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Prosthesis

A thesis submitted in partial satisfaction of the requirements
for the degree Master of Fine Arts

in

Visual Arts

by

Grace Grothaus

Committee in charge:

Professor Pinar Yoldas, Chair
Professor Lisa Cartwright
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Professor Miller Puckette

2021

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The thesis of Grace Grothaus is approved, and it is acceptable in quality and form for publication on microfilm and electronically.

University of California San Diego

2021

DEDICATION

It's hard to find words to express the depth of my gratitude. The process of unfolding over these last three years contains so many unforgettable moments which will remain with me, continue to shape me, for a lifetime.

To my partner Felipe, from our earliest chance discussions in class together to today, the exchanges we share are a daily inspiration. To my family, thank you for believing in my artistic voice. Without you I would not be here. To my friends and to our cohort, you are the communities that give meaning to the journey, thank you for everything along the way. To the faculty who walked this part of the path with me by joining my committee, thank you not only for your magnanimity with time and ongoing support but also for the thoughtful questions you asked: they have helped me to choose my way. Thank you also to a number of other faculty both in the Visual Arts department and across the UC San Diego campus for continually stoking my intellectual curiosity; your collegial generosity in discourse is what makes interdisciplinary work possible. To the students who I've been fortunate to teach with, thank you for your energy and enthusiasm for learning. It is for your generation and those after that I research and advocate for climate change solutions.

Lastly, thank you immensely to the more than human ecosystems among which I've walked and listened with intention, as the knowledge gained therein reaches beyond the written.

EPIGRAPH

“It is of man’s essence to create materially and morally, to fabricate things and to fabricate himself.”

Henri Louis Bergson (*The Creative Mind*, p. 84-5)

...sometimes “environmental art engages directly with the earth and with crucial scientific and political issues, asking questions that would otherwise be unasked by scientists and politicians. ...Again, the issue of political effectiveness comes to the fore, allied with the question of whether environmental art in general functions as more than a sticking plaster on the surface of a ravaged environment. But it may be that this work operates more-or-less effectively on the broader social consciousness in ways that may be difficult to trace.”

Paul O’Brien (*Art, Politics, Environment*, p. 63)

“The emergence of new publics who traverse the digital-material world as they form their critical stances on environmental issues through public art appears to be within reach.”

Larissa Hjorth, Sarah Pink, Kristen Sharp, and Linda Williams (*Screen Ecologies*, p. 36)

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ABSTRACT OF THE THESIS

Prosthesis

by

Grace Grothaus

Master of Fine Arts in Visual Arts

University of California San Diego, 2021

Professor Pinar Yoldas, Chair

My thesis holds that humans and other animals are not separate, yet each species is unique: in possession of different strengths and weaknesses. I will focus herein on our own human species' particular strengths and weaknesses because these have shaped the present moment of planetary climate crisis. I argue that our ability to consciously influence our own evolution through the epigenetic influence of our species' tool usage puts the possibility, and therefore responsibility, for correcting our present course of mass extinction squarely upon our shoulders. The very traits of humanity that brought us to this point can

indeed chart quite a different course than the one we are on. Our capabilities eliminate the need for our current misgivings, prevarications, and distractions from doing the work at hand and they mitigate against denial, pastoral nostalgia, inaction, and further injustices towards one another. We are confronted on a daily basis with the duties of planetary ecosystemic care, yet the majority have not taken them on. It is time for us to realize our full human capabilities by embracing of our corresponding human responsibilities. I will indicate that art's imaginative storytelling and cultural influence can help us along the path, both individually and collectively.

INTRODUCTION

What tendencies drove humanity to the precipice of climate disaster and how can we best confront and subvert them to avert the coming crisis? My research converges on this question. Humanity is part of, and inseparable from, planetary ecosystems. Nonetheless, within this ecosphere we find an important distinction between the human mammal and all other animals. This difference centers upon our tremendously unusual processes of producing and storing information exosomatically and the irreducibly bivalent nature of this epistemological and cognitive accumulation. The bivalency at stake is emblemized by what Socrates called *pharmaka* – that which has the capacity both to poison and to cure. This may explain why *homo faber* has produced both penicillin and the atomic bomb.

In order to unfold my thinking and praxis surrounding this confounding contradiction, the thesis has two parts. In a dyadic relationship, the conclusion of part I is what sets part II in motion. Part I is the result of training my gaze inward and identifying the *weltanschauung*, or fundamental cognitive orientation, that drives me. Part II attempts an elucidation of my praxis during my nascent research, which is to say, it offers a material exteriorization of my *weltanschauung* in order to establish a dialogue with others. My aim is to interrogate the artworks I have undertaken during the last three years as an MFA student in the Visual Arts Department at UC San Diego, to attempt to discern their processes, materiality, and research orientations. For me, each working process brings with it a series of new questions that in turn give rise to further artworks. Though this *ouroboric* process began many years ago and will continue long beyond my studies at UCSD, for the purposes of this paper I will focus on this excerpt of time.

PART I:

From Outward, Gazing In: A meditation on *weltanschauung*

If we follow Robert Lanza's biocentric proposition that lives themselves are generative of the universe, then we might say that we collectively co-create our reality.¹ Following this line of reasoning, we can then establish that we each hold this power and responsibility jointly as co-acting agents within the broader human collective, whether or not we choose to awaken to it. Indeed we do possess this power, as exemplified in the fact that a life can as easily generate another or choose to extinguish it. In this, there is no difference in the animal *Homo sapiens*, as this holds true for every animal. There is no doubt that humanity is inseparable from the Earth's interrelated ecosystems, which are comprised of all living species and non-living terrestrial matter. Humanity is not just physically situated within but an inextricably agential part of the ecosphere, despite any pre-industrial, and particularly post-industrial era discourse to the contrary. There is no utility in carrying forth from a perspective of *nature* versus *other* and there is no outside position that can be taken with validity.

Nonetheless, though humans and other animals are not fundamentally separate, they are certainly each distinct in their niche capabilities. This is to say that the unique strengths and weaknesses that one species holds, another does not similarly possess. Take for example the bumblebee, *Bombus terrestris*. It can easily detect and memorize the characteristics of floral electric fields and recall them at will; a cognitive feat humans likely have difficulty imagining, let alone emulating.² A discourse on our own human species' strengths and weaknesses nonetheless remains essential, though for our purposes here, it will not be as posited elsewhere in the antecedent Western ideological cannon. Our "human exceptionalism", if indeed exceptional at all, is best characterized as that of having had an exceptionally deleterious impact on planetary homeostatic mechanisms; vastly outstripping that of any other species. Let's examine what specific and unique attributes have given rise to this present state.

What do a drawing, a written word, and an equation all have in common with one another? They are all produced by the same human peculiarity: the capacity to store information exsomatically, or out-

¹ Lanza, Robert, and Bob Berman. Biocentrism. 1st ed., BenBella Books, 2010.

² Clarke D, Whitney H, Sutton G, Robert D. Detection and learning of floral electric fields by bumblebees. Science. 2013 Apr 5;340(6128):66-9. doi: 10.1126/science.1230883. Epub 2013 Feb 21. PMID: 23429701.

side of our own corporeal bodies and project them into the world. This exsomatic information is stored exteriorly for the purpose of knowledge sharing with one another and with subsequent generations, and our mode of doing so is particular to the human animal.

When viewed via a historical perspective of deep time, all exsomatic knowledge, which is to say all human technical and cultural production, can be taken together, and is best not considered to be wholly separate. From this historical perspective, what we call *technical* or *cultural* are in fact fuzzy distinctions at best within the totality of exsomatic endeavors. Further complicating our capacity to make clear delineations between the two, they co-evolved inextricably from tool development. The first hominid pre-human beings to develop tools were prelinguistic. Their tool use was so primordial that it predates language; however, hominids are hardly the only species to utilize tools.

Some time after the advent of rudimentary tool usage, pictorialization and grammatization emerged simultaneously as exteriorization by way of cultural artifacts and trade goods, as well as greater specialization in tool use and construction: approximately 300,000 years ago.³ Since then, cultural constructs and techniques of making have cumulatively changed together, not separately. When contextualized historically, it becomes clear that culture has been always already technical and the technical has never not been cultural as well.⁴⁵⁶ From this position we can see that technology has always been incorporated into every domain of human endeavor from art to science, economics, and politics. Therefore, it would be as absurd to oppose technology to culture as it would be to position humanity outside of ‘nature’.

³ Leroi-Gourhan, André, et al. *Gesture and Speech* (October Books). Y First American edition, The MIT Press, 1993.

⁴ Stiegler, Bernard, et al. *La technique et le temps. Tome 1, La faute d'Epiméthée*. (Meridian: Crossing Aesthetics) (No. 1). 1st ed., Galilée, 1994.

⁵ Leroi-Gourhan, André, et al. *Gesture and Speech* (October Books). Y First American edition, The MIT Press, 1993.

⁶ Coeckelbergh, M. Language and technology: maps, bridges, and pathways. *AI & Soc* 32, 175–189 (2017). <https://doi.org/10.1007/s00146-015-0604-9>

How should we consider humanity's relationship to our exteriorized knowledge; whether cultural, technical, or other? These processes of exteriorization do not merely accumulate material changes in the external world, they have actually fundamentally changed the way people think interiorially. These changes are then carried forward genetically to subsequent generations. In this way, slow species-wide processes have taken place via a long series of cognitive changes that have resulted from adaptation to living life through our tools across time. It is fair to say that humans experience cyclic coevolution with and through their cultural and technical exteriorized knowledge artifacts. Therefore, the very essence of what makes the human, *human*, is how our brains have been shaped by the flint knife and subsequent devices. We have stored knowledge exteriorially outside of our temporary corporeal bodies through the organization of non-human matter, and literally, over time, that is how we became human. Humanity is at its very essence only comprehensible in terms of cyborg ontologies. Our being in the world is at once both human and organic, as well as artificial and comprised of non-human material. Indeed, we have even altered our own evolutionary trajectory, albeit accidentally (lacking any organized purposeful aim) through our exteriorized knowledge.

The advent of *Homo sapiens* comprises a marked break in evolutionary processes from that of other species. No other species is less complete in its own corporeal body than the human. The question then remains: precisely what qualities of self-containment are present in all other species, yet lacking in humans? Is this lack perhaps the key driver that induces our powerful need to organize inorganic matter around ourselves? In a sense, could we say that there is a deep-seated fragility inherent in humanity that we endlessly seek to remedy? Take for example Pinnipeds, commonly called seals, who are at home on the water-worn crags, making their beds wherever they happen to find themselves when tired. In all its environs, the pinniped is equally at home. Truly, more than human species exist in the world in a largely similar way. Though some may fabricate nests, and others burrows, they are all suited to their environment in such a manner that they do not require the use of anything approaching the same elaborate exosomatic devices that humans make, if indeed any at all.

