-cost access to energy is also at the core of most of the past century's gains in poverty reduction and global living standards. Providing billions of people with food, shelter and security takes a lot of energy, and this energy has to come from somewhere. To make the energy system sustainable without descending into severe hardship and conflict in the process will require game-changing innovations in technology and in clean energy economics in a short time—the kinds of innovations Musk is pioneering.

The Green Revolution in agriculture provides a good analogy. In the late 1960s, scientists warned of an imminent global food crisis caused by overpopulation. Instead, agronomists—led by Norman Borlaug—made breakthroughs in developing high-yielding crop varieties, and global hunger decreased over the following decades. Borlaug won the Nobel Peace Prize in 1970 for these innovations, which are often credited with saving billions of lives thereafter.

Beyond being an appropriate recognition of Musk's accomplishments in renewable energy technology, giving him the Nobel Peace Prize would also send some sorely needed messages in the modern age of outrage: First, a couple of bad tweets shouldn't be enough to overshadow a decades-long and brilliant career. This is certainly not a standard that most past recipients of the Peace Prize would have met. Second, we should value people who get things done more than we value people who say the right things in public.

There are many ways to make the world a better place, and most do not fit the 'speak truth to power' mold. If we want enterprises to do good, we need to encourage do-gooders to be enterprising. The Nobel committee has a golden opportunity to make this case to the world. In 2007, they awarded the Peace Prize to Al Gore and the IPCC for sounding the alarm on climate change. In 2018, they should award the prize to Elon Musk for doing something about it.

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Ian Burgess
Co-Founder and CTO of Validere, recently named one of Canada's 20 most innovative technology companies by the Canadian Innovation Exchange

FACULTY AFFILIATE FORUM

Into the Wild – For Rain, Part I. British Columbia

by Eve-Lyn Hinckley

Research Hydrologist Sheila Murphy with rainfall collectors.

This article was originally published in National Geographic: https://blog.nationalgeographic.org/2018/08/29/into-the-wild-for-rain-part-i-british-columbia

The American Cordillera is a jigsaw of mountain ranges that curls southward from the Alaskan coast through my home range, the Colorado Rocky Mountains, to its end in the Antarctic Peninsula. I'm making my first stop along its length – coastal British Columbia – to start a new project studying the rain chemistry of remote regions.

I travel with my collaborator, Sheila Murphy, a research hydrologist with the U.S. Geological Survey. Together, we seek to determine whether the chemical signature of human development moves in rainwater to the wilds of BC, the US, Ecuador, and Patagonia. With the exception of the US site, all are locations of National Geographic Unique Lodges of the World, our partners in this effort.

As each flight connection takes us farther from Denver and closer to the BC coast, the aircraft get smaller and smaller. When we reach Port Hardy, we walk down a quiet dock to a three-seater floatplane. It is a tiny bird, like a lone tern, perched at the end of the dock. Travel by such a bird is a first for me.

The pilot instructs us to crank open the metal doors and demonstrates how to bust out the windows in case of emergency. We hop in, my hands shaking as I buckle my lap belt. He fires the motor and we are off, the plane's narrow limbs lifting us above the water.

The BC coast stretches before us, fingers of the Great Bear Rainforest stroking Queen Charlotte Strait. Still, gray sky surrounds us as we buzz along our watery path northeast toward Nimmo Bay. There, a small wilderness resort floats on narrow docks between water and land. No roads lead to Nimmo—hence the floatplane.

"See many whales this time of year?" I yell at the pilot. But the propeller is loud and the motor drowns my voice. I take a video of the blades clipping the air for my kids, rain streaking the tiny windshield.

We're not disappointed by the weather – we've come for rain. More precious is the nitrogen dissolved within its droplets: a fundamental nutrient that sustains life. Here, that means plankton, salmon, grizzly bears.

Nitrogen is one of the elements most manipulated by humans. In the absence of our engineering, the vast atmospheric pool of nitrogen gas is accessible only to specialized bacteria. They have the capacity to transform this gas into available forms that can be used by plants and animals for growth.

But the Industrial Revolution ushered in a whole new era. Our move toward dependence on fossil fuels, combined with work by a team of chemists who figured out how to synthesize fertilizers, changed the world. The latter development, known as the Haber-Bosch process, created industrial nitrogen fertilizers, which enabled us to grow crops intensively. No longer were we dependent on the slow, small efforts of

bacteria. This boon allowed our human population to grow. The combined effects of fossil fuels combustion, conversion of forested land for agriculture, and use of nitrogen fertilizers have more than doubled the amount of nitrogen cycling through air, land, and water systems, polluting them in many places around the world.

Yet you can almost forget all of this in the wilds of BC. This landscape is new to Sheila and me. We typically study places where people and their influences are immediate – agricultural areas, urban centers, wildfire scars. We share a drive to understand how people change the water and nutrient cycles that support life on Earth, and to work with land managers to balance the goals of a developed world and sustaining the health of people and ecosystems.

This project is different. Like the guests who come to Nimmo Bay's wilderness resort, we're drawn to its location, far from the noise and haze of our usual research sites. Sheila and I will use the tools in our laboratories back in Boulder, Colorado, to measure the levels of nitrogen in rain, capitalizing on the distinct chemical signature of human-derived nitrogen to determine whether it reaches the BC coastal range. Rain can carry excess nitrogen far distances, even to those places we still think of as wild, pristine.

