Constructing a Continent
Constructing a Continent
the Antarctic experience in context
By employing information design within the Antarctic context, we can encourage transdisciplinary dialogue about and access to the scientific, cultural, and political concepts that form our collective image, or construction, of a continent. This work explores the role of visualization in stimulating engagement with the most socially and geographically isolated continent on Earth. The often contradictory notions of popular imagination and the daily realities of life in Antarctica cultivate the cultural incognizance that persists today—one where published communications from the continent are strongly weighted toward scientific findings. I argue for a more pragmatic approach to polar knowledge dissemination—one that sees the value of contextualizing the Antarctic experience through the lens of human engagement. The urgency for this type of design is particularly acute for Antarctica, where the value of information design can be applied to rising socio-environmental concerns such as climate change and geopolitical conflict.

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participatory design
bridge objects
exploration
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Introduction

The Lost Continent, The Southern Continent, Terro Australis, The Ends of the Earth. For centuries the term “Antarctica” has evoked visions of an inaccessible, perilous, and lifeless terrain, suitable for only the most adventurous of souls. Though this romantic vision certainly contains elements of truth, it offers sharp contrast to the daily realities of human life in Antarctica today. These opposing notions of popular imagination and the everyday experience cultivate the cultural incognizance that persists today—one where published communications from the continent are strongly weighted toward scientific findings. These communications often have a narrow subject matter and an even narrower audience. Alternatively, interdisciplinary and experiential media offer the promise of a richer cultural consciousness and connection to the continent.

Appreciating Antarctica through new approaches has merits beyond the acquisition of personal knowledge and stimulation. The Antarctic Treaty—an international agreement (est. 1959) conserving the continent for cooperative science and peace and signed by more than 50 countries⁴—will be up for renegotiation in 2041. Opening up the continent for exploitation would have both dire environmental impacts and global cultural implications, reversing years of transnational cooperation and goodwill. One hope for my work is to promote Antarctic

dialogue through diverse means of engagement, inspiring curiosity and wonder along with a sense of latent, protective responsibility.

Humans have held a continuous presence in Antarctica since 1957. Following that “International Geophysical Year” which effectively ended Cold War-era global science divisions, total summer populations have remained larger than 4,000 people across more than 100 scientific research stations and camps. Meanwhile, about 30,000 tourists now visit the continent each year, 99% of which are sea-based journeys. Yet Antarctica still excludes more than seven billion people. How can the rest of the world meaningfully engage with the Antarctic experience from afar, in an inclusive and exploratory, rather than didactic, format? The following compendium addresses this pursuit.

The power of Antarctica and Antarctica-related media lies in the provocation and opportunity for wonder and curiosity inherently present in an extreme environment with such a brief history of human intervention. Antarctica was only sighted for the first time in 1818. No human even stepped onto the continent until 1895. In the intervening century, humans planted a flag at the South Pole and national science programs began to support a network of rich science collaboration. Like the International Space Station, Antarctic cooperation now transcends struggling international relations elsewhere on the planet. The individuals that make up this array of scientific support and temporary Antarctic citizenship are those whose experiences need connection and reception. Engaging with their experience through popular and social media is limited, however, by both technology (i.e., minimal internet connection) and official restrictions from national science programs.

So how do we both socially and culturally construct a continent? On a personal level, every time we hear the word “Antarctica” or “Antarctic,” we add these new contextual elements to our previous conceptual image of the continent. We slowly form a mental model of this space as a place—geography rife with opportunity, exploration, unique politics, challenges of survival, scientific discovery, and awe-inspiring scenery and life. Fleshing out these manifestations of Antarctica as place, while harnessing both visual and narrative strategies to do so, illuminates the importance of the human lens—as both creators and consumers—in our cultural construction of Antarctica.

Scientific discoveries and findings make up the primary formal knowledge generated and disseminated about Antarctica. Though the content is fascinating, dissemination—both in terms of media (how) and audience (to whom)—is severely limited by the proprietary model of academic journals and their analytical, scientific prose. One must pay a handsome fee to read a single article in Polar Record, for example, and the technical language may ward off any interested but non-scientific audience. This is because academic journals are aimed at an academic audience. We now have the opportunity, in a tech-advancing 21st century, to engage in a more pragmatic approach to Antarctic knowledge dissemination—one that sees the value of contextualizing the Antarctic experience through the lens of human engagement both on and off the continent.

This compendium seeks to test that idea, exploring Antarctic themes in the context of human experience and engagement. The thesis begins with two essays, preceding the compendium, that further detail the current Antarctic knowledge divide and the need for meaningful engagement through new communication modes. It then details the participatory engagement necessary for a robust understanding of what people are actually curious about—identifying and honing in on the missing bricks in our cultural construction of the continent. Finally, the compendium is conceived in five parts, proportional to the broader themes of people’s ‘curiosities’ and each presenting unique information

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3 COMNAP. Updated February 13, 2014. “Main Antarctic Facilities operated by National Antarctic Programs in the Antarctic Treaty Area (South of 60° latitude South).”

design projects and experiments. Each section briefly describes traditional knowledge dissemination on the theme, representative participant curiosities, and elaborates new engagement methods and ensuring design opportunities.

Visual literacy increases daily. On every continent there is need for design that challenges traditional knowledge models and encourages human engagement and transdisciplinary dialogue with relevant issues. Encouraging Antarctic wonder and curiosity on an individual scale will only incite broader cultural cognizance, keeping dialogue about the continent afloat amidst the current barrage of media. It is worth reiterating the value of new modes of Antarctic dialogue and engagement, particularly with data-driven design and storytelling, as the continent is increasingly impacted by man-made climate change and 2041 draws near.

This compendium has two ultimate aspirations: to promote public interest and curiosity about one of the most beautiful and vulnerable places on Earth; and, by exploring opportunities within the new genre of information design, to create energy and synergy in fields beyond the Antarctic context.
There is a deep chasm that resides in the domain of knowledge produced and disseminated about Antarctica. On one side, analytical, scientific knowledge resounds and, on the other, a more participative and pragmatic philosophy of knowledge resides. A pragmatist’s approach concerns the “practicalities of human involvement, the interaction of the senses, and the vitality of human engagement.”

I argue that we need both to understand the ‘big picture’ of Antarctic knowledge generation and dissemination. We must examine this divide, this varied range of epistemic opportunity, to promote curiosity and foster even an abstract sense of Antarctic stewardship for the billions who cannot experience it.

