

An underwater photograph of a person swimming, viewed from above. The water is a deep teal color, and there are many small white bubbles and light reflections scattered throughout. The person's arms and legs are visible, moving through the water.

**Tomorrow
Is Already
Here**

Tomorrow Is Already Here

Art and ideas from the Headlands Center for the Arts'
Thematic Residencies on Climate Change and Climate Equity

Kat Austen

Gaye Chan

Adriane Colburn

Sofía Córdova

Fog Beast

Ayasha Guerín

Ellie Irons

Andrew Jones

Raj Pandya

Miriam Simun

Mika Tosca

Pinar Yoldas

Ulrike Zöllner

Marina Zurkow

HEADLANDS CENTER FOR THE ARTS
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Tomorrow is already here,

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Cover image: still from *Your Urge To Breathe Is A Lie* by Miriam Simun.

Page 4: *The Spoils* by Adriane Colburn. Page 25: *Carrying Capacity* by Gaye Chan, photo by Rae Huo. Page 28: *Ecosystem of Excess*, Pinar Yoldas. All photographs courtesy of the artists unless otherwise noted.

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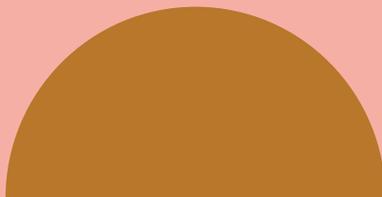
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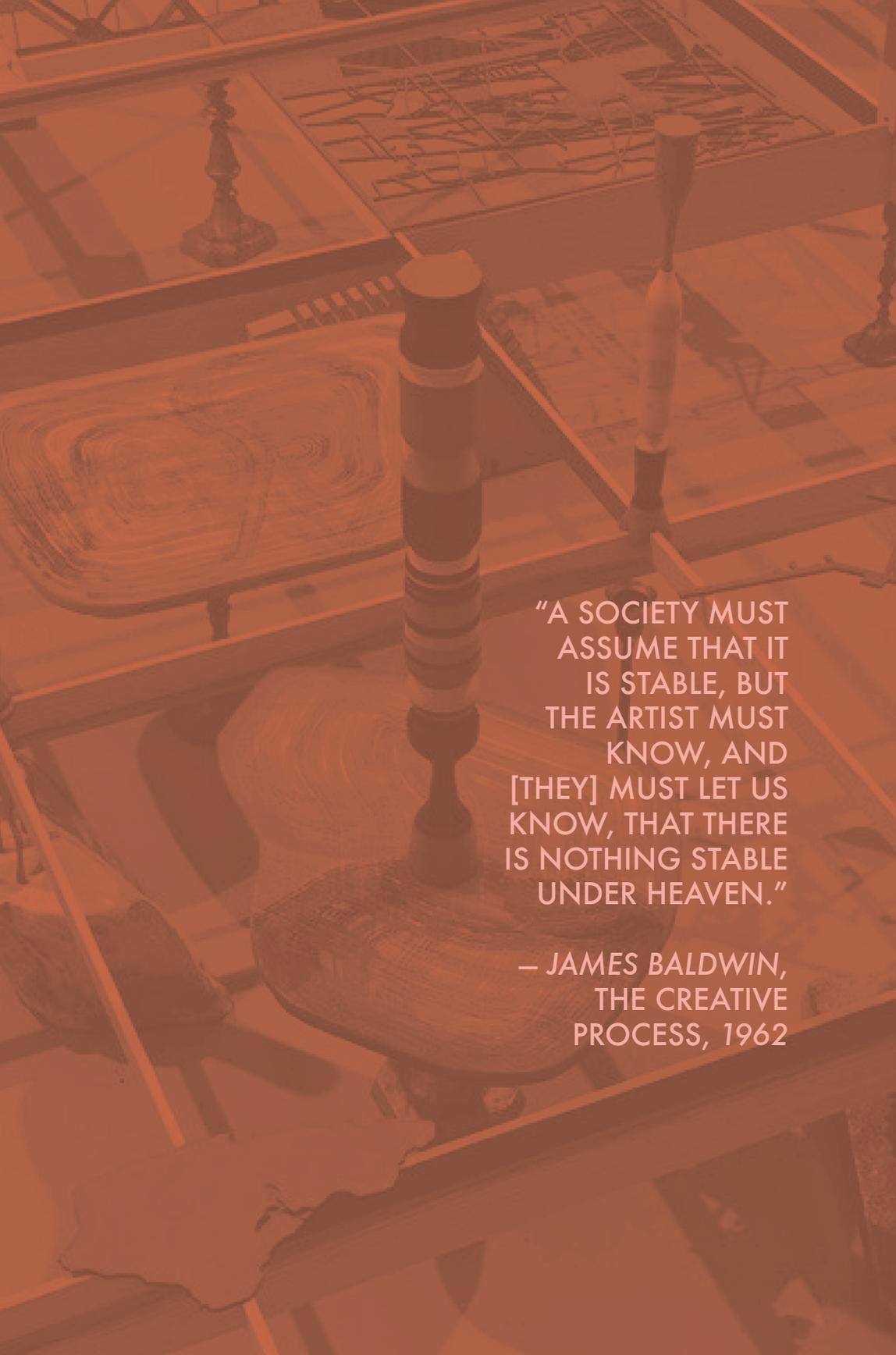
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"A SOCIETY MUST
ASSUME THAT IT
IS STABLE, BUT
THE ARTIST MUST
KNOW, AND
[THEY] MUST LET US
KNOW, THAT THERE
IS NOTHING STABLE
UNDER HEAVEN."