Often strengths are developed as compensation strategies for shielding, adapting to, or overcoming weaknesses. It would then be plausible that there exists a particularly human deficit that leads to our strengths in organizing exterior matter. Humanity is clearly so dependent upon our processes of exosomatization and their resultant corporeal and cognitive extensions. For these reasons I suggest referring to them by the term *prostheses*. In medical terminology, a prosthesis is any artificial device that is built to replace a missing corporal component, thus it would seem to be a fitting term for our discussion here.

Furthermore, might it be possible that the uniquely human condition of fragility which causes us to build prosthetics, be one and the same with the reason that we as a species are not capable of murmuration or schooling behavior observed in Sturnidae (Starlings) or Thunnini (Tuna)? The process of knowledge transmission is so markedly different for other species. It involves no grammaticization, no interface, and no screen. As we are lacking modes of knowledge sharing found in other species, each new human life acculturates instead through prostheses, and does so not individually, but in collaboration with others. We do not learn in isolation. In keeping with the writings of many philosophers of technology, including Gunther Anders, Gilbert Simondon, Bernard Stiegler, Carl Jung, Friedrich Nietzsche, Henri Bergson, and Gilles Deleuze, let's call these collective processes of sharing the social imaginary via prosthesis usage *individuation*.⁷ We become our individual self through collective inter-individual, intergenerational, and indivisible processes. Subsequently, although the human means of communication is far different from that of other species, it is no less communal. Perhaps it could be said that we murmurate via our books, through our paintings, and even the internet. Individuation is necessary for each generational milieu to maintain itself, which happens collectively, (and unevenly). We imagine a future together, not separately. Notions of a solitary human self are nothing more than pure illusion.⁸

⁷ Stiegler, Bernard, et al. *La technique et le temps*. Tome 1, *La faute d'Epiméthée*. (Meridian: Crossing Aesthetics) (No. 1). 1st ed., Galilée, 1994.

⁸ Evernden, Neil. "Beyond Ecology: Self, Place, & the Pathetic Fallacy." *The North American Review*, vol. 263, no. 4, Winter 1978, pp. 16–20.

As with the processes of transmission, or individuation, the processes of maintenance of our prosthetics is also a communal task. From paper and mass printing to digitization, and now machine learning and quantum computing, there is an accumulation of complexity of our devices across time and the complexity of the maintenance required by them. Though humanity is evolving due to our prosthetic usage, our prosthetics will not evolve, but instead accumulate in volume and complexity. This is because when we develop new tools and techniques, the old ones are predominantly not erased by the new, but layered upon or added to the full lexicon which includes the older modalities as well. For example, typing has not supplanted writing by hand.

Over time, the maintenance and transmission of this accretion has become a more and more onerous task. With each new generation and innovation, a greater volume of prosthetic material is projected into the world and demands a greater quantity of our collective attentions to learn about, through, and maintain. When viewed via this understanding, we see that being a human means to inherit not just the objects but also the responsibilities of our past. We are born into a milieu shaped by the actions of those who came before us, to discover that we must take up the torch before ultimately handing it on to the next. When we fail to do so, among other things, knowledge is lost.

Due to this ever greater complexity and extent of our prosthetic systems, we have come to possess greater and greater reliance, and in some ways, abnegation of our own organic capacities. We must rely on the prosthetic information storage rather than their own capacity to remember; for, given the volume of prosthetic systems present in the world today, it simply isn't possible to keep up.⁹ A human mind is not, and will never be, a Memex machine.¹⁰ The sheer mass quantity of it is perhaps difficult to comprehend. As of December 2020, and for the first time in history, human prosthetics now *outweigh* all living beings, taken together.¹¹

⁹ Zlotnik, Gregorio, and Aaron Vansintjan. "Memory: An Extended Definition." *Frontiers in psychology* vol. 10 2523. 7 Nov. 2019, doi:10.3389/fpsyg.2019.02523

¹⁰ Bush, Vannevar. "As We May Think." *The Atlantic*, July 1945.

¹¹ Elhacham, E., Ben-Uri, L., Grozovski, J. et al. Global human-made mass exceeds all living biomass. *Nature* 588, 442–444 (2020). <https://doi.org/10.1038/s41586-020-3010-5>

Do our immensely fast networked and complex prosthetic systems now possess something akin to their own sort of momentum and rhythms that our biological bodies? Do they possess their own sort of neuroindustrial reason?¹² It would seem to me that it is quite possible now to view our present situation in such a light. These prosthetic systems of ours, which have changed us genetically, have accelerated beyond that of the human nervous system to surpass us. I seriously question whether our fragile wetware can keep pace with the hardware of our own making. We seem to be at a curious tipping point, in which what we have made not only literally outweighs, but arguably outpaces our corporeal selves. To what ends might we be hurtling toward in these cyclic processes of prosthetics and individuation? ...Break-through, calamity, both, or neither?

If indeed a sort of neuroindustrial reason is emerging or has emerged from our prosthetic systems, then what is the political ecology of machines? Will there be a further emergence, one of a sort of technological consciousness? Even if artificial general intelligence (AGI) never develops, have humans not already been superseded by the prosthetic artifacts produced by themselves? Corporations seeking to maximize profit and minimize market vulnerabilities have turned over quite a bit of executive functions to machines with the widespread adoption of machine learning algorithms. How much farther along in the cycles of prosthetic systems development will we travel before we are reduced to mere system operators or users only? Perhaps we will truly cease to conceive of our species as the center of the world, acceding that role to the prosthetic systems of our making.

"It does not suffice to change the world. We do that anyway. And to a large extent that happens even without our involvement. In addition we have to interpret this change. Precisely in order to change it. So that the world does not change without us. And ultimately into a world without us."¹³

It is fair to say that we are struggling to scale to the present. Already the speed is faster than our human nervous systems can process. Should we declare that our prosthetic transmission and maintenance pro-

¹² Stiegler, Bernard, et al. *La technique et le temps. Tome 1, La faute d'Epiméthée*. (Meridian: Crossing Aesthetics) (No. 1). 1st ed., Galilée, 1994.

¹³ Anders, Günther. *Die Antiquiertheit Des Menschen 2: Über Die Zerstörung Des Lebens Im Zeitalter Der Dritten Industriellen Revolution*. Vol. 2, Auflage, Beck CH, 2013.

cesses are short-circuiting? In the larger, deep-time, sense, perhaps we already have arrived at a point in which most, if not all, executive function is handed off to machines. Not only have we brought about evolutionary changes in ourselves without executive intention, but also in our increasing reliance upon them. The fragility of these complex systems of our own devising and their proportionately increasing maintenance demands have resulted in a fragile situation. What happens when systems fail and we have forgotten? What will our future become?

Perhaps as never before, futurity holds us in its hypnotizing spell of speculation. Speculative futures have become far more vital than mere curiously imaginative thought experimentation because climate has changed everything. Our climate futures will not resemble the past because of the compressed time-scale of present warming - far faster than natural adaptation can keep pace with.

It is impossible to peer ahead. We only have this fraught present tense, uncomfortably unignorable because of the pressing crisis. Yet, one detail does present itself clearly: if humanity's very emergence is bound up in our prosthetic devices, then our future is no less so. How are we to obtain the proper framework for understanding our prosthetics, if neither through apocalyptic fears, nor through starry gaze?

Today, but one could say from the twentieth century, one *sees* technique everywhere, but the difference is that today we only have to contemplate or *use it*, we alienate it from the sphere of understanding, we judge it without knowing it, we condemn it, we criticize, we give it a capital letter that elevates it to the rank of a god, but we continue to believe that the digital age is a sort of magician's thing. ...we prefer to harangue the people against the peril of Technology, while promoting power in its *reifying* process. We are made *of the same stuff as the technique*, because the technique is the apex of our culture, the same culture which passes through our genes, which makes us artefacts.¹⁴

Returning to the beginning, to questions of agency, our prostheses are not benign in and of themselves, nor are they guaranteed dangerous agents. They are the world and they are us. They amount to Socrates' *pharmaka*: poison, remedy, and also as scapegoat. The *pharmakon* conception is an equivocation that leaves us with this burning question — what tips the prosthesis towards one side or the other? Homo

¹⁴ Carrozzini, Giovanni. "Technique et Humanisme. Günther Anders et Gilbert Simondon." *Appareil*, no. 2, 2008. *Crossref*, doi:10.4000/appareil.577.

faber “can as easily produce a kosmos as devastate its milieu” though our behavior typically falls between such poles.¹⁵ Outcomes are wrought from our prosthetics across the spectrum from social good to ill through their deployment in processes of transmission: through individuation. The space between polar outcomes, is where questions of ethics and responsibility enter our discourse.

Individuation is always a moment that is not predetermined because there are so many factors involved that the outcome is not possible to predict. It is singular then, but in within the instance of the individuation process, not within the individual. We each have a lifetimes’ worth of semi-continual individuation processes, each distinct from the next, each fallible to the spectrum of outcomes. However, as individuals in the separatist societal structures we have built, we end up falling unequally along the spectrum of capacity for prosthetic manipulation, as shaped via artificial systems of class, capital, and labor distinctions. Our ever accreting prostheses are agents of great amplification and hold the possibility of exacerbating social inequality through their usage. It is essential to ask ourselves who has access to which prostheses and how many? While there indeed seems to be, for the moment, a rising tide of the median human wellbeing, the extreme highs and lows on any such graph are growing gulfs separating one from another, and that is an extraordinary failure.

Our present moment is one of global derangements.¹⁶ It’s clear that we’ve now reached a point that the choices we have are so urgent and so cosmopolitical in terms of global warming, climate change, availability of resources, vulnerabilities of populations to sea level, wildfires, hurricanes and so called *natural* disasters of all kinds, that the call to take action to end and then reverse carbon emissions is absolutely unignorable. This precipice may in fact be simply the logical outcome of our endless prosthetic accumulations.

¹⁵ Stiegler, Bernard, et al. “GENERAL INTRODUCTION: DECARBONIZATION AND DEPROLETARIANIZATION GAGNER SA VIE AU XXI^è SIÈCLE.” Translated by Daniel Ross, *INTERNATION*, 2020, internation.world/arguments-on-transition/general-introduction/.

¹⁶ Ghosh, A. (2017). *The Great Derangement: Climate Change and the Unthinkable* (Berlin Family Lectures) (1st ed.). University of Chicago Press.