The plane touches down and I take a breath, tell the pilot he made it look easy. "It was," he laughs and guides the plane to the dock. My hands are no longer shaking as I unbuckle my lap belt and step off.

Members of the Nimmo Bay staff greet us: someone holds an umbrella over my head and offers me a warm, wet towel to wipe my face and hands. I smile and shake hands, slightly flustered. It is a new way to start to a field project with a welcoming committee, not to mention the floatplane ride.

We are anxious to connect with our research equipment, which made the journey before we did. Dylan, one of the wilderness guides, shows us the four stamped boxes we mailed weeks ago, and we begin unpacking. Funnels studded with cable ties to discourage birds from perching, sections of PVC and rebar to mount the funnels above the ground surface, and precious tubes filled with resins that will collect nitrogen from the rainwater falling into the funnels. We account for all parts of our rain collectors and get ready to distribute them across the landscape.

Adrien, head of the guide team, says that he and Dylan can take us to scout study sites by boat for the afternoon. The guide team is almost exclusively tall, dark-haired men dressed in the emerald greens and blues of the landscape where they were born. Many found their way to Nimmo Bay after tours through the commercial fishing industry. We learn that the move from resources extraction to guiding was welcome.

Guide Dylan installs a rain gauge.

We will rely on the guides for the duration of our two-year project. They will record rainfall data, collect stream water, and swap out and mail the nitrogen-filled resin tubes every two months until the lodge closes for winter. Their efforts are critical; without the commitment of the guides, there will be no data.

"This is where the grizzlies will be pulling salmon from the river onto the banks," Adrien tells us. We're standing in a mossy grove along a quiet river. It's hard to believe that it will soon be a raucous feeding frenzy when the bears journey down from the mountains and salmon swim from ocean to river, the two groups meeting in the middle. The pearly remains of last year's run provide definitive evidence—jaws and fin plates left in piles on the ground.

Adrien not only manages the guide staff, but also monitors the bears' movements closely. He's part of a conservation effort to keep their population healthy and raise awareness of their vulnerability within the Great Bear Rainforest. I can't help but look around us at the evidence of feedings past and convert the wreckage into a nitrogen flux, imagining how salmon carnage enriches the soil each summer. I consider the next set of measurements I'd like to make.

Sheila and I decide to place the collectors under three different environments typical of the Great Bear Rainforest– open sky, old growth cedars, and secondary growth hemlock trees—to determine whether they have different nitrogen inputs. We

FACULTY AFFILIATE FORUM CONTINUED
Into the Wild – For Rain, Part I. British Columbia

Salmon remains left by a Grizzly near Nimmo Bay Resort.

Leaving Nimmo Bay Resort.

are confident that we can repeat this design at our other sites, comparing open and closed canopies.

Dylan's on grizzly watch while we pound in rebar and screw funnels to resin tubes, our eyes either on the ground or reading the trees. We are learning the landscape as we install collectors in nests of four, filling in the details we simply could not know from offices two thousand miles away.

Our cabin sits by the waterfall that inspired Nimmo Bay Resort's construction in the 1970s. When we're not out with the guides, we're in researcher mode, reading and writing. Sheila is transfixed on her laptop screen, determined to pull what little data exist for the vast rugged landscape we've now entered.

Her scavenger hunt reveals that the nearest record of rainfall near the region was in Kingcome Inlet, about 30 kilometers east of Nimmo Bay, as the gull flies. The data she finds are for the mid-1970s to 1980s. Rain and snow amounts probably vary regionally, but the data provide a ballpark figure for the average annual rainfall amount, 2.5 meters. This information is better than nothing…and confirmation that our project will make a contribution.

We install a simple, manual rain gauge near the guide shack. Everyone is excited about it. The guides tell us that they will read it daily, beginning a new era of rain data collection at Nimmo Bay. We will match the rainfall amounts with the chemistry data from our collectors, allowing us to quantify the flux of nitrogen coming into the region. Rainfall amount and chemical concentration go hand in hand to understand one of Earth's most important nutrient cycles.

Before Sheila and I leave Nimmo Bay, we brief the guides one last time and record the first rain gauge reading, officially beginning our study. We pile into the Raven – purportedly the fastest boat north of Seattle – with six other staff members who are rotating off work for a couple of weeks.

"Can you believe that our next stop's in a week?" I say to Sheila, thinking ahead to Ecuador, when we will continue our journey. "Cloud forest!" She smiles and we take our seats.

Dylan is at the helm and we motor away, slowly at first, as though reluctant to head back to civilization. I feel a sense of calm, knowing that our first set of collectors is installed, already receiving drops of rain whose nitrogen content we will determine in a couple of months.

What secrets will we learn about this place? It's one of the great questions we get to ask every time we start a new project.

Sitting back, we watch the waterside cabins get smaller and smaller, until they are just six red and white dots against the black water. Then we round a bend and Nimmo Bay is gone from view, swallowed back into the wild.

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FACULTY AFFILIATE FORUM

Paris Peace Forum

by Cassandra Brooks

Last month French President Emmanuel Macron convened the first edition of the Paris Peace Forum, an event targeted at improving global governance writ large. This bold initiative involved 65 Heads of State and participants from all over the world. The occasion, which took place between November 11-13, 2018, marked the 100th anniversary of the end of World War I and provided a new platform as a "global meet-up" to share innovative ideas in overcoming the challenges of our era: peace and security, environment, development, new technologies and more-inclusive economy. For me and my colleagues with the Antarctica2020 project, it was an appropriate moment to highlight the opportunity and risk of Antarctica – a place of amazing historic diplomacy, but also of current dramatic threat from a changing climate.