— JAMES BALDWIN,
THE CREATIVE
PROCESS, 1962

To sleep and dream with the fishes: art on climate change

by Aay Preston-Myint

Introduction

I had the pleasure of meeting many of the people featured in *Tomorrow Is Already Here* shortly after joining the staff at Headlands Center for the Arts as Program Manager in 2018, during the second of two Thematic Residencies on Climate Change and Equity (the first was in 2016). Throughout my own arts career in studio, academic, and residency settings, I've been well indoctrinated on the value of “interdisciplinarity” in the arts, and the need to honor creative practice with open time and a non-commodified space for great ideas to develop. I'm sure workers in other fields are experiencing the same trend. The difference among the group at this gathering was the surprising breadth of practices, professional experiences,



2018 Thematic Residency participants Melecio Estrella, Sona Mohnot, and Ayasha Guerin in a workshop. Photo: Andria Lo

and communities of origin: painters, public health officers, social scientists, documentarians, dye makers, electronic musicians, writers, climate scientists, dancers. Certainly sculptors, performance artists, and animators have much to offer and learn from one another. And I imagine a researcher studying whales in the arctic might have a lot to talk about with a researcher studying ice or plankton in the same region. We need

these networks to share knowledge and opportunities and to maintain relevancy, but too often our research is siloed—not just from one another, but from the public. Good art can have enduring beauty and critical acclaim, but requires sound research in order to directly and efficiently address urgent socio-political issues. Good science is no less truthful when dry, but the public doesn't really

read whitepapers. I'm reminded of an installation a friend of mine once put on about the decline in bee populations as a harbinger of ecological collapse, that was beautiful and compelling but described as completely confounding by another friend that is a beekeeper.

Thematic Residencies are a new format at Headlands, gathering both artists and non-artists who are experts on certain topics and allowing them free time and space for collaboration and discussion with other workers in their field without a production-focused agenda. For artists, this might mean exposure to new research and methodologies that can undergird social practices with scientific rigor, access to technology, and opportunities to work with new audiences and publics. For scientists, journalists, and policy makers, this might mean employing storytelling and aesthetics to deliver unpalatable truths, injecting critical thinking and experimentation into densely bureaucratic processes, and incorporating respect for community-based research and traditional lifeways into their practices. *Tomorrow Is Already Here* functions as an expression and a document of what happened at Headlands in 2016 and 2018, as well as what these different professionals and community leaders brought home—new insights on how we can teach each other to move through the world with sound intentions that also make good impact, despite the facts and feelings behind our climate changing beyond control.

In Daisy Hildyard's book, *The Second Body*, the author speaks of humans moving through our ecosystems with not one, but two bodies. The first body is our selves as we usually know them: eating, sleeping, reading these words. The second body is the one that extends out: the skin we shed, the CO₂ we exhale, our waste unknowingly carted to protected lands, the systems of abused workers producing our clothing, food, and weapons in faraway countries. The problem with this is that when scaled globally, the concept of an infinite network of individual actions and unintended consequences becomes either too intellectually abstract, or too existentially unbearable, for us to feel any agency:

“Climate change creates a new language, in which... you are always all over the place. It makes every animal body implicated in the whole world. Even the patient who is anaesthetized on an operating table, barely breathing, is illuminated by surgeons' lamps which are powered with electricity trailed from a plant which is pumping out of its chimneys a white smoke that spreads itself against the sky.”

The people involved in *Tomorrow Is Already Here* are not just revealing this second body to us, but recognizing, accepting, and exploring the tension between it and the first body. The hope of this work is to produce a discourse which not only accepts climate change as truth (an unfortunately low bar), but to foster excitement, curiosity, and determination in facing its challenges, rather than fear and powerlessness.

Drowning oceans and other paradoxes

Certain of the works in *Tomorrow Is Already Here* address this existential bind directly, charting the artists' difficulties in navigating not just the facts and effects of climate change, but the societal-, geologic-, and industrial-scale forces that shape it.