Fortunately for analytical types, academic literature abounds within polar research. National science foundations fund research and require, in part, that scientists share their discoveries and findings in scientific papers, in conference proceedings, and in meetings that inform government decision-makers. This knowledge, in the format of text and visuals, is read by many other scientists and their representative national science programs but is still highly constrained to disciplinary borders.

It is rare for Antarctic information to reach the lay public in a format that suits that audience. The trend of confining Antarctic knowledge...
to the scientific community perpetuates for three reasons: 1) Polar
research literature is primarily read by other polar researchers and is
quite expensive for the public to access; 2) this literature is written in
a technical language difficult to understand by non-scientists, and 3)
the stated requirement that (U.S.) scientists spend 5% of their research
grant money on “broader impacts,” which should help disseminate
their research to the public, is not enforced. Though the publication
of Antarctic discoveries in academic research journals is a key part of
formal knowledge-sharing and fundamental for the growth of Antarctic
science, there is little transparency in informing the lay public about
discoveries and knowledge generated. This information should be
communicated through diverse approaches that offer a varied audience
the opportunity for deeper understanding and an outlet to explore their
own questions.

Where the analytical philosophy of knowledge promotes formality,
hierarchy, and rule, a pragmatist approach engenders engagement,
community, and freedom. The latter is essential in creating inclusive,
meaningful engagement with the public regarding the unique Antarctic
experience. This engagement is precisely what is needed to “transform”
a system such as Antarctic knowledge.

Writing about scientific expeditions to Antarctica, Michael Schiffer
states that “bringing light to the everyday aspects of expeditions [shifts]
the spotlight from planners and leaders to all the men and women who
make up the expeditions, their work and leisure, what they wore, ate
and did.” People care about people. If we can humanize the Antarctic
experience through the context of how we live there, why we live
there, and the spirit of discovery, we might cross the dialectical bridge
between analytical and pragmatist approaches to knowledge. A sense
of Antarctic curiosity and stewardship can only be achieved through
this type of meaningful engagement.

ANTARCTIC KNOWLEDGE
DICHOTOMIES

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To achieve a more democratic culture of Antarctic knowledge generation and dissemination, where both generalist and specialist audiences can communicate and meaningfully engage with information, we must focus on experience within the pragmatist philosophy. As experience is the starting point for pragmatism, the term needs clarification so that we understand how we want to ‘contextualize the Antarctic experience.’

Many scholars agree that experience is an everyday “process of sense-making” that considers aesthetic and ethical values. McCarthy and Wright (2004) go on to explain that experience can be “seen as the irreducible totality of people acting, sensing, thinking, feeling, and making meaning in a setting, including their perception and sensation of their own actions.” Understanding and appreciating these meaningful engagements within the Antarctic context, while highlighting the reflexive nature of such engagements, is invaluable in constructing a holistic view of contemporary Antarctica.

Just as archaeologists can learn about the daily activities and architectural technologies of Antarctic expeditions of the past by examining documents pertaining to planning, cargo, inventory and visiting the sites, we can use similar formal tools as a lens through which to examine the relationship between people and Antarctica. What actions and technologies enabled what kinds of engagements?
and affordances within the polar environment? By investigating experiences in sensory, emotional, and intellectual terms, they can take us “on a journey through our values and thoughts” and those we ascribe to the setting.

Mikhail Bakhtin, a pragmatist philosopher, explained, “although experience always occurs in cultural, historical, and material contexts, meaningful engagement depends on the event or action being felt, known, and valued in unique ways.” Antarctic tourism operators may be some of the only parties with vested interest in closely examining this meaningful engagement. One of the expectations of the International Association of Antarctica Tour Operators is to “create a corps of ambassadors for the continued protection of Antarctica by offering the opportunity to experience the continent first hand.”

However, only ~30,000 people annually experience Antarctica firsthand—nearing, arguably, a sustainable limit. How can I, as an Information Designer, bring meaningful engagement and experiential opportunity to the billions that cannot experience the continent in person and engender the same sense of curiosity and stewardship?

These goals are at the forefront of my task in contextualizing the Antarctic experience.

**ANTARCTIC KNOWLEDGE GENERATION + DISSEMINATION**

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Who lives there? What does one eat in Antarctica? Is there any land under all that ice? Does Antarctica have a native people? Who does the continent belong to? These are the questions, among many more, that I come home to after my trips to Antarctica. I work as a Marine Science Technician on the US Antarctic Program vessels under the National Science Foundation’s (NSF) Office of Polar Programs, which means that I have spent three to five months annually on or around the continent over the past five years. I have worked with all kinds of scientists, NSF officials, graduate students, and support staff, each originally drawn to Antarctic work out of some persistent curiosity.

But now, like the colorful characters with whom I work, I have experienced Antarctica. When asked, I tell people how it looks, smells, and sounds; about adventures had and frost-bitten ears. But it is impossible to accurately communicate my firsthand experience. So how can I help people back home engage with the Antarctic experience in a meaningful way? What topics do they even care about?

In order to create Antarctic-related information design that would inspire meaningful engagement, I had to find out what people are curious about. I chose a participatory design, or bottom-up, approach, in which I involved my future audience—or information consumers—in the design process. The goal was to ensure that my design work
considered Antarctic topics of which people want to know more about and engage, without letting my own thoughts about what people should know interfere.

So I created a postcard-sized questionnaire that simply asked, “When you hear the word Antarctica, what are you most curious about?” Five numbered lines were listed underneath, along with optional lines below asking for the participant’s first name and occupation.

From May 2015 to March 2016, 250 people filled out the questionnaire. I approached people at airports, potlucks, classrooms, pubs, climbing gyms, and more, trying to collect curiosities from diverse participants. They ranged in age from five to 80, with careers all over the map—architects, retired navy, florists, psychotherapists, and space systems technicians, to name a few. In total, 1,114 curiosities were gathered.

I organized the curiosities by reading through the first 100 questionnaires and letting broader categories reveal themselves. Miraculously, all of the curiosities seemed to fall under six fairly obvious groups: people, plants and animals, what the environment is like, land and ice attributes, climate change, and geopolitics. Upon receiving the remaining 150 questionnaires, these categories remained robust, with all answers consistently and proportionately falling into one of these six groups. I examined the curiosities within each category, creating word trees and word clouds to pull out repeated language and topics.

