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NASA's Big Picture: Losing Sight of Knowing

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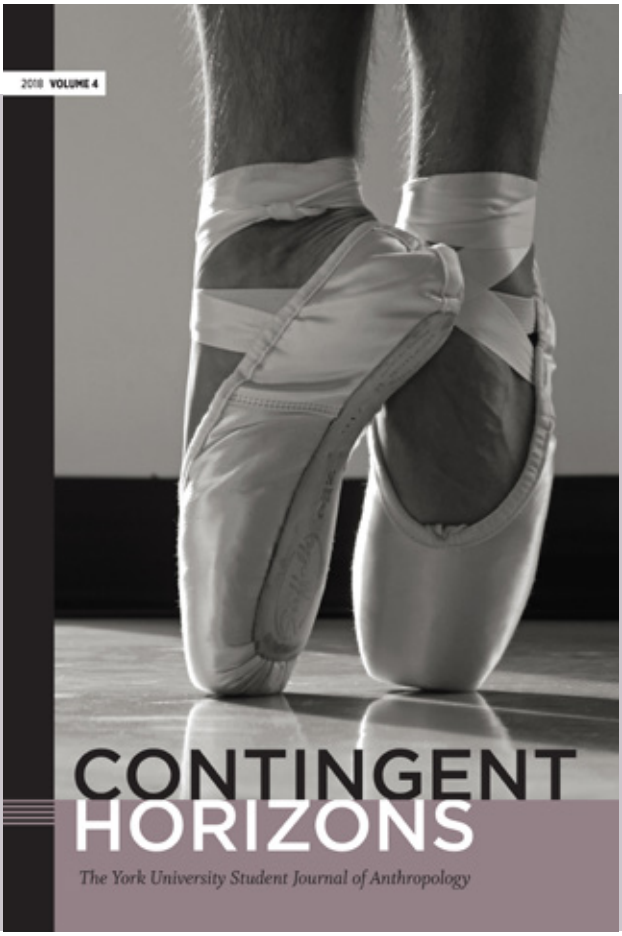

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NASA's Big Picture
Losing Sight of Knowing

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This article illustrates the ways in which NASA's stunning, extra-planetary visualizations of global climate change data create a way of knowing that separates us from climate change as a phenomenon and renders us visually impaired to its effects globally, regionally and locally. I show that while we are surrounded by an ever-growing arsenal of visual representations about how our climate is changing, these representations provide a barrier to knowing the realties unfolding on the ground, in communities around the globe. Leveraging Donna Haraway's (1988) concept of situated knowledge, with multiple ethnographic data points regrading climate change visualization practices and ethnographic accounts of climate change realities, my analysis illustrates just how little we come to know as we are bombarded with evermore visual data.

KEY WORDS Climate change, situated knowledges, visualization, representation

NASA: the purveyor of big pictures

The latest in computer and visualization technology has made it possible for the National Aeronautics and Space Administration (NASA) to expose satellite imagery of Earth's climate in animated full colour simulations (Gray 2017), giving our eyes a front-row seat as we feast on high-resolution, YouTube sized, edutainment chunks, easily digestible by our short attention spans and harried consumption tendencies. These globally spatial and temporally situated, compartmentalized, outer space views, showcasing the geo-spatial magnitude of Earth's changing climate, are a sight to behold. We are primed to accept what NASA and other entities parade in front of us as the universal truths about the state of our planet's climate and the enormity of the changes it is undergoing (Wielicki 2012).

How does NASA's full frontal visual approach prevent us from experiencing the situation on the ground through our non-visual sensorium, and the ways in which human lives are affected as a result of climate change? We are surrounded by vast arrays of imagery culminating in chart upon graph upon illustration rendering climate data from the past, present, and future, through various mechanisms, measuring techniques and models, intended to serve up universal, objective truths about the state of our planet (NOAA n.d., IPCC n.d.). Yet, what do we really know about the changes that are occurring, the significance of the changes, and the magnitude of their impacts on our planetary home?