However, no matter how (in)convenient these present dwellings, we cannot remain here; our human story does not end here.¹⁷ We are *media res* - in the middle of things - and also in the middle of *Things*. Our accumulations, drawing material out of the circular economy of ecosystems have removed them on a time-scale that naturally leads to the state of imbalanced precarity we are presently within. Our prosthetic production, at such scale, has shifted the power dynamics of humanity with one another and with the beyond-human world, and our present state is one in which we hang in the balance. Furthermore, it's no surprise; we've known this point was coming for quite a long time.

Atmospheric scientists first began to use computers to predict future global temperatures over fifty years ago, in the early 1970s. It was at this time that developments in computing power coincided with the realization that carbon dioxide levels in the atmosphere had the capacity to warm the planet. Computer simulations were then initiated in a fervent attempt to model the extent to which this would have future impact. The results these researchers found, needless to say, were a shock to global systems. In a 1977 report prepared by the United States National Research Council, Roger Revelle and Charles Keeling first argued that carbon emissions have reached a level of existential threat.¹⁸ In 1978, the EPA published a now famous report, "Environmental Assessment of Coal Liquefaction: Annual Report", which was read by Rafe Pomerance, a young political lobbyist. Pomerance found that he could not shift his attention away from the findings and subsequently his life took on a permanent directional shift. He turned first to geophysicist Gordon MacDonald, of the Jaxons, and later to others, notably atmospheric physicist Jim Hanson, and together they raised the alarm among US politicians, beseeching them to take action in the form of policy change. In 1979, the news began circulating in earnest on Capitol Hill. However, despite years of dedicated advocacy, they failed to bring about the requisite changes. This was due, in large part, to a lack of belief in the accuracy of the computer simulated projections on the part of the non-technologically savvy politicians.

¹⁷ Whitman, Walt. *Leaves of Grass: The Original 1855 Edition*. Chump Change, 1855.

¹⁸ Rich, N. (2019). *Losing Earth: A Recent History* (Illustrated ed.). MCD.

The United States has always been the largest contributor to atmospheric GHGs and the most reticent nation to acknowledge climate change. Had Pomerance and his collaborators succeeded and emissions begun trending downward then, or even remained level, we would not be teetering on the precipice of runaway global temperatures today. All the more a heartbreaking loss, given that even these early models, carried out via punchcard, have accurately predicted all that has transpired in the subsequent five decades leading to today.¹⁹ Now, in 2020, it finally seems we are seeing a bit clearer, but now the path to zero emissions is immensely more fraught. At this point, to stay below 1.5 degrees Celsius warming, emissions will need to begin to drop by 7.6% every year, dramatically reversing the long-running trend of annual increase.²⁰ To give an idea of how herculean an effort that will require, even amidst the transportation curtailing effects of the devastating global pandemic on CO2 emissions, there was not a drop high enough to meet our reduction needs. The evidence seems clear: a degrowth approach would not be the correct path to take to minimize human suffering. Alternatively, the Green New Deal offers a promising proposal for a brighter future, but will it do enough in terms of reducing inequality and promoting social justice?

The issues we are facing are not only in our future, but already form our present. Mortal impacts on natural and human systems from global warming have already been observed. According to the European Union's Copernicus Climate Change Service, in 2020 average global temperatures were already 1.25 degrees Celsius (2.7 degrees Fahrenheit) warmer than preindustrial levels. It is important to note here, that this is not an even heat distribution, nor will it be in the future. The strongest warming is happening in the Arctic, during cool seasons, and in Earth's mid-latitude regions of the Global South, during warm seasons. Of particular concern, many nations have already experienced warming surpassing 1.5C in at least one season. This comprises more than one-fifth of all humanity.

¹⁹ Hausfather, Zeke, et al. "Evaluating the Performance of Past Climate Model Projections." *Geophysical Research Letters*, vol. 47, no. 1, 2020. *Crossref*, doi:10.1029/2019gl085378.

²⁰ Olhoff, A., & Christensen, J. M. (Eds.) (2019). Emissions Gap Report 2019. United Nations Environment Programme. <https://www.unenvironment.org/resources/emissions-gap-report-2019>

Our present planetary goal is to keep warming to no more than 1.5C.²¹ Why 1.5C? It is an artificial demarcation understood to sharply curtail the number of deaths from climate-related risks exacerbated through poverty: due to lack of access to clean air, safe drinking water, sufficient food, and secure shelter. However, in reality, every tenth of degree brings tremendous loss. Who is susceptible? The least privileged three billion of our now nearly eight billion human beings, nearly one third of us residing upon our finite blue marble, Earth, are susceptible.

What happens if we breeze past 1.5C to warming of 2 degrees Celsius and above? The intergovernmental panel on climate change, the IPCC, is globally regarded as the leading authority on this information. According to their research, at warming of 2C and above, the likelihood of an ice-free Arctic is approximately one summer every decade. The oceans will rise, acidify, and deaden, and shorelines worldwide will change rapidly. There will be a sharp increase in the frequency of catastrophic typhoons, hurricanes, tornados, cyclones, mega-fires, extreme heat-waves, droughts, desertification, as well as extreme precipitation and flooding. Portions of the planet's mid-latitude regions will reach sustained wet-bulb temperatures during warm seasons exceeding 35C. This is known to be a critical number because at this point and above the heat is found to be fatal even to people without underlying health conditions. At temperatures and humidities above 35C, even if one is unclothed in the shade next to a fan, the body switches from the feedback mechanism of releasing heat into the air, to gaining heat from it; in other words, sweating provides no cooling effect. Indeed, already this human survivability limit has been recorded as being briefly surpassed at sites along the Persian Gulf and Indus River Valley in India and Pakistan.²² The year 2020 brought new wet-bulb records as early as the month of May.²³ These effects

²¹ IPCC, 2018: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)]. In Press.

²² Im, Eun-Soon, et al. "Deadly Heat Waves Projected in the Densely Populated Agricultural Regions of South Asia." *Science Advances*, vol. 3, no. 8, 2017, p. e1603322. Crossref, doi:10.1126/sciadv.1603322.

²³ Vaughan, Adam. "Climate Change Has Already Made Parts of the World Too Hot for Humans." *New Scientist*, New Scientist, 8 May 2020, www.newscientist.com/article/2242855-climate-change-has-already-made-parts-of-the-world-too-hot-for-humans.

extend, quite obviously, beyond humanity to animals and plants. At 2C, even rice, wheat, and other crops actually become less nutritious. Humanity will require more sustenance, yet globally we will have far less.²⁴ Devastatingly, the effects of temperature rise are compounding.

Already the rise has been an inordinate threat to life as we understand it. The global average of diversity loss across all known species in most major land-based habitats has fallen by approximately 20% or more, mostly since 1900.²⁵ Insects are being decimated at a rate of 1-2% annually across all known species.²⁶ The loss of biodiversity for plants is incalculable. Far less efforts were ever taken to identify them and therefore wholly unknown species are vanishing before they could ever be found. Furthermore, the time scale for evolution to replace lost biodiversity is inconceivably immense, tens of millions of years.²⁷

To further emphasize the urgency by which action is needed, even if we were to stop adding greenhouse gases (GHGs) to the atmosphere today, our present warming trend will still continue for decades.²⁸ Thousands of years of net zero emissions are needed before temperatures will return to pre-industrial levels.²⁹ By 2021, it has become clear that we will need to use geotechnologies to remove carbon from the

²⁴ “A Degree of Concern: Why Global Temperatures Matter – Climate Change: Vital Signs of the Planet.” NASA, NASA, 12 Oct. 2020, climate.nasa.gov/news/2865/a-degree-of-concern-why-global-temperatures-matter/.

²⁵ IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany.

²⁶ Insect decline in the Anthropocene: Death by a thousand cuts. David L. Wagner, Eliza M. Grames, Matthew L. Forister, May R. Berenbaum, David Stopak. *Proceedings of the National Academy of Sciences* Jan 2021, 118 (2) e2023989118; DOI: 10.1073/pnas.2023989118

²⁷ IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany.

²⁸ IPCC, 2018: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)]. In Press.

²⁹ “If Emissions of Greenhouse Gases Were Stopped, Would the Climate Return to the Conditions of 200 Years Ago?” Royal Society.” The Royal Society, The Royal Society, 1 Mar. 2020, royalsociety.org/topics-policy/projects/climate-change-evidence-causes/question-20.

atmosphere in addition to reaching zero emissions. However, we will need to be extremely careful as we do so. Potential unintended consequences are quite possible, such as of the much-discussed plan of using vast quantities of hollow glass beads to increase the albedo effect and therefore diminish summer ice loss at the poles.³⁰

The target goal of 350 parts per million (ppm) atmospheric carbon, has already been far exceeded. Scripps researchers found that for May 2020, the average atmospheric CO₂ concentration was 417.16 parts per million.³¹ Indeed, arguably our lives already depend on geotechnological prosthetics. Without such systems of measurement, we would have no idea how close we are to this survivability tipping point. However, one thing is certain, the solution will not be found in the stars. Contrary to those searching our skies for other habitable worlds, human enterprise has in fact not decoupled from planetary finitude, and therefore we must maintain the habitability of Earth.

What precisely is a geotechnology? Even planting trees could be considered to be, however at this point planting trees alone will not remove the required amount of atmospheric CO₂, though there was a time in the twentieth century when it would have.³² Our prostheses are hardly created equally; indeed some lead far more rapidly to the extinction precipice than others. Grievously, much indigenous technology has not just been ignored and denigrated, but completely erased in tandem with devastating genocides.

The world is waking up to the knowledge that much work is to be done to relearn and revalue indigenous life, though an enormity has already been irrevocably lost. UNESCO, The United Nations Educational, Scientific and Cultural Organization, has responded to the present awakening by developing LINKS, Local and Indigenous Knowledge Systems, a new program which promotes indigenous and localized knowledge through inclusion in global climate science and policy processes. LINKS' stated mis-

³⁰ Walter, Andrew. (2011). Controlling the Earth's albedo using reflective hollow glass spheres. *Int. J. of Global Environmental Issues*. 11. 91 - 108. 10.1504/IJGENVI.2011.043508.

³¹ "Rise of Carbon Dioxide Unabated." Scripps Institution of Oceanography, 4 June 2020, scripps.ucsd.edu/news/rise-carbon-dioxide-unabated.

³² Rich, N. (2019). *Losing Earth: A Recent History* (Illustrated ed.). MCD.

sion is to foster transdisciplinary engagements with policy-makers as well as with scientists to pilot novel methodologies for further understanding of climate change impacts, adaptation and mitigation.³³ However, imagine the current state of affairs from the indigenous perspective: after hundreds of years of colonialists' violence, how must it feel to experience this turn of events? How much trust has been lost, and is it even possible to regain at this point? Unless systemic changes take place, replacing world-conquering social structures with alternate modes of being with one another and with the world, trust cannot nor should be regained.