Not surprisingly, the broad audience surveyed was most interested in people. This re-named “Who lives there + We live there?” category involved questions about continental access, demography, impacts of humans there, exploration, what people research, and, most of all (52% of this category), how people live and survive in Antarctica.
The next most abundant curiosities concerned biology on the continent, or “What lives there?” Twenty-one percent of participants were curious about penguins, extreme bacteria, life under the ice, moss and other plants, and if there are ants, among other questions. Remarkably, many were curious about polar bears, which do not live in the Southern Hemisphere.

“What is it like?” and “What is it?” were the next two most populated categories. Participants were curious about what the environment feels like across all human senses, if there are seasons, how cold and dry it is, how well one can see the stars, and the spectacle of glacial calving and aurora borealis. People were also curious about basic Antarctic facts: ice thickness, topography and elevation, if one can see actual land there, how big it is, and the age of the ice, among others. As these two categories comprise almost a third of all curiosities, it is clear that basic Antarctic knowledge instruction is lacking in our Western education system.

The final two categories revealed through this research were “climate change” and “geopolitics.” Participants were concerned about global warming and glacial melting, the fate of penguin colonies, and invasive plants and animals with warming temperatures. They were also concerned about who ‘owns’ Antarctica, whether there have been wars for territory, judicial systems, if people can claim resources there, why stations are positioned where they are, and, primarily, how it is governed (“who’s in charge?”).

Collecting these many curiosities from people of such diverse backgrounds, occupations, and age groups offered me valuable insight into where to focus my thesis. From the outset, my goal was to offer these people, the future audience of my work, a meaningful experience...
relating to Antarctica. To construct a continent for them, and within a broader cultural mindset, required me to develop bridge objects that can both connect people to information and translate that information into a form through which they can engage.

The outcome: I created a compendium of objects, each proportional to the highest amount of answers within and between categories of curiosities. My audience for this work has always been the broader public, and this compendium is a reflection of their participatory engagement. My objective is that they will explore and interact with each bridge object within a variety of didactic and aesthetic contexts.
This collection of work aims to engage diverse users and viewers with the Antarctic experience by means of their interaction with bridge objects. Bridge objects, also known as boundary objects, connect and translate information across disciplines and communities. My hope is that the following objects will also provoke further Antarctic curiosity and opportunities for meaningful exploration and engagement.

"Boundary objects are objects which are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites ... They may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is key in developing and maintaining coherence across intersecting social worlds."

Susan Star & Griesemer, in Social Studies of Science (1989)
What is it?

What is Antarctica? How much land is under all of that ice? How big is it? How thick is the ice? Is the magnetic pole on the continent? Are there ponds or lakes? I was surprised that 14% of all participant curiosities concerned rather basic attributes of Antarctic land and ice.

Seeing a whole map of Antarctica—not an arched wedge at the bottom of a map or an elongated Mercator projection where the continent takes up the bottom fifth of the page—is really quite rare. The bottom of a globe almost always faces down, with Antarctica almost out of sight and a mechanical post of some kind obscuring much of the continent.

I argue that the cultural incognizance of Antarctica ubiquitous today is largely related to issues of projection and Antarctica’s afterthought-like place within the last 500 years of global map design. The main issues have been two-fold: mapmakers had very few and disparate reports of where Antarctica had been sighted and whether they observed solely ice or actual land, and some explorers, like Captain James Cook, insisted for many years that Antarctica didn’t exist at all (since he had not seen it himself, though his voyages dipped below the Antarctic circle three times), which confused mapmakers and the continent was omitted from maps for more than 50 years.

Information from informal sightings of the continent was greatly underrepresented in early formal Antarctic cartography. For example, American and European whalers maintained a strong presence in

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the Southern Ocean and spotted Antarctica in 1818. Their ships’ logs and sketchy charts, however, were purposefully kept secret so as to never disclose successful whaling grounds. For roughly 100 years, the most accurate construction of the continent was thus in the hands of whalers\(^8\) and not national governments.

When we look at a map, 99% of the time we are completely unaware of the many objective and subjective variables that go into its design: which projection was used and why, when it was made and how it was influenced by politics of the time, available mapping—or seeing—technologies, the social influence of other cartographers (i.e., “Cook says he didn’t see it, so there is no way I am putting it on the map”), printing technologies and how it was shared, intended audience, etc.

Additionally challenging for Antarctica mapmakers, even today, is the constantly shifting shoreline of Antarctica. Glaciers calve daily off of the continent’s massive ice shelves and turn into wandering tabular or other icebergs. Thick, floating sea ice seasonally covers the majority of the coastline as well, making it difficult to draw a determinate land edge. These attributes contribute to our perception of Antarctica as ill-defined geography.

Over the last two decades, however, satellite technology has enabled production of incredible images of Antarctica. With collaboration between US and Canadian space agencies, RADARSAT technology was used to execute the first modern Antarctic mapping missions in 1997 and 2001\(^9\). Since then, we have been expertly able to answer questions like “How fast is ice flowing around the continent?” and “Exactly how much land mass is underneath the ice?” These images—actually mosaics of many smaller images of the continent—underscore the importance of how much data is needed to construct a holistic image, both literally and figuratively, of Antarctica.

To illustrate the slow geographic construction of Antarctica over time, I traced the outline of Antarctica

from maps drawn in time periods representative of the themes mentioned above: 1555, 1679, 1739, 1856, and present day. I composed these five images on a static poster and included text with each year’s depiction that highlighted the current state of Antarctic cartography and other variables (i.e., politics and technology) involved.

I created a visual time series in this format because it quickly draws the viewer’s attention to the idea of an evolution, to specific snapshots of time, and they can additionally draw from the anecdotal text to complete the narrative.

Ideally, interacting with graphic of Antarctica’s relatively brief information design history will prompt further questions. How will Antarctic cartography continue to evolve? With Antarctica increasingly in the public eye regarding its vulnerability to warming associated with global climate change, how will mapmaking and technology develop to keep up and highlight climate-induced changes such as glacial melting and continental uplift? Mapping geopolitical changes will also bring a challenge, should there be territorial conflicts in 2041 when the Antarctic Treaty comes up for renegotiation.

Moreover, this graphic reminds us of key assumptions often neglected when viewing a map, such as who is mapping, why they’re mapping, and, perhaps most importantly, for whom: for which stakeholders and future information consumers is each map intended?

"Constructing a Continent" poster describing the evolution of Antarctica’s shapes during five different time periods since 1555.
Many of the participants surveyed wondered about who exactly spends time in Antarctica. Are there permanent residents? How many people live there in total? Does anyone live there in the wintertime? How many different Antarctic stations are there?