Cassandra Brooks Presenting at the Paris Peace Forum for the panel "Antarctica: Poster-child or sick man of multilateralism?". Photo: Mike Walker.

Among the presentations of ambitious solutions, ending counterterrorism, promoting digital peace, protecting global wild cats, initiating governance for the moon – among many others, we were presenting a vision of continued diplomacy and protection for Antarctica.

At the height of the Cold War, states had Antarctica divided up like a pie. The United States and USSR were both interested in using this southern uninhabited continent for military purposes. The world watched on in fear as rumors circulated that nuclear war would be raged from the Antarctic. Incredibly, instead of using Antarctica to wage war, a peace treaty was signed – The Antarctic Treaty – which came into force in 1961. It banned all nuclear and military activity and latter amendments banned mining and set aside the entire continent as "a natural reserve, devoted to peace and science." For more than 50 years, the Antarctic has been a beacon of hope, and example of functioning multilateralism serving as a model for a vast global commons dedicated to peace and science.

However, the Antarctic is undergoing rapid environmental changes and management has failed to keep pace. The Southern Ocean around Antarctica, in particular, did not receive the same protection as the continent, so in addition to suffering the effects of climate change. fishing pressure is increasing with vessels encroaching upon penguin and whale foraging grounds. Amongst glacier collapse and sea ice changes that cause reverberations throughout the food web, Antarctic species are struggling to adapt. However, Antartica2020 is one project supporting the designation of marine protected areas in the Southern Ocean to protect biodiversity and build the resilience of the marine environment to the effects climate change.

I went to Paris with a team from the project to make the case for Antarctica to continue being a place of diplomacy, peace, science and environmental protection. I talked about the incredible role that protected areas can play in enhancing resilience and for how marine protected areas themselves can be a tool for diplomacy. I saw in 2016 when, despite incredible geopolitical tension, Russia and the USA – along with the other states involved in the governance of the Southern Ocean – agreed to designate the world's largest marine protected area in the Ross Sea. This southern continent has always been a place where, despite diplomatic tensions on other parts of the world, we can find common ground.

As a testament to the importance of protecting the Antarctic marine global commons, Antarctica2020 was one of 10 projects selected from the 120 (from 850 applicants) for further support. I was immensely proud to participate in this inspiring inaugural event that will no doubt reverberate for years to come with its impacts on global governance.

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STUDENT HIGHLIGHT

Forests of the Future: Why Private Landowners Are A Key Piece of the Climate Challenge by Angela Boag, 2018 Byerly Award Winner

One summer day three years ago, I was curled up on my couch in Denver after three months of camping in rural eastern Oregon. I had spent the first summer of my PhD interviewing fifty private forest owners about how they managed their forests, including how – if at all – climate change affected their decisions.

While travelling through Oregon, I regularly checked the wildfire news to know where I should and shouldn't be, and kept up the habit back home. That afternoon, I logged onto the national wildfire map and saw there was a huge fire just south of John Day, Oregon, where I had spent several weeks.

Further online research revealed that some of the people I interviewed had lost their homes in the inferno. Just two weeks previously, I had been sitting on their porch sipping lemonade, chatting about the history of their land and the ways they managed their trees. They had shown me the places they had thinned where they felt confident a fire wouldn't spread, as well as those places they still felt were too dense and needed more work. The Canyon Creek Complex wildfire destroyed over 40 homes, the largest loss of property in Oregon in 80 years, and scorched 110,000 acres of public and private forestland.

Thousands of other families have experienced similar losses across the West, and fire scientists expect it to get worse. Large wildfires are becoming more common, in part because ongoing wildfire suppression policies have stopped the natural fire cycle. Regular fires historically reduced the amount of woody fuels on the landscape and created open meadows between forest patches. After 70 years of putting fires out, many forests have high densities of small trees, so when a wildfire ignites, it burns at high intensity across a huge area.

The other factor fueling more large wildfires is the changing climate. Warmer temperatures mean forests dry out more quickly in the summer, and heat waves combined with windy conditions create the perfect environment for massive, uncontrollable fires like those we saw in California this year. Humans are also starting fires more often as more people continue to move into the wildland-urban interface.

There is a lot of ire directed towards the federal government for the wildfire problem, but they are only one piece of the puzzle. Family forest owners own 38% of forestlands in the US and around 17% is owned by corporations focused on timber production. Only 31% of US forests are managed by the federal government. In the western US, where public forestland covers larger areas, private ownership still comprises 30% of forestland (Hewes et al., 2017). Therefore, by virtue of the large number of trees they manage and the carbon stored therein, private forest owners have a key role to play in adapting US forests to changing conditions. The U.S. Forest Service operates under a guidance to consider climate change in management decisions, however no such coordinated effort exists among private forest owners.

While wildfire is the in-your-face impact of climate change on forests, other impacts are also becoming evident. Shorter and warmer winters mean higher bark beetle populations as the beetles complete more generations in the growing season. And while warming is often the chief climate concern, more precipitation at specific times – particularly in spring – may mean more widespread disease and fungal infections in some tree species. So how do forest owners adapt?