Sofía Córdova's video work *SIN AGUA i: expectation crowned by its own desire*, follows a trippy research visit to Arizona, in which Córdova alternates between learning indigenous natureways in the Sonoran Desert and marveling at the sprawling, impossible city of Phoenix, which rose from the desert by appropriating the old irrigation system laid by the Hohokam (the indigenous people of the area), only to now seemingly abuse this precious resource at every turn. Córdova's anti-documentary of these contradicting experiences quickly spirals into a heat-scorched, dissociative collage of image clips, dissonant sound, and disjointed narration, ending with a terrifying blip on the radar: a warning of the arrival of Hurricane Maria in 2017 to the artist's familial home of Puerto Rico, three thousand miles away.



Sofía Córdova, from *SIN AGUA i: expectation crowned by its own desire*. Video, 16 min. 2017.

Córdova's second video, *dawn chorus ii: el niagara en bicicleta*, picks up the narrative with the artist returning to Puerto Rico after the storm. In this long form piece, beautiful tracking shots through water, air, and land alternate with shaky post-disaster footage and composed and choreographed scenes drawing on traditional Caribbean religion and popular culture. However, the effect is less discordant

**THIS IS OUR
INTRODUCTION TO
CLIMATE CHAOS:
SOME OF US WILL
SUFFER FROM
TOO LITTLE WATER,
BUT OTHERS WILL
SUFFER FROM TOO
MUCH.**

than in *SIN AGUA*—through the noise one feels a kind of clarity honed by the experience of seeing your home and family survive under threat. Together, both videos explore how anti-indigenous sentiment and settler colonialism exacerbate the effects of climate change on communities of color, juxtaposing footage of searing anti-settler monologues and familial accounts of survival with a wistful and ironic sampling of music and imagery exalting the glory of these now troubled landscapes. Through fever dreams in the desert, and illuminated fantasies

acted out in a flooded landscape, this is our introduction to climate chaos: some of us will suffer from too little water, but others will suffer from too much.

While we watch Córdova's personal struggle to make sense of these global inequities, the works of Gaye Chan and Adriane Colburn construct different kinds of order from labyrinthine cycles of production and waste that are characteristic of our time (the anthropocene, late capitalism, or whatever the future will call it). An abstraction of extraction, Colburn's low-lying assemblage, *The Spoils*, follows in the artist's style of using tracings and mapping to make a sculptural chart of living things, natural materials, and manufactured goods flowing through geographic and historical layers. A dense network of carved and painted wooden grids and traced maps is delicately supported by chunks of

Adriane Colburn,
The Spoils. Ash,
reclaimed wood,
bric-a-brac, marble,
granite, brass. 2' x
8' x 8', 2019.



raw material and metal and plastic bric-a-brac. Its message is not explicit at first, but calls us to pause and consider the origins and processes (such as mining and logistics) behind seemingly everyday objects. The title of the work itself plays on the aging use of the noun “spoils” as in riches, but conjures a feeling that more matches the verb—one of confusion, disappointment, and precarity.



Nesting baskets from Gaye Chan’s Carrying Capacity, an ongoing project begun in 2012. Photo: Rae Huo.

Gaye Chan’s work, *Carrying Capacity*, also critiques these opaque international logistics, through the lens of a humble throwaway object. Chan, who employs creative reuse and social practice to work through environmental problems, began weaving baskets in 2012 after becoming fascinated with baling straps—the numerous, overlooked, non-recyclable plastic ties which bind bales of material to each other,

and in turn to shipping pallets, as the material (which is itself sometimes waste or recycling) travels the globe. In this iteration of Chan’s weaving practice, a neat, bright stack of nesting baskets made from the baling straps lies next to a disorderly ball of unwoven strands, signaling both an artisan goods market and a community clean-up day by a local conservation group. However, the baskets become larger and larger, and absurdly impossible to carry—reminding us that we might recycle, reuse, and upcycle, but probably have some low odds of keeping up with such a massive stream. As tides rise, the oceans drown in waste. Here, individual, everyday responsibility is in tension with global, systemic processes and collective will (or lack thereof), reminding us that we are operating well beyond our capacity. In the face of environmental negligence on an international and corporate scale, how do we move beyond daily intentions and practices to making our greatest impact?

J is for jargon, K is for killjoy

Juxtaposed with the stress and distress of these works highlighting the waste and disorder marking our current relationship to the planet are a series of entries seeking clarity and articulation in the greater conversation around climate change.