We need wholly new systems: ones that are not based on perpetual growth and neoliberal logic. What instead? Well, it's clear even to the previously blind-eyed and closed-hearted capitalists that we need now to be concerned the benefit of each other and of the whole, because united under Earth's finite planetary atmosphere, there is no *away*. Colonial strategies of forming sacrifice zones are now obvious to the capitalist as being self-destructive. What we do in one place or to one group within our closed system spherical Earth affects all of us. Clearly we've now reached another milestone: a turning point in which the perceived utility of capitalist logic is undone. Now, we need to curve in a new direction, more actively steering ourselves collectively towards a different future, rather than continued exponential growth and exploitation. Questions of ethics, *sho*, and long-term impact must inherently be included in the plan, even from the perspective of the captains of industry who previously would not, and have not, acted as such.

Greater power should be coupled with greater responsibility: in the exchange of mutual care and environmental stewardship. Collectively reaching recognition of finitude and acting in balance with the non-human is not a new idea. Many societies have long engaged the world from this perspective, such as those of the First Nations peoples. In a way, our future is perhaps ancient.

It is possible, however, that life beyond capitalist logic comes after the time scale of those alive today for capitalism has a history of subsuming all dissent. It is a deeply entrenched system which will be

³³ "Local and Indigenous Knowledge Systems (LINKS)." UNESCO, 16 Dec. 2019, en.unesco.org/links.

exceedingly difficult to escape. Capitalism may even subsume, or perhaps especially, the requisite geotechnologies from which we will derive a livable planet.³⁴ If so, then nonetheless, there are options available to us; counter measures to limit its worst effects. Whatever the ensuing time scale, I wonder if we could not transmute the profit motive into a social motive in order to move in a direction that maximizes survival and thriving for the greatest number of lives on this planet whilst we are in the process of rectifying climate change? Could not social standing be evaluated not based upon how much one *has* but rather how much one *stewards*? After all, our sense of meaning in life is derived from this, and not from the reaching for material wealth. Therefore, such a system of exchange would also increase the happiness and fulfillment of those who are in the position to undertake the most stewardship of their community: both human and more-than-human. Here, community should be understood to be not necessarily that of physical proximity, but potentially one that is technologically mediated, and formed in the way that online communities already do: around shared interests.

Perhaps also, the addressing of questions regarding the formation of a kind of ethical community, and precisely how to live an ethical way of life has to be understood within our economic system to be work: it has to be understood to be labor and hold a recognizable value. Under such a transvaluation, we would recognize the people who are artists, writers, and philosophers, as part of an economy of contributions which is organized around not a utilitarian drive for compound profit but actually about the production of communities which will be able to get us to question the value of producing things to secure compound profit. The work of producing an ethical community of people who are linked technologically is something that we have to come to value as an end in and of itself. In addition, political commitment should be transvalued into that of a commitment to leading an ethical life.

The question of ethics, however, is one of non-universality. What is most ethical in one situation, community, society, or culture, may not be precisely what is most ethical in another. Ethos precedes ethics: it's not a formalized or rational kind of discourse oriented to do what's best for us and what's best

³⁴ Stengers, Isabelle, and Andrew Goffey. In *Catastrophic Times: Resisting the Coming Barbarism*. Open Humanities Press, 2015.

way to do things in a general reflection on what well being is or how we can attain well being in the best way possible but it would be rather about just finding ways to coevolve and to just exist and gauge in a very day to day informal kind of way to improve our own conditions of existence. this is a diffused, non-institutionalized preceding of ethics. Ethical understandings are further complicated by inclusion or lack of inclusion of intention or ethos. For instance, under Buddhist ontologies, intention is included in the perception of an action or inaction, whereas in the United States, it is the end result only which is taken into account.

Nonetheless, this move away from neoliberal ideologies is necessary because it is bad for *everyone*, even the individuals most privileged under said system. The emptiness felt by even those who “have it all” arises because humans don’t derive happiness from owning. We derive happiness from freely given, open-hearted exchange with one another. I believe ultimately that we could really be at the cusp of realizing our own ethical responsibilities to ourselves, one another, and the world because of the planetary crisis. It is very possible that resolution of climate change will result in rapid societal growth; a global post-traumatic growth, if you will.

Perhaps cultural theorist Johan Huizinga’s conception of *homo ludens* is a counter-agent to homo faber, as expressed in la James Carse’s *Finite and Infinite Games*.³⁵³⁶ Homo ludens is the play element of culture. Huizinga identifies characteristics that play must have: play is free and is in fact freedom, play creates order and is in fact a form of order, and play is connected with no material interest and no profit can be gained from it.³⁷

Conceptions of homo lumens aside, certainly when faced with global system mortality, we can agree that inventiveness, creativity, and discovery are today, as always, the only guarantees of the future of humanity – and of life in general. I believe that human beings should reconstitute their prosthetic bod-

³⁵ Huizinga, Johan. *Homo Ludens: A Study of the Play-Element in Culture*. Martino Fine Books, 2014.

³⁶ Carse, James. *Finite and Infinite Games*. Free Press, 2013.

³⁷ Huizinga, Johan. *Homo Ludens: A Study of the Play-Element in Culture*. Martino Fine Books, 2014.

ies of knowledge by rediscovering old prosthetic knowledge, ancestral even, and by combining that with the continued production of new knowledge in all fields, but to do so transdisciplinarity, inclusively of diverse perspectives, and of worlds within worlds.

Our prosthetic bodies of knowledge represent the very essence of our humanity, and are largely inextricable from the cognitive changes their usage has wrought upon us, through us. Our brains changed via usage of the flint knife and have subsequently never stopped. Thus far the process has been accidental, not purpose-driven. Did we develop our prosthetics for the purpose of altering ourselves? No, I don't think so. The invention of the flint knife was for a wholly different purpose. Therefore, it would seem that accident has defined our species thus far. We altered our own evolutionary trajectory, lacking any organized purposeful understanding of our so doing. Thus, awakened to this knowledge that our prosthetics shape us, might we open a door to a new future? If we fully grasp the awareness and responsibility that the design of our prosthetics shapes us, we can then become active, no longer passive, agents in our own evolution. The true bivalence of the unique capacities humanity provides to itself via its prostheses is that we can collectively decide our own outcomes: for the furtherance of more and more equitable lives, or for the extinction of many.

With this understanding, luddite backward gazing can be seen for what it is: nothing more than a pastoral fantasy that does not map onto the reality of our species-being-in-the-world. It is a fear-based means of deferring active stewardship in the face of the enormity of the climate crisis we are facing.

Lastly, time keeps coming up in my research on climate change. There is another perspectival shift that is in necessary: we need a different conception of time than is presently held by the dominant global culture. Firstly, we have deep time, or geologic time: this the the timescale upon which the planet's climate used to change. As we now know, however, in the last century this has been changing rapidly. The notion of an age of the Anthropocene is one in which humankind has accidentally gained the ability to change the global climate on a timescale far closer to that of our own lifespan. Lately though, it seems that the climate is changing even faster: approaching something more like electoral timescales. Six years,

four years, two years... how many years left until the tipping point of runaway greenhouse effect warming? Well, this depends upon decisions made today; and finally it begins to seem possible that political decisions are beginning to improve.

What I think is that we need another approach for our perspectives of time.³⁸ Cultural conceptions of time run perhaps even deeper than that of capitalism, indeed aspects of the latter may possibly derive from the former: one sacrifices their own future for the immediacy of quarterly returns, why? Misconceptions or erroneous valuations of time. How might we shift our mindset to one of deeper timescales? Well, for one, it would be better for us if we were to disconnect from the sovereignty of clocks much more and instead to understand that there is an eternity in every moment. Many indigenous cultures' conceptions of time are actually much closer to this, and much closer to the non-linearity of contemporary quantum physics conceptions of time, actually. Imagine if we were instead to be intensely *present* in the present, in which we are aware of the deep time in the moment and the moment in deep time and how the one folds into and contributes towards the other. Deep time *and* fleeting moment; not *or*. Our world thus becomes one which is in continuous birth, rather than the nesting of short time within long time.³⁹ I wonder if, and think that perhaps, children and the very elderly already perceive this naturally, but acculturation processes take us out of that. If this proves true, changing cultures' framing of time might be easier than it seems. Regardless, we must rethink our relationship to time in the sense that our daily lives have an impact far, far beyond our short, precious lifespans - because they do.

In conclusion, for all those who might purport to denigrate the above as utopic, I seek to remind you that all present day rules are also utopic. The ideal of a rule never fully maps onto the complexities of real life; exception proves the rule. Society is built upon elaborate utopias of rules. It is said that we cannot live without rules, and to that I emphatically agree, only that just as equally, I'd like to see you truly try to live without ideas of utopia, as clearly they are vital to our very fabric of functioning.

³⁸ Krznaric, Roman, et al. *The Good Ancestor: How to Think Long Term in a Short Term World*. Penguin Audio, 2020.

³⁹ Ingold, Tim. "The Temporality of the Landscape." *World Archaeology*, vol. 25, no. 2, 1993, pp. 152–74. Crossref, doi:10.1080/00438243.1993.9980235.

PART II:

From Within, Gazing Outward: A translation of my praxis

Art is my means for endeavoring to understand the world and exteriorizing the subsequent questions that arise as I experience it. My art is my prosthesis, and its purpose faces onto dialogic learning. I undertake each artwork as means of sharing questions and engaging in exchange of information. Although art is an imperfect transmission process, I have always considered artistic production to be a means of communication equal to that of written or spoken language. Thinking through a philosophy of mind, Alva notes that: “art is not a *phenomenon*... that stands in need of explanation,” rather, “it is itself a mode of investigation, a style of research into the crucial questions that interest us, e.g. our human nature.”⁴⁰ Be that as it may, at this particular moment in history it seem to me that the field of visual art is uniquely multilingual in its investigations. Barthes may have once declared that “who *speaks* is not who *writes* and who *writes* is not who *is*,” however, the sculptress must do them all and this sets visual art apart from the rest of the humanities.⁴¹ Although the actress is only required to act, the dancer dance, and the singer sing, the visual artist must speak between, among, and translate. At the heart of their practice, they must bring forth a multiplicity of “languages”: at once spatial, written, and spoken. Therefore, the capacity for translation lives deep in the psyche of the 21st century’s visual artist.

For these reasons I consider myself a translator, and therefore what follows is not precisely an *explanation* of my artworks, rather it is my hope that it will be taken as a work of translation. Translation between languages is always imperfect, but never impossible and always useful. Here I will examine some of the artistic projects I’ve undertaken during my M.F.A., including *Rise* [2019], *The Promise of Progress* [2019], *Projected Horizons* [2019], *SunEaters* [2020], *These Delicate Lines* [2020] and *Open Seed* [2021], drawn from a long-running investigation titled *Against our Better Nature* [2018-].