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This paper will explore the ways in which NASA's stunning, extra-planetary visualizations of global climate change data create a way of knowing that disconnects us from climate change impacts; blocking our view and impairing our ability to understand how these changes are being manifest in a human context—globally, regionally, and locally. I will focus on NASA's extraterrestrial time lapse imagery which directs one's attention to changes in the Arctic sea ice from 1984 to 2016 (Gray 2017). While this mega-representation of climate change data exudes notions of objectivity and universal truth coveted in Western science practice (Haraway 1988, 582), it comes at a cost. Such representations from the seat of the stratosphere hide the micro and desensitize us to the ways in which place, human, and sentient beings are transmuted as the Arctic sea ice evaporates. There is no denying that such artistic representations of global climate change data play a role in the development of knowledge and building of awareness. They do, however, represent only one element of a multi-layered, complex, evolving story that is unfolding in and out of the view of NASA's ever watchful satellite eyes and computer simulations.

Climate data and climate change data

The creation and collection of climate data had humble beginnings in the nineteenth-century with the sporadic, voluntary, and manual recording of local weather conditions at various measuring stations around the globe (Edwards 2010, 4). According to Paul N. Edwards (2010), climate is understood as the history of weather over long periods of time (xiv) and knowing about climate's past can help us construct knowledge and understanding about the present and predict what may happen in the future (xvii).

It wasn't until the late 1940's that the digitization of climate and weather data became possible, as computer technology gained the technological means required for the large body of collected data (Edwards 2010, 14). During the 1970's, three-dimensional climate modelling techniques were developed and deployed by climatologists, establishing a new era for the formal and conscious collection of data to record and monitor the Earth's climate (Edwards 2010, 14). From the 1980's, climatologists and meteorologist embraced the abilities of computer modelling techniques to capture, track, and display climate and weather-related information in a truly global context, due to concerns about global warming (Edwards 2010, 15). This global climate measuring system now includes a complex array of surface based, ocean, and atmospheric measuring instruments which take hundreds of thousands of daily readings (Edwards 2010, 4). By all accounts, I suggest the collection of climate data is akin to Helen Verran's (2002) notion of a grand scale accumulation project (751), in which the counting and measuring of variables is undertaken to achieve the holy grail of cause-and-effect generalizations (755), neatly packaged into models, charts, and simulations suitable for subsequent display.

There are, of course, limitations to data gathering and management projects that are both local and global in scale. Edwards (2010) theorizes that we are in fact "stuck with" the weather and climate data accumulated to date, not only in its form, but also with the sources from which it came (15). Further, I would argue, we are constrained by the ways we visualize, interpret, and come to understand this quantitative, painstakingly collected, data set. These limitations make it difficult for us, lay people and scientist alike, to see beyond the numbers, to see the actualities of the pasts, presents, and possible futures tied

up in these sanitized generalizations. When one examines the charts and graphs published by organizations such as the Intergovernmental Panel on Climate Control (IPCC n.d.), the quantitative bias of the data is clear: the stories told focus on the discrete, measurable elements of the scientifically desirable single properties, similar to how Verran (2002) describes forms of scientific generalization that exist in epistemic tension with Aboriginal knowledge on firing practices in Australia (748–750). Climate scientists presenting climate change data embrace a similar, single property approach, as can be witnessed in Bromwich's 2013 TED talk. Data are painted onto graphs and charts reminiscent of those that economists and business leaders deploy to convey data about the health of trade, labour, and gross domestic product. As these numbers are dished out during analyst calls, press briefings, institutional reports, and discussed across media outlets, the story is the number: how it may have changed since the last report; what policies and indices require tweaking to bring the numbers back in line; whose numbers speak truth and whose do not.

Such representations of data give visibility and voice to distinct quantitative and macro depictions of the global climate system and climate change. NASA's satellite data is collected from somewhere above the planet and its resulting images are rendered from an extraterrestrial vantage point. Donna Haraway's (1988) notion of unlocatable knowledge claims—claims that cannot be called into question (583) and are prominently on display—suggests this view from above is disembodied knowing. Climate and climate change become individual and distinct objects in their own right; objects to be dominated and clinically separated from other objects that scientists track and measure; objects over whose data we can obsess. Current obsessions with climate change data are directed towards determining just how much warming the planet is undergoing and how to stay beneath a two-degree Celsius increase in average global temperature (MacMillan 2016). This is the climate change story retold by scientists, journalists, politicians, and corporate leaders, interpreted and manipulated to account for their own singular interests and leaving space for both advocate and denier to find their respective truths amidst such disembodied portrayals.

