

NEWSLETTER OF THE CENTER FOR SCIENCE AND TECHNOLOGY POLICY RESEARCH

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 about the work of research affiliates Ryan Vachon and Dan Zietlow.



An image of the Alaskan wilderness where Ryan Vachon and Dan Zietlow filmed Adventures in Science and Cloven.

Science Education is STEAM'N Along in a New Direction with the Emmy-Nominated Program Adventures in Science by Spencer Zeigler

o you remember when your teacher would roll out the gigantic TV and you would turn to your friends and whisper, "Yes! Movie day!"? Of course, because these were the days you got to watch a movie instead of doing worksheets. But to your chagrin, when the movie started it was almost more boring than regular class and you would just listen to a "dude in a lab coat pontificate" on and on about a subject that simply didn't matter to you. Fortunately, those days have changed thanks to Dan Zietlow and Ryan Vachon, the creators and founders of Provare Media (pronounced 'pro-vare-ay'), a film production company specializing in science communication and the effortless combination of art and science, whose program *Adventures in Science* was nominated for a 2018 regional Emmy award. Dan and Ryan both received their PhD's from the University of Colorado Boulder and are currently both CSTPR Research Affiliates.

Adventures in Science (https://www.youtube.com/channel/UCN5U6YXZteXJg6rkAvi94Sw) is Vachon's "pet project", a television series for youths, aimed at middle schoolers, ages 9-14. In 2014, Vachon worked with the Rocky Mountain PBS to create a pilot and it was nominated CENTER FOR SCIENCE TECHNOLOGY POLICY RESEARCH NO. 53

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for an Emmy Award back in 2015, but PBS simply didn't have the bandwidth to support this project. After this set-back, Vachon let *Adventures in Science* take the back burner to other science outreach projects, but then, Zietlow came onto the scene.

Dan Zietlow who always had a passion for both science and art- doublemajoring in physics and art history in undergraduate, found Vachon on the suggestion of a colleague of his who noted both his and Vachon's passion for science outreach and filmmaking. Zietlow reached out to Vachon, and they immediately became a powerful creative force. Together, they embody the concept of STEAM'N-Technology, Science, Engineering, Arts, Math,



Ryan Vachon working in Alaska as a part of the NSF funded grant submitted by Jeff Welker and Kathy Kelsey at The University of Alaska Anchorage.

and Nature an acronym important to both of them as artists and scientists. With Zietlow at the head of photography, Vachon executive producing, and both acting as editors, *Adventures in Science* was brought back as a passion project.

Determined to make the show a reality, Vachon reached out to contacts at The University of Alaska Anchorage, where fellow University of Colorado alum Kathy Kelsey and Jeff Welker in ecosystem's biology were writing a proposal for the National Science Foundation (NSF) to study how the changing climate is affecting patterns in vegetation and what the knock-on effect of changing vegetation patterns are on migratory caribou. As with all NSF grants, a 'broader impacts' statement must be made. According to NSF director, France Córdova in a 2014 speech, the broader impacts statement's purpose is, "to engage the public in order to help improve the understanding of the value of basic research and why our projects are worthy of investment." Vachon, Zietlow and Welker saw the concept of Adventures in Science as the perfect project to fit into the broader impacts statement, so they were written into the grant. When the grant was successfully funded, Zietlow and Vachon had the chance to go to Alaska multiple times to film on the northern slopes and near the oil fields. Welker wanted films about this subject to be accessible to both adults and children, so Provare Media was tasked with making two films utilizing the same materials—a television series for youths entitled Adventures in Science and a documentary for adults, called Cloven.

Cloven is a 20-minute documentary aimed at scienceinterested adults, which investigates the impacts of climate change on vegetation patterns and consequently, the impacts on caribou migration. It is more like a traditional documentary, where they follow and interview the scientists involved in the methodology of the experimentation. Vachon and Zietlow hope that this will encourage adults to think outside their personal expertise and perspectives and to help them understand that science isn't just a cerebral exercise but is something they can engage and interact with. This film is now submitted to the Banff, Whistler, Anchorage, Boulder International, and other film festivals for 2020. While the adult documentary is focused on understanding how scientists go about answering the questions about the interplay between climate change, vegetation, and migratory caribou, the youthversion of Adventures in Science will be about comprehending exactly what the question is and why we're asking it.

The pilot episode for the youths, *Adventures in Science – How Caribou Survive Arctic Winters*, is a 26-minute documentarystyle show, filmed in Alaska, "designed for classroom use, informal use, and sparking that interest in science" according to Zietlow. Their work, although an artistic achievement in its own right, is also a monument to new tools in science education—such as 'peer-to-peer learning'. This is a unique idea in science education, and hinges on the idea that if "somebody who looks like you and is roughly the same age

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as you is exploring these things and asking these questions, you are much more likely to engage with that knowledge and be curious about it yourself", as Zietlow explained. To deploy peer-to-peer learning, Vachon and Zietlow recruited students from Broomfield Heights Middle School to act, explain concepts, and interact with the scientists in the documentary.