Before heading to the continent for the first time, years ago, I set out to answer some of these questions for myself. I encountered difficulty, however, in getting a true sense of just how many people live there. Population data for each Antarctic station is only published every few years by the Council of Managers of National Antarctic Programs (COMNAP) in the form of a data table. Not only do few people know about this data table or how to find it, but this source also fails to give a reader any 'big picture' geographic sense of how many people reside on the continent throughout the year.

I set out to understand what, if any, Antarctic maps might contain population information. Even executing a simple Google search, one can find a plethora of Antarctic maps. Published by national science foundations, academic institutions, atlases, travel companies, defense contractors, and others, most maps consistently show the geographic position of all 104 Antarctic facilities, but completely lack information regarding human population.

Typical Antarctic base depictions include the facility name and its nationality in parentheses, or in the form of a flag. If there are other facility variables, they might include...
distinctions between permanent, summer, unmanned, or transshipment stations, what national territorial claim the facility falls within, and whether it has a runway. All are static, or non-interactive, maps that, surprisingly, visualize no information on how many people actually live there.

To remedy this visual information gap, I used COMNAP facility data (updated in February 2014) as the source to create an interactive browser-based Antarctic map. I first placed a red square at each of the 104 facility locations. Then, at each location, if anyone lives there throughout the year I plotted blue circles with area relative to population. The shade of blue indicates seasonality: dark blue represents winter population and light blue signifies summer.

When a user hovers over each facility with their mouse, the largest blue circle (if any) is highlighted in yellow and a box with facility-specific text appears at left, underneath the webpage title, “Constructing a Continent: seasonal and year-round facilities in Antarctica.” The text describes the facility name, its associated national program, average summer and winter population values, altitude of the facility, and the year that it opened. For reference, the oldest and continuously occupied station in Antarctica is Argentina’s Base Orcadas, which was founded in 1904.

The benefit of an interactive map is its inherent exploratory nature. A user can click on a station of their choosing to learn more about it. Should they be curious about Antarctica’s largest station, they can click on the largest blue circle to discover USA’s McMurdo base and learn about its specifics. If they are curious about which facilities are not permanently occupied in any season, a user can click on any one of the red squares to learn about that facility.

With my minimalist approach of displaying Antarctic facility information that is revealed on demand, I place users in the role of explorer. They can discover which nation operates the station at South Pole, which nations operate other far-inland facilities and how many
people are left there over the winter. Upon gathering basic facts from locations and facilities of interest, or pondering the disparate population density around the continent, they are hopefully inspired to ask new questions. Why are there so many stations on the Antarctic Peninsula? Why is McMurdo so big? Why do some facilities have no people and why do they exist? Why are most bases positioned along the coast? This kind of provocation is the ultimate objective of this interactive map.

Looking forward, there are several features that can be added to this interactive webpage to improve exploratory functions and engage with the actual human experience on the continent. I see ample room for the following exploratory functions on the current page: a toggle switch that can highlight which facilities have runways, a brush tool that allows the user to interact with the time series—allowing them to view only the bases opened before 1970, for example—and possibly a dynamic donut chart showing which nations have the most people on the continent in summer and wintertime. The latter feature would allow a user to highlight all facilities operated by a specific nation.

Approaching the future of this interactive map from a more speculative side, I plan to link Antarctic facilities with social media from the continent. With the proliferation of Internet-connected facilities—particularly in the last five years—many scientists, support staff, ship’s crews and tourists are posting on Instagram and Twitter from the ice. Luckily, many of these posts often use hashtags such as #PalmerStation (a US research station), #Vernadsky (a Ukrainian base), #McMurdo, etc. By linking an interactive map to this kind of social media, I would be able to offer a more engaging geographic connection to the continent.

"Most Antarctic stations are located on ice-free ground, which makes up less than 0.34% of the continent’s surface area."
The four main tenets of pragmatist philosophy are “the interaction of the senses,” “the practicalities of human involvement,” “rich explorations of experience,” and “the vitality of human engagement.” Though it may seem difficult to ground these ideas within the Antarctic context, and particularly with intent to engage an audience, the participant questionnaire provided some illumination. What senses and what interactions? What kinds of experience do people wonder about?

Participants were curious about all senses—what Antarctica looks and feels like, how it sounds and smells, and what food tastes like there. They mainly asked questions about the weather, daylight, temperature extremes, patterns of sunlight and seasons, scenery, what it’s like to get there, and visibility of the stars and aurora borealis—all through the lens of a human engagement with the Antarctic environment.

A bridge object to address the question “What is it like?” could undoubtedly take on countless visual and palpable forms. One could create diagrams or graphs of the topics above, illustrate clothing needed in different environments, show a series of photographs, or compare the advice of different Antarctic travel guides or touring companies. And should this bridge object aim toward a direct sensory experience, like literally touching icebergs or hearing whale songs, or could it translate someone else’s experience in a meaningful way?

Knowing that I would spend most of my North American summer down on a ship in the middle of Antarctic
winter, I wanted to communicate about what my ‘Antarctic experience’ was like. What were the daily changes in my environment as I traveled from South America to the Antarctic Peninsula and back twice? How could I create a bridge object that would engage a North American landlubber with my daily sea experience? Could an ensuing conversation be fruitful on both sides of the bridge object?

I decided that my sister, Celia Moret-Ferguson, an archaeologist and jewelry designer, would be a perfect collaborator. She speaks the language of beads and I speak the language of the sea. I suggested that co-creating an Antarctic data-driven necklace would be a good way of conversing across hemispheres, Celia in the Pacific Northwest US and me in the Southern Ocean. She was excited to apply her jewelry making to a new context and engage with my Antarctic world. I was eager to communicate about my daily environment—even be more aware of it, myself—and see it take on a new form. We devised a data encoding system where different beads signified particular environmental variables and where each half of a strand represented one seagoing day.

In May–June 2015, I spent 28 full days at sea, along with another 20+ half- or full days in port. While at sea, every day at noon I wrote down current environmental data—wind speed, air temperature, wind chill, and sea surface temperature—from the ship’s digital readout. I then relayed this information to my sister, who added the corresponding beads each day.

Our slowly-forming necklace facilitated rich discussion. With her daily inquiries about marine and weather phenomena and my responsive descriptions of daily life, she was able to experience Antarctica in her own language: beads. I, on the other hand, along with my entire crew, became exponentially more aware of changes in my environment—if the temperature was twice as cold as the day before, or how the sea temperature had dropped to the point of sea ice formation. There was fruitful engagement on both sides.