In 2018, I accepted admission to the University of California San Diego Visual Arts Department and began the transition to a new region of the country and a new art community. Making the most of the journey from Oklahoma, I stopped at sites of historic preservation along the way. Anasazi cliff dwelling

⁴⁰ Noë, Alva. *Strange Tools: Art and Human Nature*. Reprint, Hill and Wang, 2016.

⁴¹ Barthes, Roland. "The Death of the Author." *Image / Music / Text*. Trans. Stephen Heath. New York: Hill and Wang, 1977. 142-7.

remains and petroglyphs held my focus anew, having just prior visited the Cradle of Humankind near Johannesburg when presenting a talk on installation *Wake* [2018] at ISEA International (Figure 1). As a result, upon arriving at UC San Diego, I began investigating new research questions. *Homo naledi*, a species of archaic human, the fossils of which were discovered in the Rising Star cave constellation at the Cradle of Humankind, had more akin to primates than *Homo sapiens*, yet there was substantial evidence of burial rituals. How conscious were the *Homo naledi*? If consciousness was not the sole domain of *Homo sapiens*, then what is the nature of consciousness among other primates, all mammals, and plants as well? And most importantly, what was it about human consciousness in particular that led to making art, ships that cross ocean and sky, global-scale war, and climate change?

Delighting in UCSD's Geisel Library and its astonishingly generous interlibrary loan program, I set about to learn as much as I could about these questions. I hoped that a deeper understanding of the history that gave rise to our present day would help me to develop more effective, *and affective*, artworks regarding human agency in the world and sustainable systems development. I also knew that this research needed time to develop and the resulting artworks would unfold only slowly, because that has always been the case in my practice. In addition, I still had unexplored burning inquiries of immediate concern left over from *Wake*. Therefore, I set out on a concurrent dual artistic research and production process. This is often the case in my practice. I find that production of a present project while researching and developing ideas that need time to gestate is my most generative mode of being. When I reach a seeming impasse or exhaustion in one, the other provides respite and creative synthesis which in turn fuels the other. I believe many artists work in this way. In the interviews of Trevor Paglen, whose thinking I greatly admire, he describes a similar process, sometimes extending into several years or as much as a decade.⁴²

Therefore I continued my material experiments with water in my new studio and discussion with my cohort and faculty. Unsurprisingly, discussion of water here in San Diego was regionally different than in Oklahoma. Here the issue was of imminent sea level rise, not aquifer loss. Global human impact is

⁴² Bryan-Wilson, Julia, et al. Trevor Paglen (Phaidon Contemporary Artists Series). Illustrated, Phaidon Press, 2018.

so locally complex, that every region faces unique threats. Nonetheless, the constant remained that water is not only our most valuable natural resource, but a visceral part of human experience. Through librarian Peter Mueller at Geisel, I soon met a composer and environmental activist named Peter Sloan, an Integrative Studies PhD student in the Music Department. He and his wife were newcomers to the area, like myself. I shared some of my studio material experiments and ideas with him and soon we were off on the collaborative production of *Rise* [2019].

Rise became an immersive multi-disciplinary audiovisual installation that investigated projected changes to Earth's oceans in the coming decades. The finished production grew to a forty minute narrative experience that opened to the audience with an abstraction of our present day lively, but threatened, oceans, and progressed forward through oceanic changes projected by the Intergovernmental Panel on Climate Change (IPCC) if we don't avert exponential warming. In addition to rising levels, these include oceanic warming, acidification, noise pollution, and continued species loss.

Over the course of our research, Peter and I explored many ideas of how *Rise* would take on form and appearance. We settled on three central ideas. First, that human performers should initialize the experience and be the acting agents throughout, just as they are in our world. Secondly, that *Rise* would be experienced visually, auditorially, and physically, because our hope was that a fully immersive experience would convey a cognitive sense of the real and immediate threat of climate change. Third, we wanted to find ways for the sounds, materials, and images to be fully interconnected ecosystemically, not merely simultaneous. This last point was inspired in part by the experience of diving off the coast nearby. There, the hypnotic sonic rush of the ocean waves slipping past, the undulation of clumps of kelp and sea grass, and the brilliantly orange flashes of darting Garibaldi damselfish, lead to my desire to create *Rise* in as fully immersive a manner as possible. I became aware of the campus Calit2, or California Institute for Telecommunications and Information Technology's sound spatialization theater capacities, and together Peter and I developed a proposal for Calit2's Initiative for Digital Exploration of Arts and Sciences performance series and were fortunate to be gifted use of just such a space. UCSD is also home to the The Keeling Curve Project, a daily record of global atmospheric carbon dioxide concentration maintained by

Scripps Institution of Oceanography, one of the oldest and largest centers for ocean and Earth science research. Feeling a sense of right place, right time and exploring the campus was electrifying.

Around this time I also discovered the Whale Acoustics Lab at Scripps. I reached out to the lab director Dr. John A. Hildebrand concerning our project *Rise* to see if there was any collaboration possible. Dr. Hildebrand and lab researcher Dr. Joshua Jones, as it turns out, had a long history of collaboration with art and science communication projects: and they generously shared access to their archive of HARPs, High-frequency Acoustic Recording Packages recordings with Peter and I. Spanning twenty years and forty sites worldwide, this archive holds sonic records of the recent past and present of oceanic ecosystem health. Peter spent significant time investigating their archive and composing an acoustic weaving of the vibrant voices of marine life therein: Beluga whales, Bowhead whales, ringed and ribbon and bearded seals, Pacific walruses, and much more. He also chose to turn his focus towards recordings of industrial shipping noise and drilling in the Gulf of Mexico. Taken altogether, from the HARPs, he was able to weave an entangled narrative from the sonic fabric of the Anthropocene.

In the meanwhile, my studio material experiments evolved into the development of sculptural systems and water pools for later assembly in the performance space and the purpose of being activated by performers at key moments during *Rise*. Still working with the notion of the reflecting pool, as in *Wake*, I created waterbody forms, only smaller and more modular, in adaptation to local constraints (Figure 2). In addition, I also sculpted a webbed tangle of reservoirs resembling gas cans and interconnected piping to hang from the ceiling of the performance space, suspended above pools of water (Figure 3). These would make the event of rising sea level physically possible in the theater, as they held pollution-colored water and would release it via solenoid valves at the times designated by me via code and electronics. The hall we were to use also held a 32 foot long video wall, which made live video feed during the performance possible. I was keen on this inclusion because climate change is a live action phenomenon we watch over time via both real-time footage and documentary, therefore it was important to me to allude to this mediated nature of experience. Climate change is perhaps less hyperreal, in the sense

delineated by Timothy Morten, than it is surreal. It is the surreality of a slow-motion disaster unfolding all around us, that sets our contemporary, global-scale crisis apart and what I hoped to highlight.

The finished work took place in May, 2019 (Figure 4). It was performed by a five-piece ensemble: Ilana Waniuk (violin), Juliana Gaona-Villamizar (oboe), David Aguila (trumpet), Paul Roth (alto sax), and Kathryn Schulmeister (bass) (Figure 5). Via Peter's orchestration and my physical computations, we took the audience through a narrative beginning with a healthy ocean through to one which was unlivable and unbearably silent.

During the performance, the ensemble harmonized with the marine life recordings, and all panned the space via surround sound and activated the reflecting pools via subwoofers. The lively, aqua pools of water were inexorably transformed by my infrastructural sculptures depositing brown, black, and acid yellow water. Peter's composition of mesmerizing marine calls soon shifted to sounds of transport ships and underwater machinations. As promised, all was initiated by the musicians: from initially triggering the touch sensor that began the water's relentless rise, to harmonizing with the sea creatures and later, mechanical rhythms. The human role in both the production and lament of the problem was ever-present. Ultimately all ended in still, black water and silence; I'm not sure I've ever felt a hush so loud.

Amidst the development of *Rise*, the IPCC released *Ocean and Cryosphere in a Changing Climate Special Report*. This non-nationalistic scientific team found that global mean sea level is conclusively rising, with acceleration in recent decades due to increasing rates of ice loss from the Greenland and Antarctic ice sheets, as well as continued glacier mass loss and ocean thermal expansion. Findings included probable increases in tropical cyclone winds and rainfall, extreme wave events, and relative sea level rise. Projections showed globally shifting shorelines on all continents, potentially drastically so, by 2050. While back in Oklahoma there was still much work needed to be done in order to shift the communal conversation regarding global warming towards it being fact, not speculation; this was certainly not so in fire-ravaged California. Here the facts were already visually manifest, wildfires having burnt all doubt to ashes. That fall over a quarter million acres burned locally in California alone. Simultaneously on the

global stage, Greta Thunberg had become prominent in public discourse. The consensus on campus was that climate change was no longer our future but already our present. Outwardly, my impetus to generate work took on a new urgency, even as internally I felt a new confusion about the role of art and activism work in making headway on environmental issues.

What followed was a blur. *The Promise of Progress* [2019], and *Projected Horizons* [2019] immediately came out of *Rise* [2019] within the following month. *The Promise of Progress* was my third artwork utilizing the reflection pool as symbolic means by which to create space for communal reflection on human agency. I once again engaged the use of a webbed tangle of reservoirs resembling gas cans and interconnected piping, reprising some of the infrastructural sculptures from *Rise*, but in a new formation (Figure 6). What resulted was a gallery installation that unfolded dynamically across the duration of exposure to the public (Figure 7). *The Promise of Progress* was nonetheless a marked shift and narrowing of scope from that of *Rise*, discussing the linearity in human production, consumption, and pollution. We consume, digest and throw away; and yet because there is no “away” on our circular planet, the waste sits with us until we are literally swimming with our trash. Our oceans full of micro (and macro) plastics. In *The Promise of Progress*, initial clear, reflective waters were soon disrupted by incremental pollution streams blackening the gazing pool’s waters. It is a one-way system, and asserts that the very framework of capitalistic consumption and its associated persistent and unwavering adherence to linearity underpins our current environmental crisis via byproduct accumulation. I felt an increasing sense of exigency as the slowly darkening, thickening waters rose over the course of exhibition, and the infrastructural feeder systems ran dry, their desiccated plastic husks ever remaining (Figure 8). Global systems are complex and our future seems even more opaque. I eschewed reductive narrative and offered no answers, only the act of questioning via the slowly unfolding installation.