Zietlow wants watchers of Adventures in Science not just to learn the science, but to understand the importance of respecting the land around us, "We are stewards of this land, we need to take care of it, we need to understand it." There is an importance that cannot be neglected any longer in making youths aware of the fact that while we love nature, we also have an undeniable impact on it- like the idea that the devices we use every day come directly from and thus directly impact nature. Seamlessly weaving together science, policy, art, human elements of the communities impacted by climate change, and ideas of the 'human ecosystem' is something that Provare Media is intent on achieving. Vachon sums up the objective of Provare Media and Adventures in Science succinctly with, "Creating informed, but curious and empowered, decision-makers is our goal."

Provare Media is a new company, but its impacts are already far-reaching. PBS is interested in picking up *Adventures in Science; How Caribou Survive Arctic Winters* aired on select member stations, but many want it to be a series of for to five 30-minute episodes on a variety of subjects, not just a standalone episode. Vachon and Zietlow are in the midst of working to make this a reality and are "totally stoked" about reaching more people through both PBS and the word-ofmouth that comes with the Emmy Award nomination.

Provare is an Italian word meaning, 'to try', and that is what Provare Media is doing,

"that's the vision we're working on, trying to communicate complexity in science and natural systems to different aspects of the public." Provare media is trying to influence both youths and adults already interested in science, but who may have a fear of science, to make them more powerful and involved policy-influencing citizens. Zietlow clarifies, "Science is nothing more than asking the question "Why?" and being curious to find the answer. That's all you have to do. You don't have to have a PhD or a Master's to do any of this, you just have to be



Dan Zietlow conducting an interview for Adventures in Science.



Carley Rutledge, an animator who owns Cool Cactus Media, Ryan Vachon, the actors from Broomfield Heights, and Dan Zietlow celebrating the finishing of filming Adventures in Science.

curious about the world around you and we're trying to elicit that feeling in people."

Spencer Zeigler spencer.zeigler@colorado.edu CSTPR Science Writer



FACULTY AFFILIATE FORUM

Do Experiences with Extreme Weather Change Beliefs about Climate Change? Perhaps, If your Neighbors are Harmed by Deserai Crow and Elizabeth Albright



Residents embrace near a washed-out home in Jamestown, Colo. on Sept. 14, 2013. Flooding hit the mountain community hard, and residents were trapped for days with no road into or out of town. Photo: Helen H. Richardson, The Denver Post.

eaving catastrophic damage in their path, flood damages and recovery costs across the U.S. tally in the billions annually, a cost-estimate that is likely increasing over time according to a 2008 study (Brody et al. 2008). Colorado's catastrophic 2013 floods were one such example. The floods caused billions of dollars in damage to Colorado communities, homes and businesses, and regional infrastructure.

As the climate changes, scientists warn that increasingly intense and damaging weather events will become more frequent (Coumou and Rahmstorf 2012; Intergovernmental Panel on Climate Change 2007; Karl et al. 2009). To make matters worse, households are increasingly relocating to flood-prone areas. Our work over the past 5 years has tried to understand if, how, and under what conditions individuals and communities can learn from, adapt to, and become more resilient to these climate-driven disasters.

One of the important questions we sought to answer is whether those who directly experience damage from extreme climatic events – such as disastrous flooding – change their beliefs about the causes of flooding. Our research allows us to understand whether experiencing an extreme flood event changes someone's beliefs about climate change and the role climate change may play in extreme flood events.

Sudden, extreme climatic events, particularly those that cause extensive damage, often garner increased public attention to issues surrounding climate change, at least immediately after the disaster. Directly experiencing extreme weather events may shape individuals' beliefs about the seriousness of climate change, even if the science linking global climate change to specific localized weather events is complex and uncertain (Egan and Mullin 2012; Konisky et al. 2015; Sisco et al. 2017; Spence et al. 2011).

Understanding these links is critical, in part because beliefs about climate change may influence public support for policies aimed at addressing issues related to climate adaption and resilience. In local governments, we increasingly see action to mitigate and manage risks, including conversations about building resilience (Albright and Crow 2015; Brody et al. 2008; Godschalk et al. 2003).

In our forthcoming paper, we examined how 903 residents in six flood-affected Colorado communities perceive the seriousness of climate change and its potential link with the floods. We specifically examine (1) the proximity and

FACULTY AFFILIATE FORUM CONTINUED Do Experiences with Extreme Weather Change Beliefs about Climate Change?

severity of flood damage to residents, focused on household, neighborhood, and/or community levels, (2) how flood damage experience may affect climate change beliefs, and (3) how demographic variables, political affiliation, and beliefs about climate change may impact perception of future risks.