By cruise end, and after a momentary “bead crisis” where Celia ran out of the word tree describing curiosity results containing the word “like” from 250 participant questionnaires.
bead representing air temperature because she hadn’t planned on it being so cold on my trip, we created a 14-stranded necklace. If one squints their eyes and is data-minded, each half of the necklace could be viewed as a stacked area graph. Our asymmetrical piece is a wearable conversation. We were able to construct an unexpected and tangible object that continues to represent an Antarctic journey through its making and display. Its data-encoding inspires scalability across many data contexts and audiences.

Though several artists have created jewelry11 and other household objects12 encoded with environmental data, our Antarctic necklace, titled “Strands of Dialogue,” models a new way for experiencing and connecting through our environment in that it facilitated direct conversation through its co-creation. By choosing a material that my sister already connects with, we were able to collaborate effectively and reflectively. I stress this material relationship as an important aspect to consider when devising bridge objects of the future.

How do we explore new and creative ways of portraying complex and isolated ecosystems, particularly those not frequented by the human race? Penguins are the obvious and most media-pervasive representatives of Antarctic biology. They are charismatic birds that live in large colonies on the continent and are much easier to see than the whales and krill underwater. Because we are culturally more aware of penguins—likely due to their prominence in a few popular movies over the last two decades—penguins were mentioned in 8% of all curiosities collected, making up a third of the “what lives there?” category.

But when I go to Antarctica I rarely see penguins. Yes, I see them swimming in ‘flocks.’ I see their colonies from our ship, or venture close to their smelly territory if we have shore-based work. But I see other wildlife as well: giant birds called petrels, seals lounging on icebergs, and many types of whales breaching. Describing these visions to other people is easy, however, because these creatures still exist somewhat above the sea surface, within the domain of humans. How can I help people imagine what lives beneath the surface?

I work on scientific cruises in Antarctica where we tow nets through the water column or dredge the seafloor to collect marine species of interest. These nets contain heaps of bizarre sea creatures that I get to appreciate once they are brought onboard. From the usual giant sponges to shiny gold worms, purple octopuses, large-mouthed...
fish, and round, swimming snails, Antarctic biodiversity is indeed incredible. On my last scientific fishing trip, I considered these creatures through the lens of information design, pondering the challenge of how to communicate about their extraordinary features.

People think of Antarctica as white, gray, and blue. In fact, if you search the term “Antarctica” in Google Images, it returns photographs in precisely these colors. Blue icebergs, white and black penguins, clear blue-sky days (ha!), and snowy peaks abound. An occasional brown landmass can be sighted here and there but, overall, the images are relatively monochromatic and were taken exclusively above the ocean surface. How can I upend this paradigm and reframe Antarctic dialogue to include different creatures and colors?

I focused specifically on color to visualize the diversity of life that I see above and below the ocean surface in Antarctica, with intent to reveal the true strength of Antarctica's land-sea chromatic paradox. I know that life under the sea is far from white, gray, and blue. To begin, I chose 50 archetypal photographs that I had taken above the sea surface on seven different trips to the Antarctic Peninsula, and asked my friend, Paul North—an Undersea Naturalist on Lindblad Expedition/National Geographic’s Antarctic voyages—to select and send me 50 representative underwater photographs from the same area.

After ensuring that all 100 images were the same size and proper resolution, I wrote computer code to systematically sample pixels within each photograph. These pixels were then sorted by their RGB color code (each pixel has red, green, and blue integer values that create the overall pixel hue we see), stacked vertically, and then horizontally elongated by 20x so that the resulting cumulative pixel bar was easier to see.

The fifty pixel bars representing images captured of the land and seascape above the sea surface were placed atop 50 lower bars representing the vibrant world beneath the waves. In order to create a bridge object that would highlight...
the diverse creatures and colors that pervade Antarctica's underwater realm, I intentionally doubled the quantity of pixels sampled from the undersea images to those above.

The juxtaposition of color and intensity in the final graphic exposes our false assumptions of a 'colorless' Antarctica and reveals a surprising realm below—one that tends to be neglected in popular dialogue about Antarctic and its vulnerability to climate change. This work also highlights biodiversity in a new and visual form, one that can be used in a variety of didactic and aesthetic contexts.

After completing the static graphic and publishing it with The GroundTruth Project on Medium, I developed it for both online interaction and as a movement-based interface. The browser-based version is relatively straightforward: when a user hovers over a pixel bar, the corresponding image appears. Not surprisingly, the interactive and visually sensational aspects of this design far exceed the static version. Where only five example images were shown with the original graphic (two above the surface, three below; see pg. 58; 64 and 66 for detail), a user can now explore all 100 photographs.

Likewise, I created a gestural interface where, instead of a mouse, a viewer can use their hand to sweep across the pixel bars, pausing on a colored pixel bar where they want to view the corresponding photograph. As they pan across the bars with their hand, bars turn slightly opaque, with a visual effect similar to dragging one’s finger across a set of piano keys. Stop on an intriguing color bar and the representative image appears. Pull your hand towards yourself and the photograph gets bigger (similarly, moving your hand toward the screen makes the image smaller). Close your fist and the interface freezes, allowing you to further investigate the photograph at hand.

This work emerged as a successful design piece, as noted both through its successful publication and consequent propagation on social media and the honor of a prestigious award—Popular Science Magazine and NSF's joint “The Vizzies” scientific visualization competition, in which
“Antarctica: a chromatic paradox” won the People’s Choice Award for the Poster and Graphics category and was published in an issue of *Popular Science*.

By simplifying and identifying a visualization method that anyone can relate to, I can inspire curiosity about-and access to-a diversity of Antarctic and scientific concepts. Ultimately, I would like to see this work exist in a public space such as an aquarium or airport. Who will the initial visuals attract? What new questions does it provoke? What are their lingering thoughts after interacting with the piece? By operating at a larger scale, perhaps I will understand specific visual or cognitive aspects of this piece that should be considered for future design work.

Extracting colored pixels from images is effective at providing a rich experience because photographs contain much implicit information. By abstracting the pixels into contrasting color bars, we compare information within the images without being distracted by their messages. We are able to identify patterns and thresholds likely missed when viewing the photographs in their entirety. The visual approach used in this work is scalable across different contexts, even within the theme of contrasting environments. For example, one could visualize urbanization by creating a horizontal chromatic comparison of healthy mangrove forests to a nearby metropolis like Panama City. Decoding images in this way could reveal unexpected results, inciting curiosity and provocative engagement.
Interactive browser interface.