The installation *Projected Horizons* subsequently followed *The Promise of Progress*. Drs. John Hildebrand and Joshua Jones, with the Whale Acoustics Lab, Scripps Institution of Oceanography, generously offered access to a large archive of video footage from their arctic explorations after seeing *Rise*, and from this archive I created *Projected Horizons* (Figure 9). It was a landscape-sized immersive video

installation that transported viewers to the arctic circle to witness footage of glaciers in decline, providing a lived experience without the deleterious effects of ecotourism. For this work I once again collaborated with a composer, a fellow student by the name of Felipe Rossi, who devised the full score from screenings of my completed multi-screen video. Drawing again from methods developed in *Rise, Projected Horizons* also employed video monitors in the installation to create a sense of the spectacle of climate change. I hoped to convey a notion of us watching ourselves watching, and did so by focusing on segments of footage that revealed researchers in the process of surveilling the landscape by binocular and of a polar bear gazing back (Figure 10). Furthermore, it was important to me here to implicate the individual in *Projected Horizons*. The footage I selected highlighted moments of human intrusion, with even the research vessel itself not exempt from its impact toward the planetary problem under my directorial gaze. We are not held separate from the problem by focusing our attention on it and I attempt no moral high ground over my audience. To greater or lesser degree, we are all in this together. All are involved, therefore all are implicated.

Following *The Promise of Progress*, I redirected my attention inland to focus on the latent fires and deforestation. Biodiversity loss and subsequent potential ecosystem collapse was now my chief concern. As a result of cumulative anthropogenic activity, global mass extinction is currently in progress; the sixth extinction. My nascent research at Geisel began to coalesce into project *Sun Eaters* (Figure 11). I wanted to create an artwork that could call attention to the more-than-human world around us, and to help us as people to form empathy for other life forms beyond our own species, particularly the plants all around us that we pass by everyday. Plant blindness is the name for this form of cognitive bias, the common tendency to overlook plants and to treat them solely as a beautiful backdrop in front of which human action takes place. Yet plants, trees in particular, sequester atmospheric carbon. Trees are vital to the health of our future and warrant our increased attention.

Sun Eaters is a series of sculptures that sense the invisible bioelectric waves present in all living beings and translate it into visible light for us to see. For much the same reasons that some stop signs and warning notices are outfitted with blinking LEDs, *Sun Eaters* illuminates these trees with the same: to to

arrest your attention within our over-saturated world. I view this series as along the lines of artwork as tool. It is easier to understand something if we can seed it. Taken in this way, *Sun Eaters* are visual aids for seeing the common pulse that runs between us and other species, albeit visually dissimilar. I'd like that cloud of these translational sculptures can encourage a moment of reflection regarding our complex, interwoven, beyond-human ecologies of present-day Earth in that they can provide an empirical interface for grasping ecological processes.

Concurrent to the development of *Sun Eaters*, I also began going on numerous walks and attempting to record the abundance of life that I found. *Against our Better Nature*, is the name of this ongoing project, the title referencing our collective actions taken against our own future interest, as we ourselves are part of the global ecology we refer to as "nature." The impetus for these recording sessions in the field arise from an urgently felt need to record some of the richness of life's diversity before it is too late. I began locally in the chaparral and temperate coniferous forests of southern California, and later via support of the Center for Iberian & Latin American Studies (CILAS) and the Institute of Arts and Humanities (IAH) I was able to conduct field research in biodiversity hotspots in the Panamanian canal zone tropical moist broadleaf forest (colloquially: rainforest), the Brazilian Cerrado and Mata Atlântica, and the Cove Forest and Mountain Bog biomes of the southern Appalachian Mountains. These areas are prominently biodiverse. They are so species rich that a great number of endemic species have not yet even been discovered, especially in the Panamanian canal zone. They are also threatened. Less than 30% of the natural vegetation remains in the Cerrado, nonetheless it is the most biodiverse savannah in existence. Additionally, over 85% of the original Mata Atlântica has already been deforested, and less than 10% of the precious Carolina Mountain Bog biomes still exist. These are places of irreplaceable biodiversity (literally millions of years would be needed for such species diversity to re-evolve) and yet the devastating losses continue. It's estimated that the general animal population around the world has fallen by 68% on average, and up to 94% in tropical regions. However, the situation is worse for plants, for which there is no estimate, and some species which are now going extinct, were never yet identified by the scientific community and broader public.

In the field I collected photographs, video, audio, seed specimens, field notes and sketches (Figure 12). By collecting seed specimens, I mean that I take careful light-controlled photographs of them, and then return them in situ to their rightful habitat. The seed specimens I have recorded vary greatly in size: from paper thin 1/64" diameter to enormous 18 3/8" long conglomerate seed pods. Back in my studio, I am able to develop exact digital replica models of the seeds via photogrammetry (Figure 13). I've chosen photogrammetry because it provides a means of collecting without harming the ecosystem. Real seed specimens are able to remain, take root, and cultivate the future forest, while harmlessly, only their identical 3D models travel on (Figure 14). Subsequently, I work with identification guidebooks and experts to identify the species and contextual information.

The pace of plant growth is markedly slow in comparison to human movement, and this lends toward the human impression of the plant world as consisting of a constant, reliable backdrop. Yet, everything is moving constantly and all that I observed was in flux. I'm grateful for the extended time dedicated to careful observation, and reminded of Heraclitus's truism that you can only step into the same river once. In the same way that it is difficult to focus attention for the length of time requisite to really witness a plant grow, climate crisis is similarly difficult to observe, and yet with both, the cumulative changes are unmistakable. July 2019, when I began this field work, was the hottest globally on record after several successive years of the same. July in Brazil is the dry season of winter and that year the landscape was unusually desiccated. In this region, the Cerrado and Mata Atlântica are commonly prone to small spontaneous winter wild fires and unfortunately human induced burn clearing as well, but the scale that year was astonishing. Standing at a mountain overlook in the Serra do Rola-Moça mountains a number of smoke columns were visible across the horizon and their number only increased as the weeks went by (Figure 15). Some seeds there have evolved tough walls that only allow germination via the natural, fast-sweeping fires. Nonetheless, the rise of frequent human-induced burns, has had a devastating affect. The Brazilian fires that summer were visible even from satellite, making international news. In astounding truth, parts of the Amazon have been on fire ever since, despite the eventual distraction of media focus.

Throughout this field research, the political writings of Karel Čapek (seemingly innocently on gardening) have stayed with me, particularly the following:

“The future is not in front of us, for it is here already in the shape of a germ (seed). ...What is not with us will not be, even in the future. We don’t see germs because they are under the earth; we don’t know the future because it is within us.”⁴³

The IPCC reports that one million species are at risk for extinction due to human-induced climate change, and even if all green house gas emitting activity were to stop tomorrow, we will see the compounding effect for many years to come. In this way, we have already planted seeds, and our future is already here.⁴⁴

With the growing archive of digital seed models, I have begun creating sculptures: printing them into physical objects and embedding motion-sensitive electronics inside that will enable them to murmur stories into our ears (Figure 16). If a seashell held to the ear presents to our imagination sounds of the ocean (though in fact amplifying the rushing circulation of our own lifeblood), then perhaps these seed sculptures and their sonic narratives, composed from field recordings and whispers, will amplify our hopes and fears about our planetary future to a level that we cannot ignore. For the future of our forests’ health is one with our own. Throughout this project I find I am also cultivating a growing hope that we will refocus our attention on the plant world, as trees are our best tools for carbon sequestration. We should see in them the possibility for enacting a brighter future than the one we are presently bringing into being.

My views are not one of an indictment on any one individual’s action, but rather a call for broad, systemic change. Together we must enact a better world to protect the most vulnerable among us. For even as we are aware that climate changes affects us all, its worst of its effects will be borne by the most

⁴³ Karel Čapek, politically charged science fiction writer, also coined the now one-hundred year old ubiquitous word robot in *R.U.R., Rossumovi Univerzální Roboti*. The above quote was taken from: Čapek, Karel. *The Gardener’s Year* Illustrated by Josef Čapek. London, Allen & Unwin, 1931.

⁴⁴ IPCC, 2018: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)]. In Press.

vulnerable populaces, particularly those residing in the Global South. This I have learned firsthand, throughout the project.

Against our Better Nature has been underway now for two years. I have conducted these walks and talked with researchers and interested individuals across North, Central, and South America, along the way I've collected hundreds of species specimens via photogrammetry models, and over the time the project has changed. What initially began as hesitant individual explorations of my own has grown into a collective inquiry taking form as a public archive and events. The *Against our Better Nature* project archive now has a digital home, *openseed.space* [2021] in which all the recorded seeds and photographs can be seen alongside their stories (Figure 17). These are stories that capture memories of a changing climate, landscape, and relationship between ourselves and the plants that inhabit the spaces we traverse (Figure 18). Each story and each seed is only a fragment, but altogether collective wisdom can emerge. It is an archive of stories that transcend national borders.

Through workshops, I will invite participants to go on a walk with me, to take a few hours to slow down their pace and gaze. While forest bathing, they are invited to learn to see seeds among the trees themselves and together with me to create digital records of them (Figure 19). Participants seed stories are added to the archive, meanwhile the real remains behind, the local ecosystem unharmed. Through *Openseed.*, I endeavor to create an explorative space for people to contribute to and learn about the real life importance of healthy ecosystems and the very real possibility of total ecosystem collapse here on our home planet through climate change. I am exploring the convictions that sometimes it is easier to understand large-scale problems via the collective aggregation of individual contributions.

This archive effort as artwork is in the spirit of the artistic precedent set forth by artist Tomás Saraceno's *Mapping Against Extinction* (2019), in which he "seeks to enroll a global community in the collective task of mapping spider/web diversity" for the purpose of "cultivating an interspecies attunement by facilitating art of noticing, and as users are invited to locate spider/webs within their own localities - whether anthropogenic or 'wild' and contribute documentation to the project's growing and dynamic

archive of our invertebrate kin.”⁴⁵ I also see the project as inspired by Richard Long, twentieth century land artist I’ve long admired. Long would say that “walking—as art—provided a simple way for [him] to explore relationships between time, distance, geography and measurement” and would record the event as different ephemera: a single photograph, map, or text work, for example. Ecological issues are far more pressing now in our time than in his and so I see this reflected in the differences between his gestures and the more urgent nature of the *Openseed* archive’s text and images, however I believe there is a direct line of inspiration for me that can be drawn between the two.

Engaging in the work of this project *Against our Better Nature*, traveling across the Americas, and grappling with ecosystem futures, has really brought home the importance to me of holding a perspective that encompasses the world rather than just its parts. It has lead to the creation of another installation work, *These Delicate Lines* (Figure 20). *These Delicate Lines* is intended to be the installation of a new flag in substitution for places presently flying nationalistic flags. This flag presents a warning image of a potential future for our world: one in which all the polar ice has melted. This iceless world is more likely than not if we continue on with business as usual.