The findings from our study indicate that experiencing a flood does have an effect on climate change beliefs. Direct experience with a flood causing household damage is not significantly associated with climate change beliefs several years after the flood, however. Rather, it is the perception of neighborhood and community damage that is related to a greater belief in climate change and its links to the floods and future flood risks. This connection between more communal measures of flood damage and belief change is surprising and an area we intend to explore further. It also gives some element of hope in an era where we hear daily about selfinterested decision-making to know that concern



Our research team works to understand how communities, people, and governments can learn from disasters. We study disasters such as extreme flooding and wildfires to assess how we, as a society, can reduce our vulnerability to the risks we face and become more resilient. Resilience, as we imagine it, is seen when communities learn to adapt to hazards they face, encourage feedback and learning among and from residents, and make decisions with future risks and goals in mind. The lessons from our research can be applied in government settings at the local, state, and national levels, but also by individuals who face these risks on their own properties.

Visit the research team's website at www.learningfromdisasters.org for a full report and publications.

for community may be a motivating factor in belief changes after a disaster.

The findings described here will soon be published in the journal Climatic Change under the title "Beliefs about Climate Change in the Aftermath of Extreme Flooding". This project was funded by the National Science Foundation.

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FACULTY AFFILIATE FORUM

Business Leaders Would be Wise to Better Support Youth Climate Protests by Lucy McAllister



Protesters throw a ball depicting the Earth during the "Global Strike for Future" demonstration in Stockholm on May 24, a global day of student protests that aimed to motivate world leaders to act on climate change. Jonathan Nackstrand/AFP/Getty Images.

Il around the world people are taking to the streets to protest climate inaction: notably school children, but also moms, dads, grandmas, grandpas, teachers, scientists, artists, and, what protesters in Munich described in a May protest as, "middle-aged white men for the future". Though the above list is obviously not exhaustive, one group has been noticeably absent in its public support of the widely visible youth movement – business leaders.

Yes, global businesses are taking significant steps to address climate change, and turn a profit while doing so, and yet these steps are frequently reactive if taken at all, as evinced by Proctor & Gamble's use of Canadian boreal forest in its toilet paper despite its previously glowing global reputation as a leader in sustainability efforts.

Too often multinational firms perceived as leaders in sustainability efforts are revealed as Dr. Seuss's *Once-lers*, only giving back to the future upon discovering or regretting the errors of their ways at meetings with other billionaire leaders from Silicon Valley.

Fortunately, some firms are not simply reacting to environmental or social issues that visibly surface in their supply chains or to assuage consumer calls for climate action, but instead are reshaping their entire business models in ways that address the United Nation's Sustainable Development Goals. For example, the Business & Sustainable Development Commission has identified 30 sustainable development "unicorns," that is, firms experiencing tremendously rapid growth, that are already making impressive progress towards, for instance, cutting emissions and reducing air pollution, all



while being valued at more than US\$1 billion.

Today's youth are leading the way in pushing for urgent climate action, and we would all be wise to support their efforts beyond mere platitudes, tweets or press releases, whether it is to support your child's future or to secure the brightest talent and loyal consumer base of tomorrow.

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FACULTY AFFILIATE FORUM An Interview with Dr. Cassandra Brooks

Cassandra Brooks is an Assistant Professor in Environmental Studies at the CU Boulder. She was recently selected as one of the science faculty on an upcoming #TeamHB4 #WomenInSTEMM leadership initiative in Antarctica. Originally published in Nature: https://socialsciences.nature.com/users/71852-adam-yeeles/ posts/50217-an-interview-with-dr-cassandra-brooks

lease tell us about your research interests. Consumption, overexploitation, and the resulting environmental degradation threaten the long-term vitality of the resources upon which human societies depend.Based on hundreds of case studies, we know that human communities have the capacity to conserve their resources, particularly at the small to medium scale. Moreover, several conditions or processes have been shown to facilitate sound, equitable management of common pool resources. Despite such numerous local yet spatially constrained examples, how do we scale up these conceptual frameworks to apply to the global commons? Recognizing there are no panaceas, what are some of the essential socio-ecological conditions required for conserving our global commons? My research is driven by a desire to study and devise potential solutions for collective action to address environmental dilemmas. These issues are inherently interdisciplinary, and with my advanced degrees in Marine Science, Science Communications, and Environment and Resources, I draw from a diversity of fields and disciplines - including environmental governance, international relations, policy, law, conservation biology, and economics. By creatively using the most appropriate methodologies – both qualitative and quantitative - I compile and apply diverse datasets to address a suite of complex issues surrounding policy and management of global international commons.