What remains hidden from view are the stories and experiences taking place on and near the ground, not just human stories and experiences, but also those of the other than human, or what Zoe Todd refers to as "more than human" (2016, 45), everything that is not defined as human. Embracing the "more than human" (45), I propose, re-integrates climate back into the patchwork of earthly vitality and helps bring to life the symbiotic, rhizomic quality of the locally situated ways in which both humans and the "more than human" (45), are being transfigured together and in unison with the changes taking place in the planet's climate.

And so it is with the pulsing imagery of NASA's simulation, the ebb and flow of Arctic sea ice swirls around the North Pole, a digitally rendered collection of facts on display from somewhere out in space. Nowhere in sight are the inter-connected knowledges and understandings that tell us what is happening on the ground at this globally significant geographic marker on top of the Earth, or how such happenings connect to other happenings at other places on the planet. Verran submits that Western scientists' ways of knowing isolate human acts from the land (2002, 739), and in a similar vein NASA's pulsing Arctic sea ice, a disappearing ice mass that has traditionally served as land, severs human, as well as "more than human" (Todd 2016, 45), acts and ways of being from the land. When

consuming NASA's time lapse imagery of melting arctic ice, I am lulled into a false sense of awareness and objectivity—I observe the shrinking ice as time progresses and believe that I am aware of the full extent of what is going on at the North Pole. NASA is watching over the proceedings, somebody is in control.

Situated experiences and ways of knowing

Susan A. Crate (2011) alerts us to the challenges of a global view and its impacts on locally situated ways of knowing (176). Specifically, Crate indicates that the generalizations required to implement globally measured, tracked, and communicated phenomena detract from the complex and unique local involvements of both the human and other than human (176). Further, she maintains that the quantitative bias of current climate change data, its analysis and representation, conceal accompanying sociocultural implications at the local level (176), such as how communities live with and use the land they inhabit (178). This is a point clearly demonstrated by the quantitative data depictions from NASA's satellite view, and further supported by Verran (2002) who insists that generalization oriented towards "clean and accountable cause-and-effect knowledge" (755) makes invisible other modes of generalizing that maintain the temporal and contextual qualities entangled with the "how" (756).

While many social media sites are brimming with dramatic, even romantic, images of polar bears with their cubs, replete with warnings about the loss of sea ice and the looming decimation of wildlife populations—as in the example from the Discover Magazine blog (Yulsman 2017)—NASA's pulsing Arctic sea ice model decouples any notion of consequence. This is true not just for wildlife and flora, but also for the Indigenous communities who call the Arctic Circle home. These communities, like the polar bear, rely on the sea ice for their sustenance and ways of life, and those, too, are at risk; their land isn't changing, it is evaporating. The ebbing and flowing of sea ice changes put forth in NASA's imagery do not present the viewer with the equally important and vastly more complex facts of local challenges resulting from vanishing permafrost and ice due to a warming climate. The phenomenon of drunken trees (Gore 2006), which are losing their footing as the thawing ground heaves, or the precarious future of whaling villages like Kivalina, on the brink of sinking into the Arctic Ocean (Callison 2014, 41) as the permafrost they are built on melts away, are two such challenges.

It is all too easy to dismiss the changes in Arctic sea ice as happening 'down there,' distant, behind the glass of the computer screen, contained in YouTube frames, as the observer takes their place in the stratosphere, a position with a view, certainly, but what exactly does one see? Since recordings began, weather related data has had both nation-state and global value in the name of improving nation-state systems and facilities (Edwards 2010, 13); having first naval, then national security, and commercial applications (41). NASA's images, however, take climate data representations, and our coming to know about climate change, beyond the global to the cosmic.