Adaptation actions primarily aim to reduce vulnerability to increasingly likely natural disasters like wildfire, or increase capacity to respond to gradual change. Thinning trees back to densities similar to those pre-fire suppression can ease drought stress on individual trees and reduce wildfire severity. Thinning combined with prescribed burning has the most fuel reduction benefits, however most private forest owners are reluctant to implement prescribed burns on their land due to liability concerns.

STUDENT HIGHLIGHT CONTINUED

Forests of the Future: Why Private Landowners Are A Key Piece

Research indicates that many tree species will move to higher latitudes and elevations over this century, suggesting forest managers should begin thinking about replanting species post-fire or post-harvest that are "future-adapted" to projected climatic conditions.

Most forest owners I interviewed know thinning is important for wildfire mitigation, but lack a plan or funding to get the work done. Research shows that forest owners who get support for developing a forest management plan and access to cost-share and grant funding through state forestry agencies, university extension or non-profit organizations, are much more active managers. These are avenues through which best practices for climate change adaptation could be communicated.

In eastern Oregon, I found very few private forest owners who were concerned about climate change itself. Climate change is a highly politicized issue in rural Oregon as it is elsewhere in the US. Therefore, organizations supporting sustainable forest management by private forest owners may make more progress by focusing on the symptom of climate change, wildfire, rather than the cause. In the end, fuel reductions are still one of the first steps towards "climate-smart" forest management that almost all private forest owners need to take.

Hewes, Jaketon H.; Butler, Brett J.; Liknes, Greg C. 2017. Forest ownership in the conterminous United States circa 2014: distribution of seven ownership types – geospatial dataset. Fort Collins, CO: Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2017-0007

Angela Boag is a PhD student at the University of Colorado Boulder investigating the relationships between climate change, forest management and land ownership. She is the 2018 recipient of the Radford Byerly, Jr. Award in Science and Technology Policy: http://sciencepolicy.colorado.edu/students/byerly_award

MULTIMEDIA HIGHLIGHT

Institute for Social Change and Sustainability, WU Vienna

Barriers to Sustainability: Interview with Steve Vanderheiden (starting at 2.25)

How may we best support the transformation of contemporary consumer societies to social and ecological sustainability? How may we help to avoid losing time with narratives of 'transformation' which may in fact do more to reproduce the status quo? Sustainability researchers in academic institutions are not just detached observers of societal developments, but they are themselves key actors in the public debate in which societal concerns about sustainability are articulated and politicized, and political priorities identified. Acknowledging this dual role and the social, political and academic responsibility that comes with it, the Institute for Social Change and Sustainability (IGN) explores the interdependence of the development of modern societies and their discourses and politics of (un)sustainability. In an international research workshop the IGN investigated the persistent obstacles and limitations to profound societal change.

Video [3:40]: https://www.youtube.com/watch?v=y-w_rMhTXFk

To view more videos from CSTPR see: https://sciencepolicy.colorado.edu/news/multimedia/index.html

STUDENT HIGHLIGHT

Adventures In London & How The World Is Doing On Climate and Health

by Olivia Pearman

The 2018 Annual Meeting of The Lancet Countdown: Tracking Progress on Health and Climate Change

Last month, on September 4th and 5th, I had the good fortune to travel to London to attend the annual meeting of The Lancet Countdown: Tracking Progress on Health and Climate Change. The Lancet Countdown is a project that started in 2015 and produces a report published annually in the highly esteemed medical journal, The Lancet (2017 impact factor of 53.25). This report is put together through the efforts of dozens of experts based around the world representing 27 academic institutions as well as the United Nations and several intergovernmental agencies. These experts in health, climate, economics, and communication have formulated 41 indicators to track several facets related to health and climate change including: climate change impacts, exposures, and vulnerabilities; adaptation planning and resilience for health; mitigation actions and health co-benefits; economics and finance; and engagement in public and political spheres.

What am I getting at here? This is a massively impressive effort to collaborate across disciplines, geography, and institutions to achieve a tangible and grounded understanding of how the world is doing on climate and health. And I feel privileged to be able to contribute to one small part of it. In conjunction with the Media and Climate Change Observatory (MeCCO: http://sciencepolicy.colorado.edu/media_coverage) project, CSTPR provides the data and analysis for the indicator related to public engagement with health and climate change.
Max Boykoff, CSTPR Director, is the official member of the working group for the Lancet Countdown, but I was able to attend the meeting in London in his stead. I started getting involved with the project this year. I contributed to gathering the data to increase and expand the indicator's coverage from eighteen to sixty-two newspaper sources. Thanks to my and Lucy McAlister's (another associate of CSTPR and CU Boulder graduate) efforts, the indicator for the Lancet now tracks coverage of health and climate change in newspapers across thirty-six countries and in four languages – English, German, Spanish, and Portuguese.

And what have we found? Without getting too much into the gritty details, our findings for health and climate map pretty well onto the broader trends MeCCO has already seen tracking coverage of climate change. For example, the same events that spark increased coverage of climate change, such as the United Nations Conference of Parties (COP15), also sparked increased engagement with health and climate change. Based on the other indicators not covered by CSTPR, it also seems that health remains relatively marginal to broader engagement with climate change.