I have a fierce passion for Antarctica, with the last fifteen years of my career focused on marine science and conservation in the region, especially marine protected areas (MPAs). I've participated in five Antarctic research cruises, studying diverse components of the ecosystem, from phytoplankton and krill to finfish and mammals. I've published on the life history of Antarctic toothfish-the top fish predator in the Southern Ocean that supports a lucrative international fishery. I've also been involved in extensive media projects, including the Last Ocean, in which we produced an awardwinning documentary and a highly regarded book about the Ross Sea, Antarctica. I've been lead author on multiple MPA policy reports which focused on identifying key areas for inclusion in a representative network of Southern Ocean MPAs. I've also authored more than 150 popular articles, opeds, book chapters, blogs and websites, many focused on Antarctic science and conservation. Most importantly for my work at the science-policy interface, I've spent the last eight years studying the process for adopting Antarctic MPAs. This work was the foundation for PhD at Stanford University and, along with my media and outreach work, helped drive the



adoption of the world's largest marine protected area in the Ross Sea, Antarctica – one of healthiest and most productive marine ecosystems left on Earth.

I see that your education is in biology and marine science, but you also have worked quite a bit in science communications and policy outreach. What has your journey been to this point? I am an intensely curious person with a passion for the environment, especially the ocean, which drove me to pursue science. For me, a career in science has been a life of endlessly turning over rocks to discover, with delight, what lives underneath. Yet I was never satisfied with the scientific process in isolation. I wanted to show and teach the public about the beauty of the natural world. Even more so, as I learned that everything I loved and studied – from my back yard in New England to the reaches of Antarctica – was immensely threatened, I was desperate to drive conservation solutions.

My journey has centered around science, outreach and policy often working within these worlds simultaneously. I completed a BS in Biology at Bates College in Maine and during that time I worked in labs across campus while completing a summer Environmental Education internship at the New England Aquarium. I also spent a summer at Shoals marine lab and conducting summer research at the Mount Desert Biological Lab and Virginia Institute of Marine Science. After college I spent three years working in Environmental Education as a wilderness therapy guide working across the United States for Outward Bound, Summit Achievement and Naturalists at Large. In the midst of these largely seasonal jobs, I also toiled as a federal fisheries observer on New England groundfish boats. Seeing how poorly managed fisheries are, particularly deep-sea fisheries drove me to return to school for a masters in Marine Science at Moss Landing Marine Labs in California. There I studied the life history of Patagonian and Antarctic Toothfish (sold as Chilean Sea Bass). The research itself was a direct call from managers within the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR – the international body that governs the waters around Antarctica) to gain more life history information on these species which were supporting a growing commercial fishery in the Antarctic.

FACULTY AFFILIATE FORUM An Interview with Dr. Cassandra Brooks



Cassandra Brooks speaking at the Future 2019 Congress in Magallan.

I'll never forget my first research trip to Antarctica in 2005. The wind whipping across from the icy Antarctic continent, icebergs scattering the horizon and me donning a thick orange coat to brace the elements. I remember finishing a 12-hour shift on deck sampling Antarctic fish. I watched as night fell and unfamiliar stars peppered the thick dark sky. I remember hearing a brisk exhale off the side of the boat and the wet scent of krill hitting my face. I peered to see a humpback whale breaking the surface, swimming in parallel just a few feet from our vessel. I had never felt so alive, so small and so inspired and humbled. Nor have I ever felt such a visceral compulsion to protect a place.

I had worked in and studied fisheries for many years of my adult life, but only when I made the exhaustive trek into the ice-choked waters around Antarctica did I realize the severity of the problem. It was hard to believe that fishermen would travel so far - into the most treacherous waters on Earth in search of fish. But then I remembered scrambling on the deck of New England groundfish boats as a fisheries observer, gathering measurements from the pathetically small catch, while fishermen relayed stories of hauling in cod larger than me. We have depleted our fisheries closest to home and have had to cast our lines ever deeper and further to find new fish stocks, but we now have nowhere else to go. The Antarctic toothfish that I was studying supports the Earth's most remote fishery. And the more I studied, the more obvious it became that this species, like most deep-sea fish, was incredibly vulnerable to overexploitation.

In 2008, I stood before my master's defense committee making a case for a Ross Sea marine protected area (MPA). Current management allowed fishing on their purported spawning grounds and didn't take into account the overall impact on the greater Ross Sea ecosystem. A marine reserve, which excluded fishing from critical life history areas, seemed an obvious solution. But my committee scoffed at the idea. As an international space, an MPA in the Antarctic would require the consensus of more than two-dozen nations – a seemingly impossible feat. What my professors didn't know (and what I would later learn) was that closed-door discussions were already underway developing plans for a network of MPAs across the Southern Ocean.

Later that year, I received a call from a prominent conservation photographer, "We need to talk about toothfish," he said. He, along with a renowned Antarctic scientist, had been partially responsible for jumpstarting the MPA discussions within CCAMLR, particularly around the Ross Sea, a region deemed by many to be the last intact marine ecosystem left on the planet. They wanted my help in pushing the MPAs forward. I jumped on board their grand outreach effort, which we called The Last Ocean. We worked to generate the support of hundreds of scientists, developed an in-depth website, published academic and popular articles, a critically acclaimed book, created curriculum for school children, and traveled to New Zealand (where the largest Antarctic toothfish fishery is based) to help produce an award winning documentary film. Working with environmental non-profits from all over the world, we generated policy reports, translating complex Antarctic science into policy recommendations. Then we worked to put it all before the decision-makers at CCAMLR. By 2012, a Ross Sea MPA, what I had been told was inconceivable, was actually on the table of CCAMLR.