Haraway (1988) argues that celestially orbiting satellites are "visualizing technologies" (581), serving up disembodied objectivity from their "conquering gaze from nowhere" (581). As a public, we consume NASA's imagery through the visualizing technologies of our digital devices, creating further separation between what we come to know and the

actual situated experiences of those living with and on the Arctic ice. Our eyes are captivated in and by layers of visualizing technologies, intensifying Haraway's (1988) claim of disembodied ways of seeing and knowing (581). NASA's satellites move us beyond the macro to the mega, and we lose sight of the details that attest to the situated experiences of the "more than human" (Todd 2016, 45) and humans alike, as they collide with a changing climate.

Edwards (2010) suggests that the idea of a global climate requires long-term thinking, in the frame of one hundred-year cycles or longer, for us to meaningfully compare past climate attributes with what we now perceive to be a warming climate (4). He further conceives that nobody lives in a global climate and that humans are unable to detect the changes to average temperature trends over time (4). Quantitative climate data and its current expressions in satellite imagery, charts, and graphs, then, become the pre-requisite tools through which we perceive and come to know the fluctuations and gradations of Earth's climate system (4), and the resulting impacts on the planet's environment. While this sounds like a reasonable hypothesis, is it in fact a universal truth or is this, as Haraway (1988) posits, just another powerplay in the game of objective knowledge (577)?

Living in a global climate

In her ethnography on climate change, Candis Callison (2014) suggests that "how one comes to talk about the environment is based on how one comes to know it" (46). In the comforts of our Western, capitalist, neoliberal world, we have learned to refer to our environment as a container for resources to fuel our convenience-oriented lifestyles, evidenced in the PBS documentary *Global Warming: The Signs and the Science* (2012). The environment is reduced to supplying our never-ending demand for more and is something to be explained and controlled through the lenses of scientific practice, political maneuvering, and corporate profit. We have severed ourselves from our environment and climate (Callison 2014, 53), no longer a part of them, and we have become inept at perceiving these differences, as Edwards (2010) suggests.

Western capitalist lifestyles are no longer sustenance based, our food comes from the store and our sensitivity to changes in climate presents itself as power surges when the demand for air conditioning increases, when environmental allergies set in, and when structural vulnerabilities are exposed in the wake of natural disasters (PBS 2012; Gore 2006). Callison (2014) determines that rapid urbanization and industrialized specialization have resulted in a disconnect from the outdoors (53). In such living spaces, our bodies lose their perceptive abilities (Gore 2006), we rely instead on 'the app for that', to tell us how to dress, prepare and medicate for outside conditions, a place that is becoming all too alien for us to make sense of without technological aides.

In the Arctic, Inuit peoples, through their sensibilities and oral histories, have perceived and continue to perceive changes in landscapes, weather patterns, flora and wildlife, long before climate change was a mainstream conversation (Callison 2014, 53). Over the past several decades Inuit elders have observed and taken note of changes to the frequency and intensity of storms, sea ice changes, and the erosion of permafrost (Callison 2014, 53). While NASA's satellite view documents the changes to sea ice, what escapes from this view is the disappearing permafrost, lichen, and caribou, and the new arrival of moose, moss,

and black spruce trees that are making their mark in the Arctic circle (Callison 2014, 53); impacting communities dotted through the polar region (Callison 2014, 51).

According to Sheila Watt-Cloutier (2015), the Inuit people perceive their world interrelationally (7), where everything is connected, and everything counts (6). The reciprocal relationship between sentient being, land, and water uniquely attune those living in the Arctic Circle to sense changes in their surroundings (Callison 2014, 54). For Callison (2014), the ability to observe the impacts of a changing climate on the frozen land and ice mass, requires people to have a firm understanding of their outside world and have an "ecosystem mind-set" (53). It would appear then, that the Inuit people are located firmly in the global climate and are quite adept at perceiving changes to it at the local level.