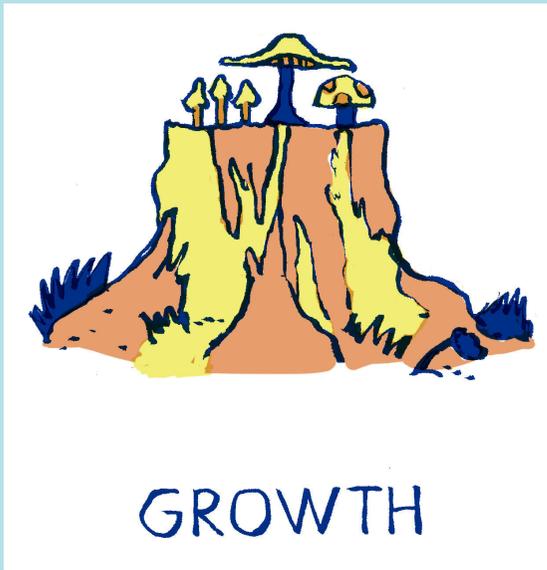
Naturally, these highlight collaboration, openness, and hybrid practices, and demonstrate some of the most concretely visible connections to the Thematic Residencies at Headlands.

Springing directly from meetings at the 2018 Thematic Residency around how we speak and are spoken to about the environment (dubbed the ‘Climate Keywords Group’), artists Ayasha Guerin, Ellie Irons, and Marina Zurkow created the print *ABCs of Climate Change* with bold illustrations by Ulrike Zöllner. This takeaway broadsheet functions as a multi-age teaching tool about trending terms and concepts about climate *change*, but also encourages us to consider the complexities and disagreements around what exactly these keywords might mean in the context of climate *equity*. In this work, ‘Privilege’ is signaled by our apathy and obliviousness, corporations and European settlers are ‘Invasive’ species, ‘Growth’ is ecologic, not economic, and ‘Youth’ lead the charge.

In another text-based piece, *Xteen things we know about climate change (and some things we aren't sure about)*, we encounter a list of considerations and demands similarly gathered from the 2018 convening, collectively edited by attendees, thoughtfully compiled by climate scientist Raj Pandya, and now presented in the center spread of this catalogue. Similar to the *ABCs*, this loose manifesto raises certain questions, primarily: who constitutes “we” when we talk about climate change? Who stands to benefit most from climate action, and are they the same people that suffer most from climate inequity? What prejudices and assumptions might be embedded in our language?

In the collaboration between dance/performance group Fog Beast with climate scientist Andrew Jones, we are able to witness in real time the birth and evolution of ideas, meetings, and projects that characterize the Thematic Residencies. Opposite the exhibition, the group is taking over one of Headlands’ Project Spaces in an open studio format to research and develop *These Lines Are Living*, the first

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WHAT PREJUDICES
AND ASSUMPTIONS
MIGHT BE
EMBEDDED IN OUR
LANGUAGE?



Ayasha Guerin, Ellie Irons, Ulrike Zöllner, and Marina Zurkow, *ABCs of Climate Change (excerpt)*. Open edition of offset prints on paper. 29.5' x 23.5', 2019.

in a series of multimedia, site-specific performances taking place on shorelines throughout the Bay Area. The content of the work, which wrestles with the once-stable concept of shorelines in the face of chaotic environmental and political change, is developed through a collaborative process between scientists, dance and music professionals, and local youth. Rather than relying on the passive absorption of facts without action, the process and performance of *These Lines are Living* affords

participants an intentional and critical engagement with climate justice through problem solving, creative thinking, and artistic expression.

Back in the exhibition space, artist Kat Austen presents her sound, sculpture, and video installation, *The Matter of the Soul*, which similarly responds to studies that show scientific data and truth alone, even if accepted and internalized, provide little benefit toward the emotional work of behavioral change. Like *These Lines are Living*, *The Matter of the Soul* translates this often obtuse scientific data to evoke

Andrew Ward
of Fog Beast.
Photo: Robbie
Sweeney





Kat Austen, The Matter of the Soul (detail). Acrylic, wood, LEDs, cassette tape, oil on canvas, video projection with sound. Dimensions variable, 2018. Image courtesy of nkproductions.org.

more visceral responses of curiosity, deeper engagement, and, hopefully, empathy towards the environment and our collective futures. The electronic elements of the work's score were developed atop a research ship in the arctic, where Austen hacked water sampling equipment to produce sound, in effect "playing" the water from dying icebergs. To anchor this abstract symphony in place and lived experience, Austen layers it with fragments of interviews with people residing in and around the arctic circle, and combines the sound with manipulated video of arctic ocean scenery. As we approach the work, one of the sculptural elements of the installation, a heavy illuminated prism embedded with a cassette tape, like a time capsule, greets us with an inscription both hopeful and wry: *Good Luck*.

Learning to breathe again

While we contend with the former artists' and scientists' proposals for new language and ways of thinking through climate change, another group offers premonitions and future narratives of adaptation, resilience, and resurgence (keywords!), but not necessarily in ways we might want or expect.