In London, I met the other members of our working group that work on the other related indicators, including coverage of health and climate in scientific publications, engagement in political discourse, and engagement in the corporate sector. They are an impressive cohort with extensive experience in this work. They represent several organizations, including the University of Birmingham, the University of York, the University of Essex, and Centre Virchow-Villermé (from France). The relationships CSTPR has formed with these individuals and organizations are valuable for continuing to improve our understandings of how and why people care about and engage with climate change – the most all-encompassing environmental problem of our time.

Olivia Pearman is a PhD student at the University of Colorado Boulder and is interested in improving approaches to complex environmental problems through policy.

LOCAL HIGHLIGHT

Open Access: The Way Forward For Academic Publishing

by Alison Gilchrist

Scientists: what if you knew one weird trick that would increase the number of times your paper was read, cited, and shared? What if that one maneuver also increased the impact your research had on the general public? Other scientists would hate you!

Well, maybe not—but some academic journals might. The ploy that might accomplish all of the above for scientists could also drastically change the scientific publishing industry as we know it: publishing in an open access journal.

"Open access is when research is made openly available to the public to read, reuse, redistribute, and remix in any way that they would like, as long as there is attribution to the original author," explained assistant professor and CU Boulder librarian Melissa Cantrell. Publishing an open access paper means making that paper readable and downloadable to anyone—your peers, your family, even your second-grade teacher—if they want it.

A particular paper can be made open access, or a dataset. Open access can also describe a journal—the journal Current Zoology is fully open access, for example. A journal can also be a "hybrid" journal, meaning that some of the papers are open access and some are not.

The alternative to open access, "closed access," describes research that is behind a paywall or that you can only see if you have a subscription. It is the norm in scientific publishing, and the system relies financially on scientists and institutions buying subscriptions to journals. If your institution has bought a subscription to a set of journals, you will be able to see all the papers published by those journals. At CU, this means you have access to the papers from high impact journals like Science, as well as access to more obscure databases like Bloomsbury Encyclopedia of Philosophers.

The downsides of closed access publishing are well-captured by the phrase itself. Research is only accessible if you or your institution has already purchased access, and sharing papers or data from these journals is discouraged. Many argue that the closed access system prevents members of the public from viewing research that they are interested in and that their tax dollars have paid for. What if you published a very interesting analysis of the philosopher George Berkeley in the Bloomsbury Encyclopedia of Philosophers, and nobody was able to read it? Like the famous fallen tree in the forest, the question is: would it even exist?

Open access has become the antidote to these problems. There is a growing movement towards making research more accessible by making it publicly available online, no subscription necessary.

"There have been things that probably qualified as open access for decades," said Andrew Johnson, Head of Data & Scholarly Communications Services at CU Boulder University Libraries. "But really when people started calling it Open Access—capital O, capital A—which started around 2002, there was a big statement on Open Access called the Budapest Initiative. A lot of people see that as ground zero for the movement."

The Budapest Open Access Initiative, a public statement supporting and advising open access, arose from a meeting called Open Society Institute. The statement was signed by various advocates for open access and sparked an international movement towards upholding the outlined principles.

After 2002, there were a number of organizations that began to publicly embrace open access—including the National Institutes of Health. The NIH, a major funder of biological research, now makes the peer-reviewed articles it funds publicly available online.

LOCAL HIGHLIGHT CONTINUED
Open Access: The Way Forward For Academic Publishing

Apart from being required in some cases, publishing in an open access forum can be beneficial to the researchers involved. Perhaps unsurprisingly, papers and data published on open access platforms are cited more frequently and referenced more often (including on platforms such as Wikipedia, demonstrating how important open access is for the general public). This is powerful motivation for researchers to choose open access, as well as being motivation for the public to support more researchers publishing on open access platforms.

"It really helps increase the impact of their work," said Cantrell. "It helps it reach a wider audience."

The Center for Science and Technology Policy Research (CSTPR), like most CU Boulder departments, has strong incentives for supporting open access.

"Open access is extremely beneficial for the public, in the way it helps make research more accessible and equitable," said Cantrell. "Especially because science and technology are really special in terms of how fast things are moving. It's so important for people to know what's going on in science and technology."

"Open access can apply to data too," Andrew Johnson elaborated. "And you absolutely have to have access to the data to make policy impacts." For example, the Media and Climate Change Observatory (MeCCO) datasets, as well as summaries of the data, have all been made publicly available. This data could help politicians and the general public understand current attitudes about climate change.

But of course, there are detractors of open access, along with some ongoing challenges and downsides. Some scientists claim that open access journals are of dubious quality. This is a generalization: there are high- and low-quality open access journals just like there are high- and low-quality closed access journals. Others point out that all the most competitive, highest regarded journals (those with the highest "impact factor") are not open access. This is a misrepresentation: open access journals are generally younger than traditional journals, so they haven't had time to make a name for themselves.

"Outright hostile reactions are few and far between," said Johnson, "but there's certainly a lot of skepticism, and I feel like a lot of the time it's coming from people who are, for one reason or another, heavily invested in the traditional system."

Open access does have the potential to disrupt traditional publishing. If many researchers chose open access over closed access, the impact factor of well-established journals could be affected. Theoretically those journals could lose subscribers as the open access makes subscriptions unnecessary. We might be a long way off from the point where it seriously damages journals' profit margins, but it's certainly not outside the realm of possibility.

"So maybe they are on the editorial board of a closed access journal," said Johnson. "Or, maybe they've had a bad experience with a low-quality open access journal—which of course exist, just like low-quality closed access journals exist."