By then, I was beginning to realize that good science and effective media were not sufficient to generate sound policy, and I returned to school for a PhD at Stanford University to study the Southern Ocean MPA policy process directly. I gained access to high-level international policy meetings, approaching the research as a case study. I gained expertise in gualitative methods, international relations, environmental governance, economics and the science-policy interface. I analyzed a policy process as it unfolded in real time and learned to appreciate the complex suite of factors that drive policy development and implementation including the role of science, the influence of media, the constraints of state interests, and the power of industry. My grounding in science has also allowed me to analyze the extent to which the policies being proposed would reach their stated management and conservation goals.

In late October of 2016, just three weeks before I defended my PhD, I witnessed what many had said was infeasible – the adoption of an extensive 1.55 million km-2 MPA in the Ross Sea, Antarctica. This moment changed my life. Conservation – even at immense international scales is possible. This feat cannot be understated. It was the culmination of the dogged efforts of hundreds of scientists, thousands of conservationists, and millions of global citizens over the course of more than a decade. We took one of our most productive and healthy stretches of ocean and protected it for the future. In my current research, I continue to study the MPA process in the Southern Ocean. As a global community, we have so much to learn from the case of the Ross Sea. And we have so many other areas of the world in critical need of protection. Read more: https://go.nature.com/33xT109

STUDENT HIGHLIGHT The Big Impact of Imperceptible Things: David Oonk on Fracking and Microplastics by Alison Gilchrist

his summer, CSTPR's own David Oonk is working with the Center for a New Energy Economy (CNEE) to make the communication of climate research to policy makers a little bit easier. CNEE is headed by Colorado's 41st Governor, Bill Ritter, Jr. and was formed to help the government create policies that steer the United States in the direction of clean energy.

"They do a lot of information synthesis. They build out dashboards, really helpful information centers. They run workshops, all trying to connect the technical information around energy policy to decision-makers," said Oonk. "They're trying to better inform energy policy-related decisions."

CNEE, founded in 2011, is a department of Colorado State University. Oonk is excited about the variety of topics he'll be working on as one of the graduate interns.

"Since I've been spending so much time on natural gas and fossil fuel related policy, I'm interested in building out some more expertise on renewable energy policies and energy financing policies," said Oonk.

Oonk is a graduate student in the Atlas Institute, where he studies oil and gas development and policy in Colorado.

"The case study I'm looking at right now is hydraulic fracturing in the Front Range," he said. "I'm trying to understand decision making around it. I'm also trying to understand its implications for our energy transitions because of climate change, and the air quality risks and impacts that we're experiencing: how do we measure them, what are the uncertainties, and how do we make decisions about them."

Oonk makes the point that many of the health impacts of fracking are hard to measure, but must certainly be considered when policy decisions about the process are made. It's hard to see the toxic effects of benzene and ozone (both emitted during the process of fracking) as a civilian, but policy makers should be aware of them when considering fracking legislation.

"There is an interesting tension between the requirement of science, measurement, and instruments to measure what is going on, and the serious health questions around it," said Oonk.

In fact, he is generally interested in studying the large impacts of nearly invisible things. As well as the effects of fracking on air quality, Oonk is also studying the tiny pieces of plastic that end up in our mountain streams—microplastics. Along with Patrick Chandler, another graduate student in CSTPR, he is measuring these microplastics in Rocky Mountain streams.

"We're essentially going to monitor a bunch of streams around the Front Range, up and down watersheds," said Oonk. 'We



want to see, one: if microplastics are present, which the pilot study suggests that they are; and, two: what plastics are in there, and what concentrations they're at."

He will also be working with Chandler to display this information in a way that is engaging, artistic, and informative.

"We're doing all the data collection and analysis this summer, and then in addition to that, we're doing an exhibit that is going to be up in CU's Sustainability, Energy and Environment Community (SEEC) sometime this Fall," he said. "That will be a photography, sound and video multimedia exhibit."

Oonk and Chandler's goal is to make the prevalence and problems of microplastics visible to the naked eye.

"One of the goals of the art is to bring the microscopic, invisible world, make it perceptible, and make it emotive," said Oonk. "We're trying to elicit some reaction to the fact that our reach as a species, our pollution as a species, is so great that even the areas we think are still pristine are in fact infected by our plastic use."

Oonk's work shows us how important it is to find a way to explain or display the impact of things we can't see or appreciate. The more we can understand the small changes, the more we can anticipate and alleviate the more damaging changes that follow. From air quality as a result of fracking to the insidious prevalence of microplastics, David Oonk is helping us understand the big impact of imperceptible things.