We make maps because we have difficulty imagining the entirety of our fragile planet from our perspective on the surface. Pausing to consider our current world maps, we’ll realize that they are all from an extra-planetary view, gazing downward from outer space. However, what happens if we instead were to reimagine the view upward from the center of the earth? We’d see a view such as you have in *These Delicate Lines*. I ask viewers to reorient their gaze back inward, refocusing our attention on life right here, rather than searching the stars beyond our own. Together we direct our future, but to do so we first must imagine a framework, or worldview, that shapes our thoughts and decisions. It is for these reasons that I propose a new world map and a new flag. One that not only warns and reframes our worldview upward and outward from the center of the soil, the origins of our life, but one which also presents the world as it truly is: without borders. This past year, 2020, in which worldwide we faced the same challenge no matter

⁴⁵ Saraceno, Tomás. “@Studiomassaraceno.” *Instagram*, 22 Apr. 2021, www.instagram.com/p/CN-HxOor0fN.

who or where we were, can be the beginning of our seeing clearly, of seeing 20/20. Through climate change or its remediation, we will either all continue to suffer, or choose a different future.

I'm still investigating the meeting points and divergences of artistic and activist work with regards to developing sustainable planetary systems, and as usual, my questions are numerous. However, I have reached one conviction: that artistic thinking influences the public imagination and is a necessary part of a broadly collaborative, transdisciplinary approach to tackling that which lies ahead of us that also includes activism and teaching. Environmental discourse is often one framed by the sciences, by data, and by politics, but these are overly held to the idea of utility: nature as a resource for human evaluation/consumption; nature as seen through the human lenses of value. What we need, and have always needed, is imagination, in order to go beyond utility. The arts and humanities have always been a part of environmental movements, and they are a necessary part. 21st century problems are complex and thorny global and local issues, not solved with simple solutions. These problems are both bigger and more localized than any one discipline can address alone and therefore are best met in a transdisciplinary manner – transcending discipline. What is required is radical teamwork and holistic framing.

CONCLUSION

World building is self-building because we are a prosthetic species. In building our world across time, we shape our environment, and as we do so, we shape ourselves cognitively. In sum, first we fashion our tools and then our tools fashion our minds. Therefore, let's become more actively intentional in the process, more conscious of global interconnectedness, and more invested in the long-term. Not all forms of world-building are appropriate as we see abundantly today. It is quite possible for us to misshape our world and selves. However, with that very realization comes the converse, that we have the future capacity to change if for the better. Nothing is inevitable or beyond our generative capacities for change.

Pervasive denial, pastoral nostalgia, and inaction seem to indicate that we are in a crisis of imagination about how to effect change, and to this art plays an important role. Play is how we learn as children – rapidly trying out, thinking through, iterating, and practicing possibilities – rehearsing the world-building that we will do collectively together as adults, whether conscious of our individual roles in the collective process, or not. As artists, we hold a unique capacity in society: the opportunity to continue these imaginative processes throughout a lifetime. The field of art can offer relative freedom from productivity-oriented constraints and doesn't demand an economic return in the same manner as other fields. Art therefore has the capacity to radically disrupt the conventional thought-structures, patterns, and self-imposed limitations extant elsewhere in society.

Societies generate belief systems: modes of thinking and prescribed doings. The substrata of the Global North has developed a pervasive monoculture of ideas that is still widely acted upon. We are so enmeshed in it, we sometimes have difficulty even identifying the underlying structures that give rise to certain ways of behaving and doing things, though I am encouraged by a latent rising counter-awareness. Nonetheless, many still go about their days on auto-pilot, acting in ways we believe are just natural and correct, unaware of how they are born of a certain set of beliefs we have absorbed along the way. Even when stopping to consider, as many have during the worldwide lockdowns brought on by Sars-CoV-2, we are often unsure of what alternatives are possible. For example, we understand that the continual growth demanded by capitalism is at odds with the finite resources of our planet, but as Fredric Jameson and oth-

ers have oft repeated, it is easier to imagine an end to the world than an end to capitalism. Necessarily, we don't desire an end to the world, so we had better get busy imagining alternate ways of being with one another.

Clearly what we need now, more than ever, is the disruptive and generative capacities of art. Art is often rebelliously original and multi-phonic: offering a myriad of entry points to looking at the world in new ways, embracing difficult and even chaotic ideas, creating something out of nearly nothing, and improvising connections between disparate concepts between which there was formerly no clear connection. These are radically positive attributes worth cultivating in society. We speak of how art touches us, moves us deeply, and of our aesthetic response. Art has the capacity to linger, to stay with us, to shift us from defacto settler/colonial mono-thought structures the Global North is swimming in, and art can change our understanding of ourselves and re-inscribe the world. Thus shifted, action potentials and future outcomes are shifted. Societies are then able to creatively re-engage, re-make, and re-invent. They can find and design new forms of living and being together.

I believe our future world depends on it.

FIGURES



Figure 1: Composite image of *Wake*, site specific installation created in collaboration with artist Rena Detrixhe, 2018. Materials: water, light, sound, and motion-activated electronics.



Figure 2: Detail image of one of the three pools created for performance *RISE*, 2019.



Figure 3: Detail image of one of the three water-distributing sculptures created for performance *RISE*.



Figure 4: *RISE*, site specific performance created in collaboration with composer Peter Sloan, 2019. Materials: water, pigment, sound, and touch-initiated electronics.

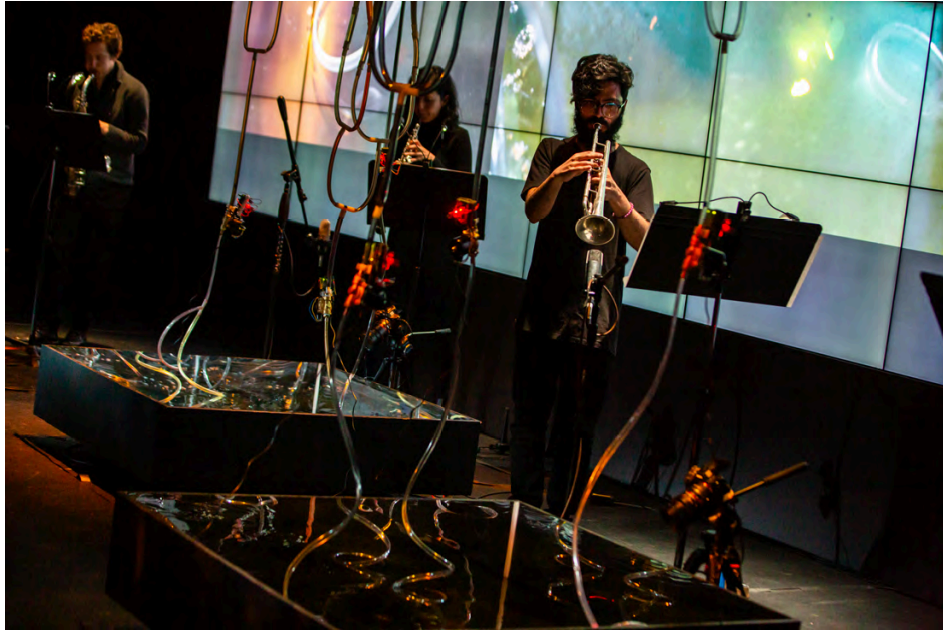


Figure 5: *RISE*'s five-piece ensemble performing: Ilana Waniuk (violin), Juliana Gaona-Villamizar (oboe), David Aguila (trumpet), Paul Roth (alto sax), and Kathryn Schulmeister (bass).

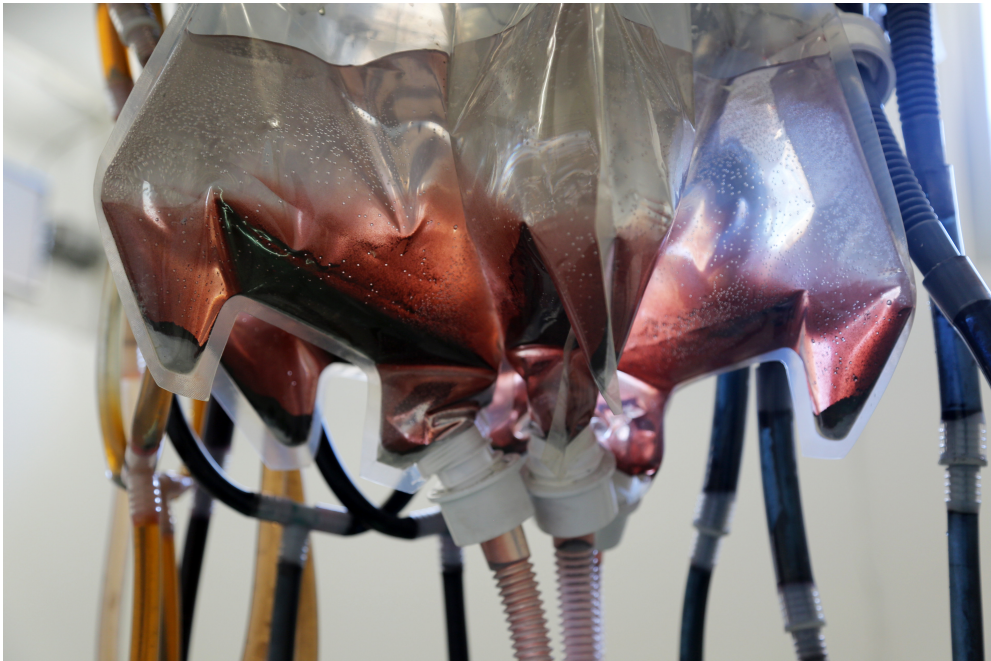


Figure 6: Detail image of the water-distributing system in *The Promise of Progress*.

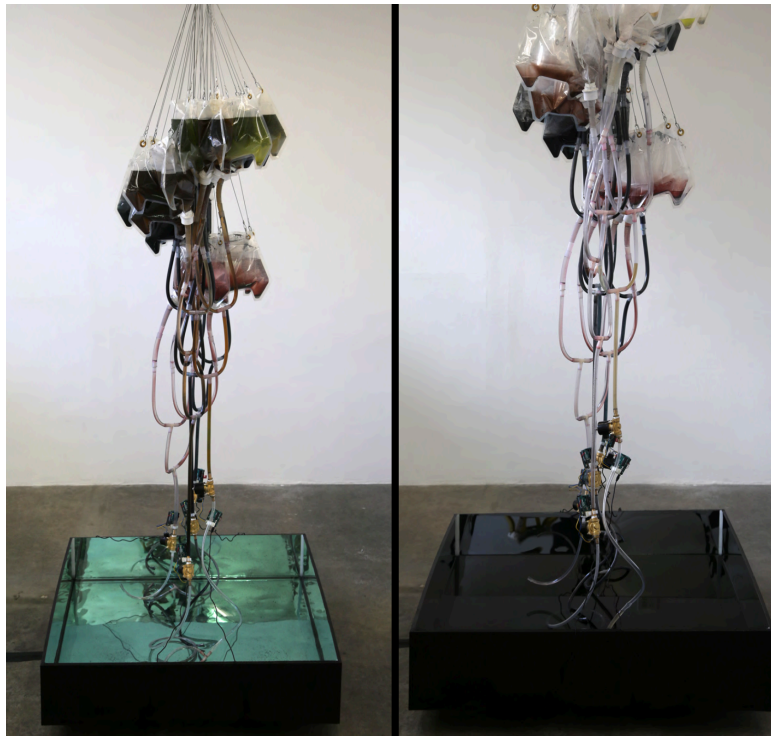


Figure 7: Images of *The Promise of Progress* at the beginning of exhibition (left) and the end (right).
2019. Materials: water, pigment, sound, and touch-activated electronics.