Some researchers believe in open access in principle, but shy away from the costs associated with publishing in an open access journal—generally, open access requires that the author of a paper pay a fee to the journal (rather than the cost of publishing be funded by subscribers). This cost can be prohibitive, and open access advocates understand why that is putting people off.

But librarians, including CU Boulder librarians, are fighting the mythmaking and misunderstandings propagated by these skeptics. Universities often have funds available for journal fees so that researchers do not pay out of their own pocket to publish in an open access journal. At CU Boulder, Andrew Johnson and Melissa Cantrell are actively trying to educate researchers about the funds CU Boulder has for this purpose, and about the benefits of open access publishing. As a researcher, you can apply for these funds if you are planning to publish in a journal that is fully open access. If successful, CU Boulder will pay the fees associated with publishing.

Another way they've planned to increase awareness of this issue is to celebrate Open Access week, planned for October 22nd-October 28th (http://openaccessweek.org). This week-long series of events is designed tp bring these open access options to the forefront of people's minds and remind them of the benefits. As well as general informational seminars, there will be talks about related topics such as accessibility of research.

"There's a difference between access to research and accessibility," said Cantrell. She clarified by email that increasing research's accessibility refers to a wide variety of underserved populations, which includes non-English speakers, "those with learning and non-learning related disabilities, and others.

There will be a group from the department of Theater and Dance who will be doing a digital presentation, and a screening of the documentary P*aywall: The Business of Scholarship*. Overall, Open Access Week should be an entertaining and enlightening way to celebrate a publishing movement that benefits scientists and the public. This "one weird trick" sounds like clickbait, but it is the future.

Alison Gilchrist, alison.gilchrist@colorado.edu
CSTPR Science Writer

CENTER NEWS

CSTPR Welcomes Environmental Economist Matt Burgess

Matt Burgess melds ecology, economics, and policy in his work—forming a new connection between the Cooperative Institute in Enviromental Sciences (CIRES) and CU Boulder's Department of Economics.

Burgess will continue his research to explore the relationship between human activity and ecological change. In recent years, for example, he has explored environmental policies such as NOAA's bycatch rule for marine mammals. Bycatch—the accidental killing of sea life during fishing operations—is a complicated problem that demands an understanding of not only the environment, but of people's economic motivations.

"Economics is just the ecology of people," said Burgess. "I've blended the two disciplines throughout my education and research career."

Burgess, originally from Montreal, Canada, received his Ph.D. in Ecology, Evolution, and Behavior from the University of Minnesota in 2014. He completed his postdoctoral research at the University of California, Santa Barbara. Today, his research focuses on natural resource management, strategies for ecological conservation, and the economics and ecology of global sustainability.

Burgess is currently working on a new study investigating when environmental regulators can get away with regulating proxies for pollutants instead of the pollutants themselves. For instance, exploring the question: when is a gas tax an acceptable substitute for a carbon tax?

"I am very excited to have Matt join our CIRES faculty," said CIRES Director Waleed Abdalati. "His expertise in environmental economics will add an important new dimension to our research portfolio, complementing our strengths in the natural sciences and science policy. His expertise in the economics of environmental decisions provides a critical interface between the research we do at CIRES, and the implications for people and businesses."

Burgess' home department at CU Boulder will be the Environmental Studies Program, where he is an Assistant Professor, and he has a courtesy appointment in Economics.

This fall, Burgess is teaching "Natural Resource Economics," an undergraduate course, and will add graduate-level courses in the near future. He will also supervise a postdoctoral researcher in mathematical sustainability science.

Burgess has published his research in Science, the Proceedings of the National Academy of Sciences, Marine Policy, and more. He is also an active writer and communicator, with articles and opinion pieces featured in several U.S and Canadian news outlets, and he maintains an active presence on social media (@matthewgburgess).

2019 Inside the Greenhouse Comedy & Climate Change Short Video Competition

1st place: $400 prize
2nd place: $250
3rd place: $100

Competition Details: Humor is a tool underutilized in the area of climate change; yet comedy has power to effectively connect people, information, ideas, and new ways of thinking/acting.

In this 4th annual competition, we seek to harness the powers of climate comedy through compelling, resonant and meaningful VIDEOS – up to 3 minutes in length – to meet people where they are, and open them up to new and creative engagement.

Award Criteria: Successful entries will have found the funny while relating to climate change issues. Each entry will be reviewed by a committee composed of students, staff and faculty at CU-Boulder.

Application Requirements

#1. 1-2 page pdf description of entry, including

- title of creative work,
- names and affiliations of all authors/contributors,
- contact information of person submitting the entry,
- a statement of permissions for use of content, as necessary
- a 100-word description of the work.

#2. A link to the up-to-3-minute composition, posted on Youtube or Vimeo or the like

Eligibility: Must be a citizen of Planet Earth; work created since January 2018 is accepted; works must be less than 3 minutes in length, captured through video; CU-Boulder employees are not eligible.

Submission Deadline

February 15, 2019: entries due to itgcomedy@colorado.edu
February 25, 2019: applicants informed of decisions

Award winners must provide the requisite payment information within 60 days in order to claim the award.