Seeing, sensing, knowing

NASA's animated simulation, while technologically sophisticated, factually accurate and artistically appealing, is anemic in its knowing and portrays a singular data point: diminishing sea ice over time. Its only connection is to a geographic location on top of the world. It looks, but it is unable to see and comprehend the changes happening on the ground. As consumers of the simulation, we are not merely separated from land; we are separated from the entire planet, looking down upon it. The NASA images do not make accessible the stories about what else is happening in conjunction with the retreating ice cap. Exalted to the cosmos, the viewer is so detached from the planet, none of this is knowable, perceivable, or visible through the lens of cosmically positioned satellites and their computer-generated simulations. However, climate and its changes are not just visual experiences. What is not knowable from NASA's disappearing Arctic sea ice act are the sounds, smells, tastes, and textures of the shrinking ice, and its connections to and extensions of other interrelated networks, social, natural, and otherwise—those elements that are not measurable via currently available instruments, or easily represented through satellite imagery, or by the coveted charts and graphs we bear witness to when climate change data is being presented.

As consumers of NASA's representation of the changing Arctic sea ice we do not come to know the ways in which communities, experiencing changing climates, attempt to adapt. Crate (2011) argues communities affected by global climate change struggle to stay on their homelands and maintain the "cultural orientations and symbolic frameworks" they draw upon as they adapt (179). For the Inuit, the warming of the global climate is causing their homelands to literally evaporate. Not only is land disappearing, lives are also being lost as hunting grounds melt and their interconnected, sustenance-oriented way of life is threatened (Callison 2014, 54). Inuit hunters have relied on their knowledge of sea ice to survive and thrive as they work to provide for their families (Callison 2014, 54). A rapidly thinning sea ice makes the hunt for food even more treacherous, resulting in deadly accidents (Watt-Cloutier 2015, 7). Verran (2002) posits the social is not distinct from the natural, there is no separation of "people and place" (735). And in the ways that Aboriginal stocks of knowledge regarding Australian firing practices are embedded in the everyday (Myers 2017), so too are the hunting practices of the Inuit; practices which are contingent upon the existence of sea ice and permafrost. In addition to feeding communities, these practices give relevance and significance to what and how the Inuit come to know (Callison 2014, 49).

Watt-Cloutier (2015) states that the historical permanence of the sea ice, the land of the Inuit, forms an integral part not just of her culture, but the physical and economic well-being of her people (7). Hunting practices are embedded in the ways Inuit depend on their collective memories to guide them through life and understand their place within it (Callison 2014, 49), as a result, Watt-Cloutier (quoted in Callison 2014, 49) suggests the high suicide rates in Inuit communities and climate change are inextricably connected. Coming to know, then, is a full inner and outer body experience, connected through and to environments, climates, histories, places and all sentient beings.

Closing thoughts

I have traced the ways in which Western science practice, with its colonial roots and disembodied approach to knowledge creation (Myers 2014, 2), lacks the sensibilities through which to experience and know in the way embodied knowledge practices do. Western science knowledge practices are oriented towards ordering (Verran 2002, 752), the single property, the visual, creating separation between subject and object. With NASA's animation, this rift takes on a new dimension as the knowing subject takes its place in outer space and the cosmos becomes the separator, forming a chasm potentially too large to close. As sites of situated knowledge (Haraway 1988, 583) and ways of knowing, bodies and places are, however, more than visual. They are multi- and opti-sensory (Myers 2014, 21), a transient collection of storied experiences, moving through and with space and time (Verran 2002, 731). But this way of knowing does not fit the pattern of the fixed, moment-in-time, disembodied, universal truth claims favoured by Western science. Rather, this way of knowing is messy, inter-related, and inter-connected (Verran 2002, 757), not reducible to variables for counting and measuring. This way of knowing defies the search for the constant; it forms a web, a network of experiences, stories, and sensibilities that do not lend themselves to the modeling and rendering of current approaches for representation and visualization.

With its animated 3D computer simulations, NASA bring us an 'at the glass' experience with Earth and climate securely located somewhere off in the distance, outside of the viewer's immediate purview, not something to really concern oneself with. One's detachment from the phenomenon is epic: I am no longer a mere human experiencing the ramifications of a changing climate, I am catapulted into the cosmos, looking down on planet Earth, witnessing its goings-on, cast as a disconnected and unbiased observer. As the knower, I assume the "god trick" position (Haraway 1988, 587), severed from the spectacle, not responsible, not accountable, not involved, no dirt on my hands, nothing to see here.

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