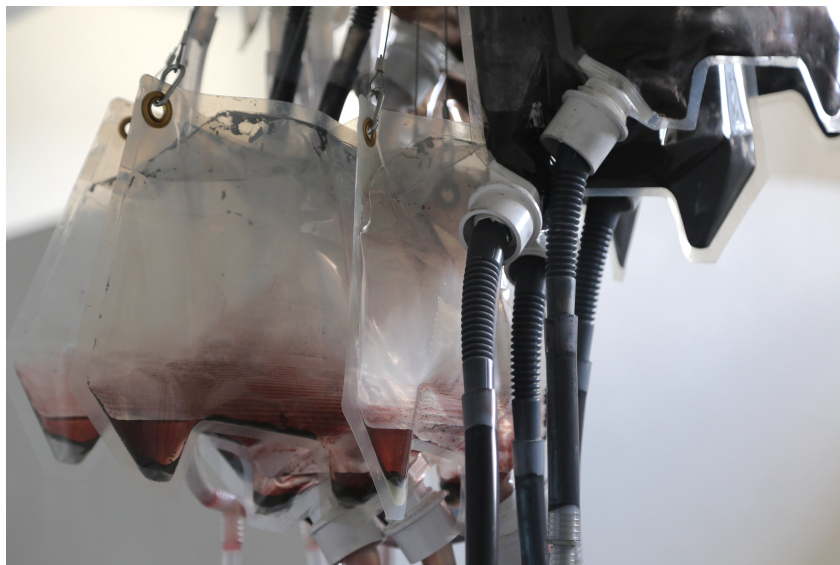


Figure 8: Detail image of the lines of evaporation within the *The Promise of Progress* apparatus.

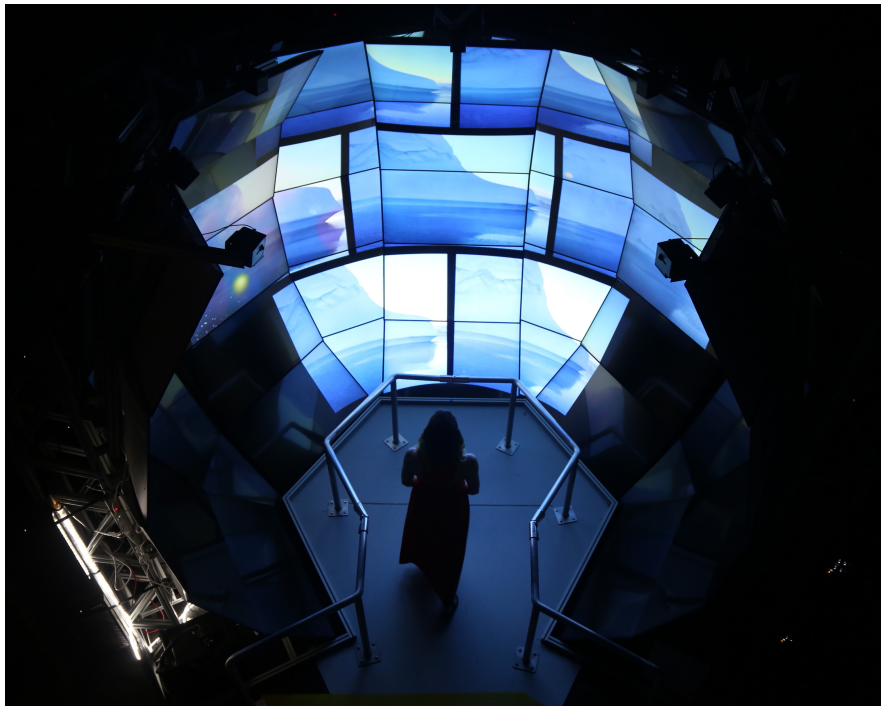


Figure 9: *Projected Horizons*, site-specific video in collaboration with composer Felipe Rossi, 2019.



Figure 10: Still image from *Projected Horizons*, 2019.



Figure 11: *SunEaters*, bioelectrically-activated light sculpture, 2020. Materials: Solar panels, LED Light, ECG sensor, and other custom electronics.



Figure 12: Detail image of one of the illuminated spheres in *SunEaters*, bioelectrically-activated light sculpture, 2020. Materials: Solar panels, LED Light, ECG sensor, and other custom electronics.



Figure 13: Composite image of field research recordings in ongoing project *Against our Better Nature*, 2019-_.



Figure 14: Photograph (left) and digital photogrammetric model (right) of the fruit of *Eriobotrya japonica*, aka ameixa-amarela as part of ongoing project *Against our Better Nature*, 2019-_.



Figure 15: Photograph of brushfire in the Serra do Rola-Moça mountains of Brazil as part of ongoing project *Against our Better Nature*, 2019-__.



Figure 16: *The Future Within*, motion-activated sound sculpture as part of ongoing project *Against our Better Nature*, 2019-__.

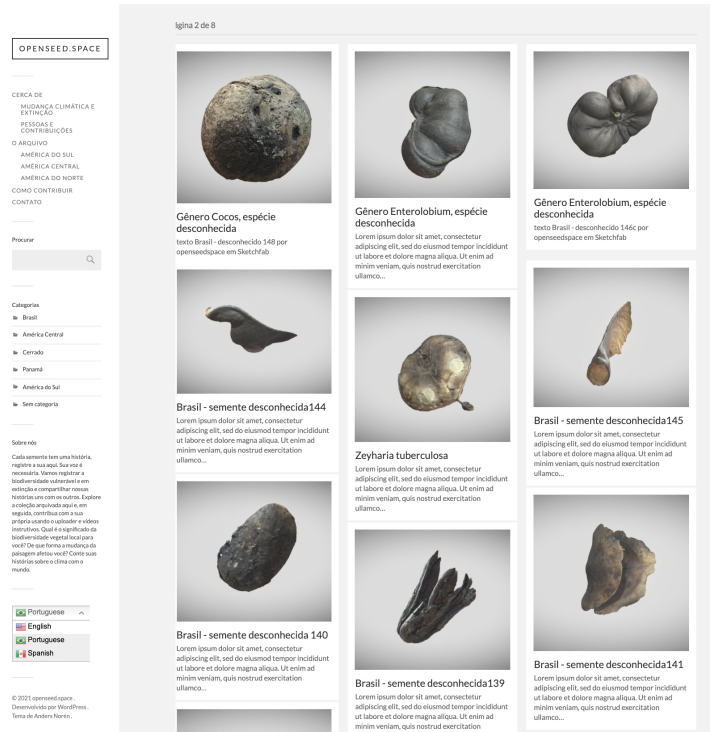


Figure 17: *www.openseed.space*, collective archive for climate stories centered around changing ecosystems and extinction, 2021-__.

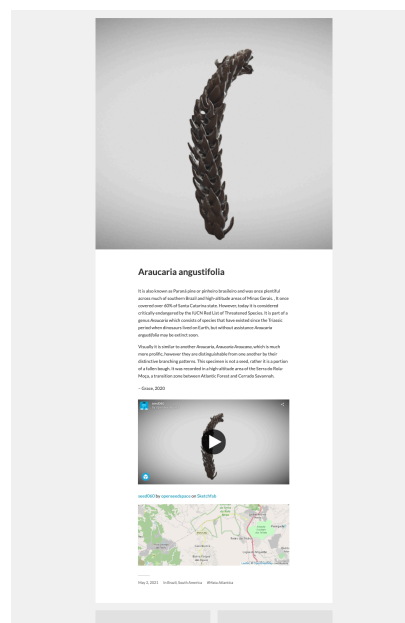


Figure 18: page view detail image of *www.openseed.space*, collective archive for climate stories centered around changing ecosystems and extinction, 2021-__.

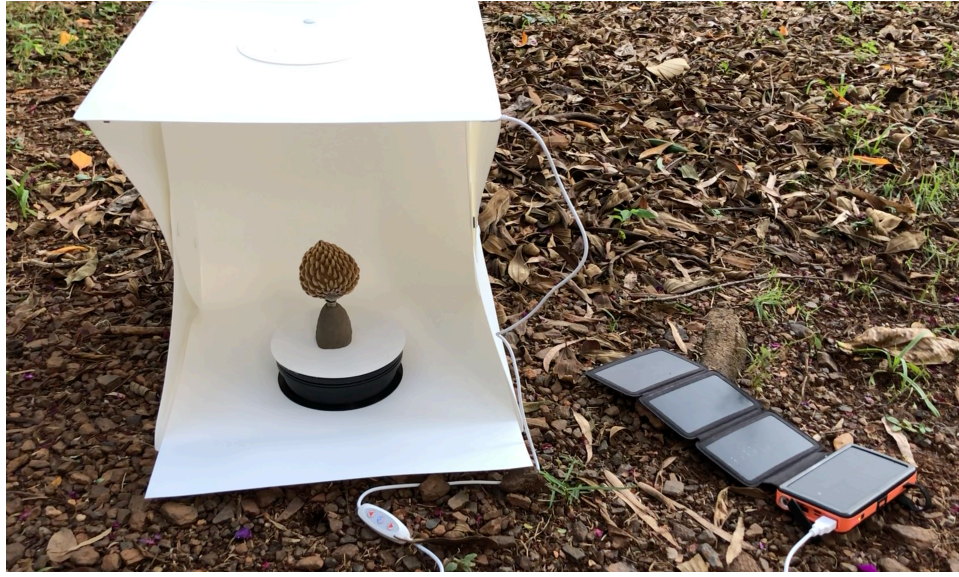


Figure 19: Documentation image from *Every Seed, A Story*, workshop series teaching 3D modeling basics and inviting participants to contribute their stories to www.openseed.space, 2021-__.



Figure 20: *These Delicate Lines (that divide us)*, 2020. Materials: custom flag.

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