Mika Tosca's essay at the back of this catalogue speaks most directly to these fluid and adaptive processes. The essay weaves threads from her unique trajectory as a climate scientist working with UI designers, a science professor at an art school, and a trans woman in the United States in the 21st century with a deep connection to a tradition of revolutionary political movements. Tosca's testament to interdisciplinary cooperation reminds us that seemingly different movements are all part of an integrated struggle towards liberation, and the success of our individual movements relies on our willingness and ability to borrow, listen, and learn from one another.

In fantastic and poetic terms, artists Miriam Simun and Pinar Yoldas accept the scientific consensus that it is already too late to turn back the clock on climate change, and that we must recenter our focus on adaptation. Viewing Yoldas' sculpture series, *Ecosystem of Excess*, we are asked to envision new forms of creatures adapted to survive in acidified oceans, subsisting on a diet of microplastic waste like that found in the infamous Great Pacific Garbage Patch.

3-D printed mutant forms float in clear vitrines and beakers. Their ghostlike state of suspension make them like relics of a future that will be unrecognizable to us, if we are included in that future at all. Or perhaps, the suggestion is that we ourselves must transform into something just as alien if we want to survive the irreversible toxicity of the planet, a future climate with no interest in allowing us to preserve what we know of ourselves.

[THE] FUTURE
CLIMATE [HAS]
NO INTEREST IN
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WE KNOW OF
OURSELVES.



Pinar Yoldas, specimen from *Ecosystem of Excess*, 2014.

and squid), ancient species which often thrive in disrupted environments. While Simun's transhumanism sometimes takes the form of illustrated guides or participatory movement, here we experience the process through immersive video and sound, following groups of dancers as they move around, over, and through each other, in and out of water, like synchronized, amphibious masses of limbs. We hear a narrator lead us and the dancers through a series of exercises, encouraging us to feel and move in new ways: thinking with our fingertips, sensing with our tongues, slithering out of our own skin and into that of others, and even learning to breathe under the rising waters. Intercut with jarring scenes

In Simun's video installation, *Your Urge to Breathe is a Lie*, that mutant "what if" is manifested as a lesson in 'transhumanism'—an aesthetic and performative thread running through much of the artist's work. Simun proposes that in order to survive rising oceans and toxicity, we might take lessons from embodying and imitating other species such as cephalopods (octopuses



Miriam Simun, from Your Urge to Breathe is A Lie.
Color video with multi-channel sound. 2019.

of violent flooding and weather, and underlaid with a soundtrack full of ominous bass frequencies, the impossible grace and cheeky sensuality of the performers serve as an invitation to find beauty and excitement in the difficult task before us: to connect with and lose ourselves in others, and in our ever-challenging environment, to connect with our second body—and evolve, or fade away.

XTEEN THINGS *we agree on*

(and some things we aren't sure about)

compiled by Raj Pandya, after the convening of the
Thematic Residency on Climate Equity in 2018

We are people who care about climate change, and bring lots of perspectives (but not all perspectives) to the work of moving forward to address climate change. Our perspectives are informed by education and professional development in art, science, and policy. We don't know what to call ourselves, except that we are alumni of Headlands Center for the Arts' Climate Change Residency who intend to work together and invite others in.

CLIMATE CHANGE IS HAPPENING, HUMANS ARE CAUSING IT—AND WE CAN MAKE IT BETTER.

Not all humans contribute to, or benefit from, the energy production associated with climate change, or are harmed by climate change in equal measure. That means thinking about responding to climate change has to be connected to thinking about equity.

CLIMATE CHANGE IS A SYMPTOM OF MANY THINGS THAT DON'T WORK WELL IN OUR WORLD AND CONTRIBUTES TO MANY THINGS NOT WORKING WELL. WE ARE PRETTY SURE THAT TACKLING CLIMATE CHANGE WITHOUT CONSIDERING THOSE OTHER PROBLEMS WILL NOT BE EFFECTIVE. SOME OF THE PROBLEMS ARE CONNECTED TO PERVASIVE PROBLEMS LIKE RACISM, HEALTH-EQUITY, RISING INEQUITY, CAPITALISM, BORDERS, AND NEOLIBERALISM.

We aren't sure calling out all these linkages is always helpful in building coalitions, and we also recognize that forming a coalition isn't equal to liking everyone in the coalition. We aren't yet sure what to do about that. We left some voices out of our meeting.

WE ALL AGREE THAT THE EMPHASIS ON ORIGINALITY—EITHER NEW BASIC RESEARCH OR ORIGINAL ART—STANDS IN THE WAY OF MAKING PROGRESS ON SOCIETAL ISSUES (LIKE CLIMATE CHANGE) BECAUSE IT STANDS IN THE WAY OF USING, ADAPTING, APPLYING, EXTENDING, TESTING GOOD IDEAS AND PRACTICES.