Alison Gilchrist, alison.gilchrist@colorado.edu CSTPR Science Writing Intern

CENTER NEWS

Max Boykoff Releases Creative (Climate) Communications: Productive Pathways for Science, Policy and Society

Conversations about climate change at the science-policy interface and in our lives have been stuck for some time. This handbook integrates lessons from the social sciences and humanities to more effectively make connections through issues, people, and things that everyday citizens care about. Readers will come away with an enhanced understanding that there is no 'silver bullet' to communications



about climate change; instead, a 'silver buckshot' approach is needed, where strategies effectively reach different audiences in different contexts. This tactic can then significantly improve efforts that seek meaningful, substantive, and sustained responses to contemporary climate challenges. It can also help to effectively recapture a common or middle ground on climate change in the public arena. Readers will come away with ideas on how to harness creativity to better understand what kinds of communications work where, when, why, and under what conditions in the twenty-first century.

"Max Boykoff deftly navigates the minefield of climate communication by providing a range of informed perspectives and insights into how to communicate the science and its implications. Creative (Climate) Communications is a great resource for practitioners and novices alike." - Michael E. Mann, Distinguished Professor, Penn State University and coauthor of The Madhouse Effect

"Effective climate communication is an emerging area that has lacked an authoritative text – until now! This innovative, accessible book unites cutting-edge theory with practice. It synthesizes the peer-reviewed literature, existing approaches to effective climate communication, and representations of climate change in the media. If you're looking to be informed by the latest theory, research, and practice in climate engagement and outreach, this is a must-read." - Katharine Hayhoe, Texas Tech University

"This important book helps us to understand what works and what doesn't work in climate communication, and why. A must-read for anyone involved in this issue." - Naomi Oreskes, Harvard University

"[This book] implores us to be authentic, ambitious, accurate, imaginative and bold in climate communications and this book is just that. A great accomplishment!" - Susanne Moser, independent scholar and consultant

Founding CSTPR Director, Roger Pielke, Jr., Testifies at House Science Committee

Founding CSTPR Director, Roger Pielke, Jr., testified before the House Science Committee hearing on Scientific Integrity in federal agencies. His testimony focused on the importance of scientific integrity policies within federal agencies that fund, conduct, or oversee research and the current status of these policies. In an appendix Pielke offers specific comments on H.R. 1709, the Scientific Integrity Act. His testimony is dedicated to the memory of



Radford Byerly, Jr., 1936-2016, who was a staff member of the House Committee on Science, Space and Technology from 1978-1987 and from 1991-1993 served as the committee's staff director. The hearing can be viewed here: https://science.house.gov/hearings/scientific-integrity-in-federal-agencies.

CSTPR 2018 Annual Report is Released

The CSTPR Annual report includes CSTPR highlights from 2018 as well as a complete list of activities. Also included are selected activities of CSTPR faculty affiliates as an indication (not exhaustive accounting) of what those affiliates engage in. Over the past sixteen years or so as a Center, we have cultivated a dynamic terrain of engagement. Among our activities



and accomplishments, we have published over four hundred peer-reviewed articles, nearly another four hundred other reports and publications, and we have generated over \$14 million in funding. We also have been referenced in the media over 1,600 times while we have delivered over 800 talks in the state of Colorado, around the country and throughout the world. The annual report is available online: https://sciencepolicy.colorado.edu/about us/annual report.html

New International Research Project to Explore Climate Change Communication Through Social Media

Max Boykoff is collaborating on a new project funded from the Spanish Ministry of Science. The project "Communicating climate change through social media: Strategies, emotions and images" (CLIMAenREDES) will be conducted, from June 2019 to December 2021, by a



group of 16 researchers from 10 universities in 7 countries. It will be coordinated by the Research Group on Science Communication of the University of Navarra (Spain), with Dr. Bienvenido León as principal investigator (PI) and Dr. María Carmen Erviti as associate PI. This project is sponsored by the Spanish Ministry of Science.

CENTER NEWS

The other participating universities are: University of Colorado Boulder (US), University of Florida (US), University of Oxford (UK), University of Otago (N. Zealand), University of Porto (Portugal), University Miguel Hernández (Spain), University of Murcia (Spain), Gulf University for Science and Technology (Kuwait) and National Autonomous University of Mexico (Mexico).

This research project will analyze some trends of increasing importance to efficiently communicate climate change through social media, with a particular focus on the role of images and users' emotions. We start from the hypothesis that social media can play a very relevant role to communicate climate change, in a way that overcomes some of the traditional limitations of traditional media, thus facilitating citizen engagement and action to address climate change.

MeCCO Figure Used in Senate Speech

CSTPR's Media and Climate Change Observatory work was recently used in Senator Sheldon Whitehouse's Senate floor speech on May 20, 2019 (around 9:50 in video): https:// www.facebook.com/ SenatorWhitehouse/



videos/633771163712749/. MeCCO currently monitors 96 sources (across newspapers, radio and TV) in 43 countries in seven different regions around the world. We assemble the data by accessing archives through the Lexis Nexis, Proquest and Factiva databases via the University of Colorado libraries.