In Living Color

Each vertical bar site and samples pixels within photographs taken of the Arctic. Peripatetic encounters. My encounter: A 100 square meter sample of the land and waterscape above the sea surface, with 881 layers. Bars represent the ocean and the world beneath the waves.

Gestural interface (opposite) using a Leap Motion and JavaScript's D3 library. An open hand selects an image and zooms. A closed fist pauses interaction. Developed with Armin Akhavan.
LOW ISLAND, ANTARCTICA—When I first gave thought to what might live under the sea in Antarctica, I imagined that the fish and other animals would be the same gray-blue hue of the landscape above. Never did I expect the vibrant colors and fantastical shapes that have appeared before my eyes on the back deck of this US Antarctic research vessel—or appreciate the disruption that climate change stands to wreak on the vitality of such a delicate ecosystem.

For three to four months each year I sail around Antarctica as a marine science technician for the US Antarctic Program, where my job is to facilitate science: to help researchers on seagoing and island expeditions sample and study an ecosystem that few have explored. When I'm not at sea I visualize data to tell stories. I use programming, illustrative techniques, photography, and participatory research to explore new and visual forms of storytelling in the context of complex environmental issues such as climate change.

In my visualizations from this trip, to capture the diversity of life above and below the sea surface, I have used iconic photographs of the continent and quantitatively compared color pixels in a vertical bar that accompanies each image.

I've been sailing along the continent since mid-May. Our singular goal on this voyage: to skim the sea bottom and collect fish, which we will keep alive to bring back to a research station within a day's steam. In order to get there, we had to cross the notoriously formidable Drake Passage, where the entire Southern Ocean squeezes between South America and Antarctica. It's now gusting up to 60 knots and the 10 foot swells are consistently flooding the back deck with water—not ideal weather for putting expensive trawl nets over the side.
Our big steel ship, the Laurence M. Gould, seeks refuge between two islands on the Western Antarctic Peninsula to ride out the strong gale. Our work will start early the next day, and before heading to bed I take anti-nausea meds—a rare step for an experienced sailor, but quite necessary given the large rolls we are experiencing. Periodically throughout the night we poke our bow out into the weather to see if the seas have sufficiently calmed so we can head north for science.

Sure enough, by 0400, in the military parlance of seafaring expeditions, the winds have laid down. We head for the shallow waters of Low Island, with its self-descriptive silhouette, and deploy our net into the sub-zero waters. It takes about 45 minutes for the net to reach the bottom, 15 minutes to trawl for creatures, and another 45 minutes to haul them up to the surface. By the time the bulging end of the net, called the "cod end" for where cod collect when fishing for them, is finally hauled up and over the stern, we are eager to open it and transfer the fish to tanks. Once the net is hauled into a safe area, we quickly untie the fancy slipknots on the cod end and expose the net’s bright, wriggling contents.

At first glance, the diversity of both shape and texture defies expectation: hairy sponges, rigid fish, spiny urchins, feathery hydroids. But as all of the fish are whisked away, the animals accidentally caught in the net remain the true spectacle.

I see bright yellow sea stars the size of throw pillows, spindly sea spiders the size of my hand, toddler-sized sponges, and pink sea cucumbers with white bumps like a real cucumber. As everyone grabs shovels to quickly return these creatures to the sea, my gloved hands touch skates with three foot wing spans and thick worms with inch-long gold spines that look like fine jewelry. Everything is vibrant and colorful in contrast to the frosty gray world above the surface. I gently pick up peach-colored soft corals the shape of cattails and bulbous tunicates that look like wrinkled, white potatoes and return them back to the briny deep.

This little glimpse of what lives at the murky bottom is truly awe-inspiring. A completely different universe below.

I return to Antarctica as both a scientist and information designer because it is extraordinary; rife with stunning scenery and scientific discovery. It is the last unexploited continent on the planet.

The photographs here are the most salient images of the ecosystem here.
on the Peninsula. The bars to the left of each image sample all of the colors and organize them based on their red, green and blue values. The end result is a juxtaposition of color and intensity that exposes our assumptions of a ‘colorless’ Antarctica and reveals a surprising realm below, one that tends to be neglected in popular dialogue about a quickly warming Antarctic Peninsula.

Though I have mixed feelings about fishing in such a vulnerable area, even for science, I never grow tired of seeing what we bring up in Antarctic nets. It’s like looking through a keyhole at a secret garden of colorful undersea creatures at the bottom of the Earth. Their stark juxtaposition to the white, blue, and brown hues that dominate the scope above motivates my need to show this dichotomy of Antarctic colors through my work: above the sea surface versus below.

As a visual storyteller I want to evoke curiosity, awe, and awareness of the vibrant, diverse, and abundant life beneath the surface at these latitudes.

Unfortunately, the Antarctic Peninsula experiences the greatest temperature anomalies in the Southern Hemisphere. The average annual temperature here has been warming 1.1°F (0.6°C) per decade. That’s more than 7.4°F (4.1°C) since 1947, when air temperature was first consistently recorded in the region.

These colorful creatures are incredibly vulnerable and are now the true test subjects in our outcome-uncertain, human-induced experiment called climate change.
How is it possible that humans live and survive in such an inhospitable place? As mentioned in the Harnessing Curiosity section, questionnaire participants were most curious about people on the continent, specifically regarding elements of the question above. In fact, 18% of all participant curiosities fell into this subcategory. Aside from wondering about extreme weather gear, loneliness, and station culture, among other things, many participants were curious about food.

Given that Antarctica is too cold for any traditional agriculture, research bases and seasonal field camps must eat food that comes from very far away. Whether it comes by plane or ship, most fresh food is already many days old by the time that it arrives on the continent. Needless to say, fresh salad is a luxury. Careful curation of meals involves long-term planning to sustain food freshness.

Having worked on US Antarctic vessels, I know how important food is for morale. Good food with plenty of variety may be the most essential component of group morale, particularly when you live in a small community and have little choice over what you consume. Additionally, as the weeks go by and ‘freshies’ (fresh food) dwindle, Antarctic residents must live with what food is presented to them, even as it all slowly becomes a rather beige color.