A good way to think about what is good in science and art is to think about what is useful to the world, especially to the commons. That isn't thought about enough in either field.

TOO MUCH TALK, IDEATION AND HEADSPACE CAN GET IN THE WAY OF DOING STUFF, JUST AS TOO LITTLE ANALYSIS CAN LEAD TO DOING DUMB STUFF. GETTING THE BALANCE RIGHT IS HARD. REMINDING YOURSELF OF YOUR PHYSICALITY CAN HELP.

Humans are part of nature and in some ways not part of nature. We do things to the rest of nature and are susceptible to harm from the rest of nature. We tend towards human-centric ideas, and less-human centric viewpoints need to be nurtured.

THE TRAGEDY OF THE COMMONS IS A FICTION: IT IS A TRAGEDY OF HUMAN IMAGINATION AND INVESTMENT INTO THE IDEA OF THE COMMONS AND WHAT IT MEANS FOR THE MODERN (BIG INTERCONNECTED) WORLD.

Everyone has the right to be included and the responsibility to be inclusive. That includes our group. Both ways. We did well in some respects, less well in others.

AUTONOMOUS ENGAGEMENT IN CRITICAL ANALYSIS IS ESSENTIAL. ART AND SCIENCE ARE TOOLS FOR CRITICAL ANALYSIS. EVERYONE DESERVES THE OPPORTUNITY TO PARTICIPATE IN CRITICAL ANALYSIS, THE TOOLS TO PARTICIPATE SHOULD BE WIDELY SHARED, AND THE RESPONSIBILITY OF PARTICIPATION IS TO BE A CRITICAL ANALYST OF YOUR OWN THOUGHTS. THIS IS ESPECIALLY IMPORTANT TO BIG ISSUES, AND CLIMATE CHANGE IS A BIG ISSUE.

Addressing climate change is an opportunity to try new ways of working and link many approaches together, which might also be useful when tackling other challenges.

ABSTRACTION AND EXTRACTION HAVE PARALLEL MEANINGS IN THE SENSE THAT EXTRACTION OF RESOURCES IS RELATED TO, MIRRORED IN, AND ENABLED BY THE ABSTRACTION OF PEOPLE OR ASPECTS OF NATURE INTO CATEGORIES THAT SUPERSEDE AND Demean BEING.

We didn't talk much about technology. Partly this is due to an absence of technologists, partly it's our hunch that social, personal approaches work better.

WHILE IT IS CHALLENGING TO IMAGINE A WORLD THAT CAN ADAPT TO CLIMATE CHANGE EQUITABLY AND LIMIT FUTURE HUMAN-INDUCED CLIMATE CHANGE, WE FOUND THE OPPORTUNITY TO CREATE CONCRETE STORIES ABOUT IDEAL FUTURES COMPELLING AND SUSPECT A COLLABORATION OF SCIENTISTS AND ARTISTS TO HELP PEOPLE IMAGINE THE FUTURE IS HELPFUL. BUT, WE ALSO REJECT THAT A FULLY FORMED VISION OF THE FUTURE IS REQUIRED BEFORE TACKLING THE CHALLENGES OF THE PRESENT.

Reimagining science: collaborations between artists, designers, and scientists as a road map to solving the climate crisis

by Míka Tosca

The artistic process begins with human engagement. Perhaps the revolution we need to address climate change begins by making it an integral part of the scientific method.

Our climate crisis is more desperate than ever—ice caps are melting, disease is spreading, heatwaves are multiplying, droughts are laying waste to crops and ecosystems, tropical storms are strengthening—and politicians continue to ignore the warning signs. It is no secret that the current U.S. administration is doing nothing to slow the amount of carbon dioxide pumped into the atmosphere

every year, a decision that promises to have dire consequences not just in the United States, but around the world.

IN 2018, THE UNITED NATIONS INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE WARNED THAT WE HAD ABOUT 12 YEARS (LESS THAN 11, NOW) TO MAKE MASSIVE, LARGE-SCALE, REVOLUTIONARY CHANGES.

Our collective understanding of human-caused climate change dates back over a century, beginning in 1896 when the Swedish scientist Svante Arrhenius first wrote of the link between carbon dioxide (which he called carbonic acid) in the atmosphere and global temperatures via the greenhouse effect.

In the past half century, sophisticated computer models have consistently demonstrated that the increasing concentration of carbon dioxide in the lower atmosphere—carbon dioxide that ended up there as a byproduct of burning fossil fuels—has raised



the globally averaged surface temperature by over a degree Celsius. This temperature rise, attributed almost entirely to human activity, has precipitated massive and rapid changes across the globe, and these changes are forecast to worsen in the future.