Former Fulbright Scholar, Anna Kukkonen, Earns PhD

In 2018, Anna Kukkonen (second from the left in the picture above) was part of CSTPR as a visiting Fulbright Scholar from the University of Helsinki, Finland. She recently defended her thesis entitled "Discourse



Networks and Justifications of Climate Change Policy. News Media Debates in Canada, the United States, Finland, France, Brazil, and India". Professor Tanya Heikkila from UC Denver served as an opponent in the defense. A post-doctoral party called "Karonkka", an old Finnish academic tradition, was held at a local restaurant in the honour of the opponent Heikkila. Congratulations, Anna!

CSTPR Fall 2019 Seminar Series

All talks will be held in CSTPR Conference Room at 1333 Grandview Avenue from 12:00 - 1:00 PM (*unless otherwise noted). All talks are free and open to the public. An updated schedule is available on our website: https://sciencepolicy. colorado.edu/news/seminars fall2019.html











September 11, 2019 at 12:00 PM Bernadette Woods Placky, Climate Matters Director Title TBA

September 18, 2019 at 12:00 PM Paul Pulé, Chalmers University Toxic Swaggers and the Case for Ecological Masculinities: A Talk about Men, Masculinities and Earth

September 25, 2019 at 12:00 PM Patrick Chandler, Environmental Studies, CU Boulder Title TBA

October 9 at 12:00 PM Co-Hosted with the Benson Center for the **Study of Western Civilization** Colorado Senator Ray Scott (R - Grand Junction) Public Discussion: Policies on Climate and Environment

October 16 at 12:00 PM Co-Hosted with the Benson Center for the **Study of Western Civilization** Colorado Senator Steve Fenberg (D - Boulder) Public Discussion: Policies on Climate and Environment

October 30, 2019 at 12:00 PM Antonia Juhasz, Investigative Journalist Title TBA

November 6, 2019 at 12:00 PM Jane Zelikova, Co-founder, 500 Women Scientists Title TBA



November 13, 2019 at 12:00 PM Co-Hosted with the Benson Center for the **Study of Western Civilization** Colorado Senator Kerry Donovan (D - Chaffee) Public Discussion: Policies on Climate and Environment

December 4, 2019 at 12:00 PM *This talk will be held in the CIRES Auditorium Susan Avery, President Emerita, Woods Hole Oceanographic Institution Our Connected Planet: Putting Science and Innovation into Action









CENTER PUBLICATIONS

Creative (Climate) Communications: Productive Pathways for Science, Policy and Society

Boykoff, M., 2019. *Cambridge University Press*, doi: 10.1017/9781108164047, Published July.

Introduction: Conversations about climate change at the science-policy interface and in our lives have been stuck for some time. This handbook integrates lessons from the social sciences and humanities to more effectively make connections through issues, people, and things that everyday citizens care about. Readers will come away with an enhanced understanding that there is no 'silver bullet' to



communications about climate change; instead, a 'silver buckshot' approach is needed, where strategies effectively reach different audiences in different contexts. This tactic can then significantly improve efforts that seek meaningful, substantive, and sustained responses to contemporary climate challenges. It can also help to effectively recapture a common or middle ground on climate change in the public arena. Readers will come away with ideas on how to harness creativity to better understand what kinds of communications work where, when, why, and under what conditions in the twenty-first century. Read more: https:// doi.org/10.1017/9781108164047

Climate Change Countermovement Organizations and Media Attention in the United States

Boykoff, M. and J. Farrell, 2019. Chapter 7 in *Climate Change Denial and Public Relations*, Ed. N Almiro and J. Xifra, pp. 121-139, Routledge, Published July 8.

Introduction: In this chapter, we focus analyses on contrarian voices – often dubbed climate skeptics, contrarians, dismissives, doubters, deniers, or denialists – that have gained prominence and traction in the U.S. public domain over time through a mix of internal workings such as journalistic norms, institutional values and practices, and external political, economic, cultural, and social factors. We

7	Climate change countermovement organizations and media attention in the United States
	Maxwell Boykoff and Justin Farrell
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connect these considerations to social networks of climate contrarianism and climate countermovement activities. We first outline the contemporary landscape of contrarians and contrarian countermovement organizations in the United States. Next, we share comprehensive text and network data to show how a patterned network of political and financial actors and elite corporate benefactors influence polarization effects. Then, we consider how and why these actors garner disproportionate visibility in the public sphere via mass media, and how media content producers grapple with ways to represent claims makers, as well as their claims, so that they clarify rather than confuse these critical issues. Last, in the U.S. context we discuss how contrarian actors are embedded in countermovement activities through ideological or evidentiary disagreement to the orthodox views of science, a drive to fulfill the perceived desires of special interests, and exhilaration from self-perceived notoriety. Through these dimensions, we explore how contrarians use celebrity as a way to exploit networked access to decision-making within the dynamic architectures of contemporary climate science, politics, and policy in the United States. We therefore interrogate the state of play of contrarian social networks and their effects - from individual attitudes to larger organizational and financial flows - in the U.S. context, commonly referred to as belly of the beast in terms of carbon-based industry power and political/societal/ cultural polarization. Read more: https://sciencepolicy. colorado.edu/admin/publication_files/2019.09.pdf

Is Adaptation Success a Flawed Concept?