For those who have never lived an incredibly remote place, explaining this color gradation and food mindset is a difficult task. I am often asked all kinds of questions about food. How do chefs and planners strategize for
the Antarctic winter when no food shipments can arrive? Can frozen food just stay outside? Do chefs or staff have to ration food carefully? Where exactly does the food come from? Do stations share food?

There are myriad possibilities of broadly visualizing the theme of Antarctic food: graphing bulk food and drink inventories in winter versus summer or between stations of differing nationalities, drawing a time series describing the endurance of fresh food as it is transported by plane or by sea (which soft foods are least robust?), creating a table showing what foods are prohibited, if any, and/or what foodstuffs must be consistently quarantined for bugs or invasive species, and many more.

To capture and communicate the human experience of eating in Antarctica, I visualized food variety and color throughout midwinter by digitally illustrating three plates of food (see pg. 72). Titled “What do you eat in Antarctica?”, each plate could figuratively be placed in front of the viewer, along with a menu stating what they were eating that night. The first plate presented has brightly colored food—‘freshies’ have arrived recently and the chef wants to use them while they’re fresh. The second plate, six weeks in, is mainly meat and potatoes with few vegetables and rather contrived color. The final plate illustrated, 15 weeks into midwinter, is mostly beige colored. It has been more than three months since residents have received a food supply and they are yearning for fresh herbs and salad.

To complete this piece, I interviewed Mike Hiller, Palmer Station’s (USA) winter-over chef, about his food strategy, what he knows about where food comes from, and how he maintains menu variety and station morale. While imbuing the digital illustration with qualitative data gathered from our conversation, I additionally created a corresponding text piece and participated in a related radio interview with Public Radio International’s (PRI) The World.

Referring to “We live there?,” the following two pieces were published in 2015 with support from The GroundTruth Project.

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15/16


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Palmer Station, Antarctica—I feel a bit remorseful as a small group of people bundled in reflective red coats, their feet planted on the snowy ground of Antarctica, wave goodbye to me and my crew, our own feet gripping the icy steel deck of their supply ship. As we steam away, the folks onshore are not just bidding farewell to their last physical connection to the rest of the world for three and a half months, they’re parting with something far more precious: fresh food.

I know how they’re feeling quite well; my own nine seagoing voyages to this vast continent have also afforded isolation and self-reliance, particularly when it comes to eating. We can be on the water for more than six weeks at a time. Aside from supporting Palmer Station, our primary purpose is to facilitate science within the U.S. Antarctic Program. For a few months each year, I sail as the marine science technician, helping to deploy science equipment and manage the laboratories onboard. Our ship, the Laurence M. Gould, often rolls 20 degrees from one side to the other. Food is crucial to our collective sanity. The profusion of chopped meats and vegetables on Taco Tuesday can improve the spirits of an entire ship. Hot dog soup? Not so much.

Nearly two dozen people spend the better part of May through October at Palmer Station, an isolated U.S. science base in the Southern Ocean—among them marine scientists, carpenters, electricians, and communications technicians. During this period, called midwinter, everyone dines together in Palmer Station’s comfortable dining hall, or “galley,” sitting next to large windows that look out over sea ice and grounded icebergs beyond. A woodstove stands in the corner with broken-up old pallets burning inside, surrounded by a couple of couches and a coffee table with a stack of New York Times crossword puzzles. A dozen small tables fill the rest of the space, many lined up end to end, and red-checkered tablecloths come out for special occasions.

Mike Hiller is the station chef. Based here for his third winter, he alone is in charge of chopping, cooking, and choreographing the allotment of fresh food—“freshies” down here—as they ripen and discolor with age. For the next 15 weeks, Hiller will have to be beyond resourceful, carefully strategizing which foods are served when in order to ensure proper variety and nutrition in each meal before he receives the next resupply from the Gould.
Hiller, burly, with a thick, red beard, hails from Homer, Alaska. Proud of the fact that he has spent the last seven years working in regions where temperatures never exceed 65 degrees, Hiller honed his culinary talents both in his own kitchens—owning one restaurant and two food trucks—and on remote Alaskan field camps and research vessels. He thrives on the challenge of running a solo kitchen in extreme environments.

“I would challenge you to buy three months of produce at your grocery store … and then not go shopping again for three more months,” he tells me, pointing to 50 large cans of tomatoes stacked in his dry-goods storage room that he’ll transform into roasted tomato bisque, spicy pizza sauce, and black bean chili.

Having spent months at a time living on ships in the Antarctic, I know all too well the threat chefs like Hiller face after weeks with no freshies: the menace of the beige plate. Rice, mashed potatoes, chicken, bread, canned corn—all meals can start to take on the same unappealing color if chefs are not overtly mindful of maintaining variety.

Hiller explains the shelf life of the freshies that come south across the Drake Passage on the Gould. Cucumbers, strawberries, and fresh herbs have just a three-day shelf life at Palmer Station; red romaine lettuce lasts up to five days; cherry tomatoes can last a month with proper refrigeration. Hiller’s strategy is to “serve freshies as long as possible while they’re really fresh.”

The first night the ship pulls into Palmer Station and offloads freshies, tradition dictates what’s called a crosstown dinner, meaning that both the station’s and ship’s crews dine together. Hiller, excited for fresh food and a new audience, creates a glorious spread for the buffet line: grilled fish coupled with a vibrant mango cilantro salsa; avocado salad topped with finely sliced red and green onions with tomato; freshly baked bread; and an apple pie and kiwi tart for dessert. The mango cilantro salsa alone is enough to boost my morale for at least a week.

Within a few days, however, I’m counting the weeks until I will eat fresh herbs again. A few days more and I am flat out yearning for fresh basil and cilantro, to the point of daydreaming about the fresh produce aisle in the small grocery store at our final portcall in Chile.

Four weeks after the last resupply at Palmer Station, the freshies are gone and Hiller’s job “gets way easier.” With only hard vegetables left—cabbage, potatoes, onions, radishes, carrots—time once spent making delectable sauces and, often, elaborate desserts: cannoli rimmed with dark chocolate and crushed pistachio, homemade glazed donuts, and mocha semifreddo served in martini glasses.
“Variety is a sign of bounty,” Hiller says. “When that first shipment comes in and I put out a big, giant display of fruit, the bananas aren’t so interesting and the kiwis aren’t so interesting because those colors are similar to what people wear and see,” he adds. “But the brightness of the lemons and the limes and the oranges and the tangerines and the apples—those colors you don’t really see this time of year … people just stare at it for a while.”