Climate Deniers on Vacation exemplifies an art-inspired approach to climate science communication. Credit: Katie Wittenberg, School of the Art Institute of Chicago

In 2018, the United Nations Intergovernmental Panel on Climate Change warned that we had about 12 years (less than 11, now) to make massive, large-scale, revolutionary changes to our global economy to avoid the worst impacts of climate change.

Proximity to revolutionary history

As a transgender woman living in America, I am no stranger to revolutionary movements. Fifty years ago, a group of queers, led in part by a few brave trans women of color, started a riot at a bar in New York City. That uprising ultimately initiated the LGBT rights movement, a movement that has seen many monumental successes punctuated by several devastating losses and setbacks.

After considering my proximity to this revolutionary history, in 2017 I took an unconventional step and left a position as a research climate scientist at the NASA Jet Propulsion Laboratory (JPL) to teach climate change at an art institution, the School of the Art Institute of Chicago. I made the switch for several reasons, but first and foremost, I wanted to dedicate the remainder of my career to exploring nontraditional ways of bridging divides between scientists, artists, and the public. I took this opportunity as a conscious effort to contribute to a solution to the climate crisis. Now, my career is dedicated to exploring ways artists and designers can help scientists both communicate climate science to the public more effectively and be better scientists.

In September 2018, amid escalating anxieties—fueled by a sensational media—that climate change would bring the end of the world, I was invited to participate in a collaborative five-day workshop at the Headlands Center for the Arts in Sausalito, California. At Headlands, a group of scientists, artists, and policy-

makers were convened to explore and address inequities produced by climate change. Among other topics, we discussed the importance of improving scientific communication, and identified the importance of including artists in the process of scientific knowledge-making. These discussions continue to inform the trajectory of my professional scientific practice.

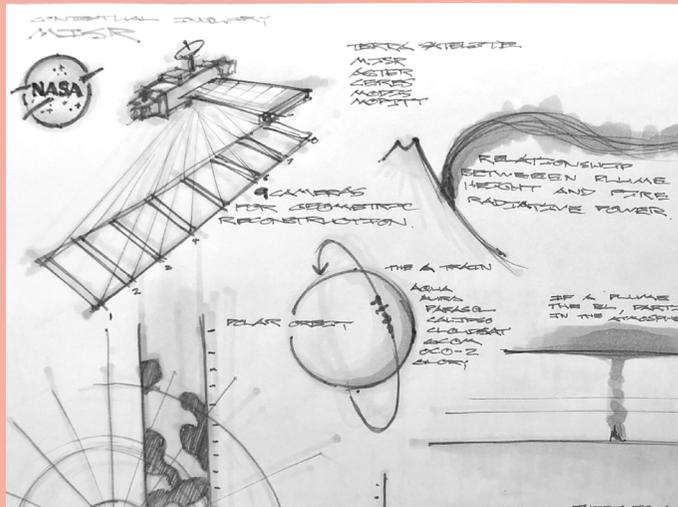
Collaboration and engagement

This excerpt from David George Haskell’s “Notes on Ecological Aesthetics and Ethics” inspires me in this effort, daily:

“Once we—collectively—have an integrated sense of aesthetics, we can begin to discern what is beautiful and what is broken about a place, and, from there, I believe we can begin to form an objective—or near-objective—foundation for ethical discernment. Answers emerge from the community of life itself, filtered through human experience and consciousness.”

In recent decades, though the knowledge of climate change has continued to expand, much of this knowledge remains abstruse, cumbersomely documented, and obscurely presented, making engagement with it by “nonscientists” difficult. Perhaps this is the reason why a large segment of the general population remains convinced that human beings have not caused the observed 20th and 21st century climate change.

Excerpt of a data
visualization
process drawing by
Adrian Galvin



AS WE UPDATE OUR UNDERSTANDING OF THE ENVIRONMENT, WE MUST ALSO UPDATE THE TOOLS WE USE TO STUDY IT AND THE METHODS WE USE TO PRESENT IT.

There exists, therefore, an exciting and necessary opportunity for scientists to collaborate with artists. Many scholars learn that the scientific method begins with a hypothesis, progresses through research and analysis, and concludes with a result. The design process, in contrast, begins with human engagement and inquiry, progresses through ideation and prototyping, and concludes with a refined artifact. It is precisely through the initial step of human engagement where artists and designers distinguish themselves from (most) scientists. And, as Haskell

writes above, “once we...have an integrated sense of aesthetics, we can begin to discern what is beautiful and what is broken about a place.” Perhaps artists can, in fact, help scientists be better scientists. I maintain that the unique insights of artists, designers, and makers present an opportunity for scientists to collaborate in the creation of evocative visual and auditory artifacts that invite the public to share in both the research process and the scientific conclusions of a study. These collaborations ultimately engender a more thorough and straightforward understanding of scientific knowledge.