More Info: http://www.insidethegreenhouse.org/node/3557

CENTER NEWS

2018 Lancet Countdown on Health and Climate Change Released

Research from 27 global institutions including CU Boulder show extreme heat damages health and livelihood and may overwhelm hospitals

New research published in The Lancet medical journal last night shows that rising temperatures as a result of climate change are already exposing us to an unacceptably high health risk and warns, for the first time, that older people in Europe and the East Mediterranean are particularly vulnerable to extremes of heat, markedly higher than in Africa and SE Asia.

Leading doctors, academics and policy professionals from 27 organizations, including CIRES fellow and Center for Science and Technology Policy Research (CSTPR) director Max Boykoff and Olivia Pearman, Lucy McAllister, Meaghan Daly from CU's Media and Climate Change Observatory, have contributed analysis and jointly authored the report. As members of The Lancet Countdown: Tracking Progress on Health and Climate Change, partners behind the research include the World Bank, World Health Organization (WHO), University College London and Tsinghua University, among others.

"Climate change is not just an environmental issue, rather it is one involving science, policy, culture, psychology, environment and society," said Boykoff. "As part of the larger collaboration, I, with members from our Media and Climate Change Observatory at the University of Colorado, examined media representations to help understand public discourse on climate change and health over the past eleven years."

Boykoff's team determined global coverage of climate and public health has increased by 42 percent between 2007 and 2017, indicating a gradual but promising trend toward more sustained attention to climate change and public health in the public arena, said Boykoff.

Some of the new health impacts of heat documented in The 2018 Report of The Lancet Countdown on health and climate change include:

- 157 million more vulnerable people were subjected to a heatwave last year than in 2000, and 18 million more than in 2016.
- 153 billion hours of work were lost in 2017 due to extreme heat as a result of climate change. China alone lost 21 billion hours, the equivalent of a year's work for 1.4% of their working population. India lost 75 billion hours, equivalent to 7% of their total working population. New methodologies have captured this data for the first time.
- Rising ambient temperatures are placing vulnerable populations at increased risks across all regions of the world. Europe and the East Mediterranean are particularly at risk, most likely due to ageing populations living in cities, with 42% and 43% of over 65s vulnerable to heat exposure. Markedly higher than Africa (38%) and southeast Asia (34%).
- Heat greatly exacerbates urban air pollution, with 97% of cities in low- and middle- income countries not meeting WHO air quality guidelines.
- Heat stress, an early and severe effect of climate change, is commonplace and we, and the health systems we rely on, are ill equipped to cope.
- Rising temperatures and unseasonable warmth is responsible for cholera and dengue fever spreading, with vectorial capacity for their transmission increasing across many endemic areas.
- The mean global temperature change to which humans are exposed is more than double the global average change, with temperatures rising 0·8°C versus 0·3°C.

This story was modified from Lancet's press release: http://www.lancetcountdown.org/the-report

CENTER TALKS & EVENTS

Spring 2019 Noontime Seminar Series

The Spring 2019 noontime seminar series will be beginning soon. All talks take place on Wednesdays at noon in the CSTPR conference room (unless otherwise noted), are free and open to the public, and most will also be webcast. Directions: http://sciencepolicy.colorado.edu/about_us/find_us.html. The schedule is as follows:

January 23, 2019
From The Inside Out: The Fight For Environmental Justice Within Government Agencies
by Jill Harrison, Department of Sociology, University of Colorado Boulder

February 6, 2019
The Geopolitics of the Energy Transition
by Morgan Bazilian, Professor of Public Policy, Colorado School of Mines

February 20, 2019
Cruz Vermelha de Moçambique: Integrating Communication and Participation Engagement to Local Communities
by Juhri Selamet, College of Media, Communication and Information, University of Colorado Boulder

March 13, 2019
Social (In)Justice in Coastal Relocation
by A.R. Siders, Environmental Fellow, Harvard University Center for the Environment

April 17, 2019
Title TBA
by Kimberly Rogers, INSTAAR, University of Colorado Boulder

More Info: https://sciencepolicy.colorado.edu/news/seminars_spring2019.html

CENTER PUBLICATIONS

An Attainable Global Vision for Conservation and Human Well-Being

Tallis, H.M., P.L. Hawthorne, S. Polasky, J. Reid, M.W. Beck, K. Brauman, J.M. Bielicki, S. Binder, **M.G. Burgess** et al., 2018. *Frontiers in Ecology and the Environment*.

Abstract: A hopeful vision of the future is a world in which both people and nature thrive, but there is little evidence to support the feasibility of such a vision. We used a global, spatially explicit, systems modeling approach to explore the possibility of meeting the demands of increased populations and economic growth in 2050 while simultaneously advancing multiple conservation goals. Our results demonstrate that if, instead of "business as usual" practices, the world changes how and where food and energy are produced, this could help to meet projected increases in food (54%) and energy (56%) demand while achieving habitat protection (>50% of natural habitat remains unconverted in most biomes globally; 17% area of each ecoregion protected in each country), reducing atmospheric greenhouse-gas emissions consistent with the Paris Climate Agreement (≤1.6°C warming by 2100), ending overfishing, and reducing water stress and particulate air pollution. Achieving this hopeful vision for people and nature is attainable with existing technology and consumption patterns. However, success will require major shifts in production methods and an ability to overcome substantial economic, social, and political challenges. Read more: http://sciencepolicy.colorado.edu/admin/publication_files/2018.12.pdf

Drought in Urban Water Systems: Learning Lessons for Climate Adaptive Capacity

Dilling, L., M.E. Daly, D.A. Kenney, R. Klein, K. Miller, A.J. Ray, W.R. Travis, and O. Wilhelmi, 2018. *Climate Risk Management*.