Dilling, L., A. Prakash, Z. Zommers, F. Ahmad, N. Singh, S. de Wit, J. Nalau, M. Daly, K. Bowman, 2019. *Nature Climate Change*, 9 572-574, doi: 10.1038/s41558-019-0539-0.

Excerpt: The Paris Agreement established a global goal on adaptation (Article 7, para. 1) and invites Parties to "review the adequacy and effectiveness of adaptation" in a global stocktake (Article 7, para. 14c). Creating universally applicable measures of adaptation success remains elusive, however, given that most adaptation projects are implemented at the local level and start from wildly differing baseline conditions.



Further, the adaptation process is never truly 'finished' in a changing, evolving climate1. Berrang-Ford et al.2 propose tracking government adaptation policy instruments as a way to assess progress. However, these and other approaches do not address what constitutes 'success', focusing instead on

CENTER PUBLICATIONS

government planning, or how vulnerability is changing and leaving open the questions of vulnerability of whom, to what, and who decides. In this Comment, we propose that the focus should be on bolstering and measuring the capabilities of individuals and institutions — capabilities that are necessary to pursue a range of resilient futures and adaptation goals. Read more: https://sciencepolicy.colorado. edu/admin/publication_files/2019.07.pdf

Distributional impacts of the North Dakota Gas Flaring Policy

Srivastava, U., **D. Oonk**, I. Lange, and M. Bazilian, 2019. *The Electricity Journal*, 32 (8), doi: 10.1016/j.tej.2019.106630.

Abstract: This paper considers whether the reform of North Dakota's natural gas flaring policy provided large operators a competitive advantage, leading to increased market concentration. North Dakota was the highest gas flaring and venting state in USA until it was taken over by Texas in 2015 coinciding with the implementation of its gas flaring policy in 2014. Two analyses are performed

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in North Dakota (and Wyoming, as a control) to compare the effect that the flaring policy had on the state's oil sector. The analyses show mixed evidence, larger firms gained an advantage leading to fewer smaller firms operating in the state. The paper concludes with highlighting possible further areas for research, and methodologies for acquiring more reliable data. Read more: https://sciencepolicy.colorado.edu/ admin/publication_files/2019.08.pdf

Good-Natured Comedy to Enrich Climate Communication

Osnes, B., M. Boykoff, and **P. Chandler**, 2019. *Comedy Studies*, doi: 10.1080/2040610X.2019.1623513.

This Abstract: report explores the use of goodnatured comedy to diversify the modes of comedy that can be used in climate communication beyond satire to others modes that are possibly more supportive of sustained climate action. Student's self-assessment on a class project involving this type of comedy were collected through an on-line survey to generate data to explore their feelings of hope

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Good-natured comedy to enrich climate co	ommunication
eth Osnes ^a , Maxwell Boykoff ^b and Patrick Chandler ^b	
Theatre & Dance, University of Colorado, Boulder, Colorado, USA; ^b Enviro f Colorado, CSTPR, Boulder, Colorado, USA	nmental Studies, University
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and their views of their own growth as climate communicators. Research findings suggest that student participation in creating good-natured comedy helps students positively process negative emotions regarding global warming, sustain hope, and grow as communicators of climate. These findings are from a practice-focussed study that shares primarily the self-reported results by students of a project offered over one semester. These findings show promise in the exploration of comedy for students to process emotions that allow joy, fun and hope to sustain their commitment to grow as climate communicators. Read more: https://sciencepolicy.colorado. edu/admin/publication_files/2019.06.pdf

MULTIMEDIA HIGHLIGHT

Creative (Climate) Communications

Princeton University C-PREE

Max Boykoff gave a presntation at Princeton University's Center for Policy Research on Energy and the Environment on "Creative (Climate) Conversations: Productive Pathways for Science, Policy and Society", April 15, 2019.

Video [55:47]: https://www.youtube.com/ watch?v=Fg9sz9Cj0pE

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



ABOUT US

Ogmius is the newsletter of the Center for Science and Technology Policy Research. The Center is within the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado Boulder. The mission of CIRES, which was established in 1967, is to act as a national resource for multidisciplinary research and education in the environmental sciences. CIRES is jointly sponsored by the University of Colorado Boulder and the National Oceanic and Atmospheric Administration.

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