In this moment, especially in the field of climate science, we need, more than ever, for the public to engage with science. Through inviting and evocative designs that tell the story of the data in a more intuitive way, we can better foment the magnitude of the climate crisis in the public psyche and, ultimately, encourage people to invest in the necessary solutions. This public buy-in would go a long way toward productively addressing the climate dilemma.

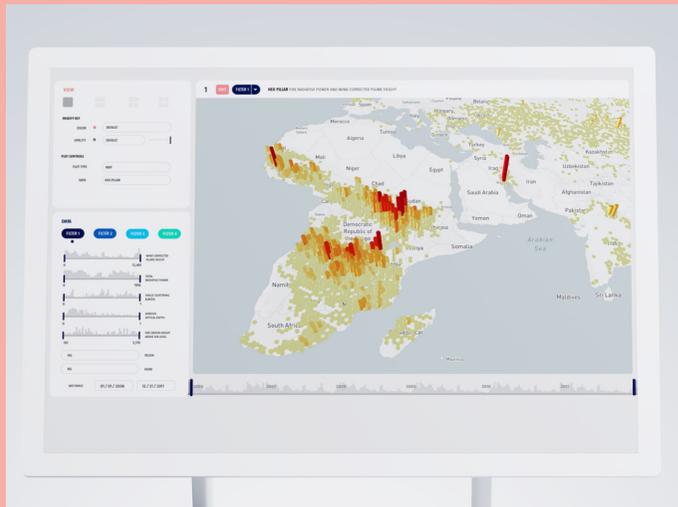
Data visualization and better science

It is perhaps intuitive that art and design can help scientists better communicate their results to the public. Indeed, many scientific institutions are now employing full-time graphic designers to improve scientific communication. However, many artists—including those I interacted with at Headlands in September 2018—continue to express their desire to be involved at the beginning of the scientific knowledge-making, rather than at the end, when their aesthetic inclinations are often tapped to improve scientific communication.

Therefore, I maintain that improvements in data visualization (through collaboration with artists and designers) can also facilitate exploratory research and help researchers ask qualitatively “better” scientific questions. Exploratory analysis, or a precursory evaluation of data with the intent of generating a research inquiry or hypothesis, is often hampered in efficacy by an arduous data-parsing process or incomplete and confusing data visualization.

As a case study, I worked with Adrian Galvin, a designer at JPL, to develop a data interface and visualization tool for the Multi-angle Imaging Spectroradiometer (MISR) smoke plume project, a unique and valuable data set often overlooked because of its inaccessible interface. Together, we conducted a thorough workflow inquiry and iterative prototyping sessions to refine interactions and visual representations. The interface redesign that resulted from this process streamlined exploratory investigation and reduced the time taken to generate visualizations and correlations on the order of days. The result of these efforts facilitated better science.

Prototype of MERLIN, the MISR data visualization interface made in collaboration between Tosca and Galvin



Through this project, Adrian and I hypothesize that similar human-centered art and design processes can critically enhance the practical value of many Earth and climate science data sets.

As we update our understanding of the environment, we must also update the tools we use to study it and the methods we use to present it to the public. There is real potential for art and design to dramatically improve the way climate research is conducted and communicated.

A new chance to be truly revolutionary

Fifty years ago, queer folks began a revolution that demanded that we be respected as equals—both in life and in law—and that revolution has resulted in enormous progress for LGBT+ people everywhere.

On the last day of class, I tell all my students that the climate dilemma offers another opportunity for us to be truly revolutionary. Through collaboration with artists and designers, we can work toward the demystification of climate science because when science becomes understandable to the public, people become interested in not only the results but the scientific process, discussions, and, most importantly, solutions.

Even though the media continues to tell us this is the end of the world, as my good friend and fellow scholar Andrew Seber likes to say, “this isn’t the end of the world, just the end of this world.” We have an opportunity to make the next world better, and more equitable, and perhaps art can get us there. It is my hope that we will follow in the footsteps of our revolutionary ancestors and solve the climate crisis, together.



A blockprint after Hokusai's *The Great Wave Off Kanagawa*, updated for the 21st century. Credit: Noa Vigny Billick, School of the Art Institute of Chicago.

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<https://eos.org/opinions/transcending-science-can-artists-help-scientists-save-the-world>

Headlands Thematic Residency participants

2016: Climate Change

James Arnott
Shahzeen Attari
Amy Balkin
Adriane Colburn
Sofía Córdova
Mark Decena
Carrie Hott
Ellie Irons
Emily Johnson
Andrew Jones
Rachel Morello-Frosch
Miriam Simun
Jalonne White-Newsome
Pinar Yoldas

2018: Climate Equity

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Kat Austen
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Torkwase Dyson
Melecio Estrella
Nahal Goghaie
Solange Gould
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Ayasha Guerin
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