Abstract: In this paper we examine current policies to combat drought in urban areas in the United States to illuminate lessons learned for building climate adaptive capacity. We conducted interviews with practitioners involved in drought management at urban water utilities across the U.S. to understand: 1) both short- and long-term actions taken in response to drought; 2) perceptions of what constitutes an 'effective' drought response and whether and how this was measured; and 3) limitations to drought response. We apply criteria from a theoretical framing of adaptive capacity and then 'reason by analogy' to understand how adaptive capacity may be built or constrained in the future by such responses, including how future actions may be otherwise limited by political, social, physical and other factors. We find that drought responses overall are seen as successful in reducing water demand and helping to maintain system reliability, but can also reduce flexibility and introduce other limitations. Public perception, the multi-purpose nature of water, revenue structures, expectations and other social factors play a dominant role in constraining drought response options. We also find that some urban water utilities face challenges in measuring the effectiveness of demand reduction strategies because it can be difficult to attribute water savings, especially those related to outdoor water use. Read more: http://sciencepolicy.colorado.edu/admin/publication_files/2018.15.pdf

CENTER PUBLICATIONS

Framing Sustainability and Climate Change: Interrogating Discourses in Vernacular and English-Language Media in Sundarbans, India

Ghosh, A. and **M. Boykoff**, 2018. *Geoforum*.

Highlights:

- Anglophone media portrayals marginalized local climate vulnerabilities.
- Technocratic conservation agenda, mythmaking drove semantic drift in media accounts.
- Anglophone media representations failed to articulate poverty, inequality, justice.
- Anglophone media discourses were found to promote neoliberal conservation agendas.
- Absence of cultural and linguistic equivalence affect vernacular media discourse.

Read more: http://sciencepolicy.colorado.edu/admin/publication_files/2018.13.pdf

A Laughing Matter? Confronting Climate Change Through Humor

Boykoff, M. and B. Osnes, 2018. *Political Geography.*

Abstract: Why fuse climate change and comedy? Anthropogenic climate change is one of the most prominent and existential challenges of the 21st century. Consequently, public discourses typically consider climate change as 'threat' with doom, gloom and psychological duress sprinkled throughout. Humor and comedy have been increasingly mobilized as culturally-resonant vehicles for effective climate change communications, as everyday forms of resistance and tools of social movements, while providing some levity along the way. Yet, critical assessments see comedy as a distraction from the serious nature of climate change problems. Primarily through conceptions of biopower and through approaches to affect, this paper interrogates how comedy and humor potentially exert power to impact new ways of thinking/acting about anthropogenic climate change. More widely, this paper critically examines ways in which experiential, emotional, and aesthetic learning can inform scientific ways of knowing. These dynamics are explored through the 'Stand Up for Climate Change' initiative through the 'Inside the Greenhouse' project where efficacy of humor in climate change communication is considered while individuals and groups also build tools of communication through humor. This is a multi-modal experiment in sketch comedy, stand-up and improvisation involving undergraduate students, culminating in a set of performances. In addition, the project ran an international video competition. Through this case, we find that progress is made along key themes of awareness, efficacy, feeling/emotion/affect, engagement/problem solving, learning and new knowledge formation, though many challenges still remain. While science is often privileged as the dominant way by which climate change is articulated, comedic approaches can influence how meanings course through the veins of our social body, shaping our coping and survival practices in contemporary life. However, this is not a given. By tapping into these complementary ways of knowing, ongoing challenges remain regarding how communicators can more effectively develop strategies to 'meet people where they are' through creative climate communications. Read more: http://sciencepolicy.colorado.edu/admin/publication_files/2018.10.pdf

Evaluating the Perils and Promises of Academic Climate Advocacy

Boykoff, M. and **D. Oonk**, 2018. *Climatic Change.*

Abstract: What are the causes and consequences of academic climate advocacy in contemporary times? Should it be celebrated and pursued, or derided and eschewed? Does advocacy in various forms tarnish or enhance the reputation of science? This research examined conditions whereby some in academic communities facilitate various forms of engagement relating to their research while others shy away from applications of their work and avoid the "advocate" label. Through an exploratory survey of US-based natural and social science climate researchers/scholars and through analysis of interviews of US-based climate change academic researchers/scholars as part of an "Inside the Greenhouse" and "More than Scientists" collaboration, we explored academic advocacy in a twenty-first century climate communications environment. Among our findings, there was broad agreement that climate change is a pressing issue, yet among social scientists, women are more likely to agree that advocacy should not be criticized than their male social scientist counterparts. Younger respondents were more likely than older respondents to be compelled to change by advocacy from someone with a smaller carbon footprint. Meanwhile, social scientists were more likely than natural scientists to be compelled to change by someone with a smaller carbon footprint. The associated effect of age differences was stronger than the associated differences with profession. Together, we examined these dynamic conditions that animate advocacy opportunities and tensions in the context of contemporary climate change research and engagement. Through conflation between advocacy for evidence-based climate science and advocacy for particular policy outcomes (with coincident dangers of individualism and apolitical intellectualism), we found that academic climate advocacy remains an unresolved subject. Read more: http://sciencepolicy.colorado.edu/admin/publication_files/2018.16.pdf

ABOUT US

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