Variation in our daily fare is likewise prized when we’re out at sea. On scientific fishing cruises, Hiller will send the marine crew off with homemade peach granola bars, which we save for the dark hours on watch when we need it most. Occasionally, we trade foodstuffs with other bases as well: Each summer the Gould visits a U.K. base, Rothera, and exchanges a giant crate of peanut butter for a couple thousand bags of black tea. Each time I’ve visited Vernadsky, a Ukrainian base, its crew has gifted us with delicious cured meats and chocolates. On a recent visit to Arctowski, a Polish base, where a handful of people had been on the ice alone for 10 months, we brought them crates of freshies. To add some variety, our science support crew makes exotic dishes as well. On the other U.S. Antarctic ship, the Nathaniel B. Palmer, I enjoy making liquid nitrogen–cooled ice cream with our excess supply. Scientists clad in cryogenic gloves and safety glasses stir cream, milk, sugar, and flavoring in large stainless steel bowls while I pour the super-cooled liquid into each, and a midday treat is served.

Until a decade ago, chefs could grow fresh herbs such as cilantro, sprouts, and basil inside Antarctic research stations. The two other U.S. bases, South Pole and McMurdo, still maintain greenhouses today. But because Palmer Station is north of the Antarctic Circle, scientists worry stray seeds from the herbs could potentially grow in the summertime, spreading invasive species on the continent. To eliminate this threat, Palmer Station has banned the practice. Eating native Antarctic animals and plants is also strictly prohibited at all Antarctic bases.

Regardless of the prohibition on growing fresh food, Hiller exudes a certain reassuring cockiness that can only come from working in other isolated environments, including the North Slope oil fields and the Aleutian Islands of Alaska. “If I’m feeling pretty creative, I can create a meal just as colorful as the first week freshies are in,” he says. He describes how to make a bright pureed pea soup with a touch of tarragon for “exoticism,” as well as a rich, magenta-colored pasta by infusing it with beet and sunflower seed pesto.

Turning a dearth of aging ingredients into a feast for the eyes takes talent and tenacity. Along with the roughly 1,100 other residents of Antarctica scattered across 41 bases occupied through midwinter, one thing is clear at Palmer Station—morale lies in the chef’s hands.
In photos
Life in one of the most remote places on Earth

Daily life in Antarctica isn’t all whites and greys. Just ask marine scientist and designer Skye Moret.

She spends between three and four months every year sailing around Antarctica. During that time, she helps researchers with their work and translates it all into a relatable narrative. The ship she’s traveling on splits its time between providing food and other supplies to a small station completely cut off from the rest of civilization for three months at a time, and housing science within the US Antarctic Program.

But when she’s not working, she’s just living daily life in one of the most remote areas in the world. Here’s what that looks like.

1. A slice of blue in the Southern Ocean

A glimpse of the brilliant blue Southern Ocean surface peeks through pack ice in the wake of USAP icebreaker, the Nathaniel B. Palmer.

2. Miles and miles of sea ice

This was the brightest day. A teal line of brash ice shows where the floating ice collides. Penguin Island is in the distance.
One of the electronic technicians built a ping-pong table last year and it lives in the cargo hold. We set up barrier boxes to avoid losing the little white ball amongst pipes, crates, and giant propeller blades. The roll of the ship adds to our friendly ping-pong challenges.

Giant icebergs arches are always a treat to see. Deeper than they are tall, they ground themselves in the shallows near the islands and continent.

We catch myctophids, or lantern fish, at night when they venture close to the sea surface. These three fish lost most of their scales in the net; the contrast shows off their photophores, or bioluminescent spots, which help them blend in with their environment and avoid predators.
Net tows off the Western Antarctic Peninsula brought up heaps of krill. They were likely feasting on algae found on the bottom edge of the sea ice. Vital to the ecosystem here, they are also prized by the fishing industry. The US is the largest consumer of ‘krill pills’ that contain omega-3 fatty acids.


These flat-topped icebergs, called tabular bergs, are formed when ice shelves calve—or break free—of the larger ice shelves of which they were a part. On my last cruise we saw several tabular bergs more than 10 miles long, a stark reminder of our warming climate.

7. A tabular iceberg south of Elephant Island, Antarctica

Icefish are unique and vulnerable to climate change. They have white blood—they lack iron-rich hemoglobin—and other highly evolved adaptations to survive the extreme Antarctic temperatures (29°F / -1.6°C), like antifreeze proteins. During my off-hours, I painted this lone icefish being studied by scientists.

8. Icefish painting
9. Extreme ice accretion

When the weather forecast says “extreme ice accretion” off the Antarctic Peninsula. Any precipitation freezes onto the vessel when it is -40°F (same as -40°C) outside.

10. The Laurence M. Gould dockside in Punta Arenas, Chile

The smaller of the two US Antarctic research vessels, the Laurence M. Gould gets prepped for sailing in the Straits of Magellan.

11. Iceberg in grease ice

Grease ice is one of the first stages of forming sea ice, where the surface takes on a seemingly oily texture. When wind pushes the ‘bergy bits’ floating amidst, they leave long wakes through the grease ice that make the bergs appear to be racing each other.
What is the role of visualization in stimulating engagement with the Antarctic experience? In the last few years, Information Design as a formal discipline has increasingly become recognized as an indispensable tool in the context of integrating cross-disciplinary knowledge, awareness, and education. Particularly within the context of Antarctica, information design should involve end users—or knowledge consumers—in the design process. The results of my participatory engagement were invaluable in determining the compendium’s composition of projects and my thesis overall was richer for it.

The intent of these bridge objects was to ‘humanize’ Antarctica for a broad audience and to help them meaningfully engage with Antarctic topics of their interest via a pragmatic design approach. Whether by exploring an interactive map, decoding data-driven jewelry, or even reading a food menu, these visual objects continue to facilitate conversation and inspire new pathways and settings for data visualization and visual storytelling beyond the Antarctic context.

We have a visual imperative to construct an accurate cultural image of Antarctica, and so experiential media and polar dialogue must keep pace with expanding visual literacy elsewhere. There are many stories to tell from a continent so white and far away from modern media and perception, and countless bridge objects with which to do so.
References


The Lost Continent. The Southern Continent. *Terra Australis.* The Ends of the Earth. For centuries the term “Antarctica” has evoked visions of an inaccessible, perilous, and lifeless terrain, suitable for only the most adventurous of souls. Though this romantic vision contains elements of truth, it offers sharp contrast to the daily realities of human life in Antarctica today. By employing information design within this context, we can encourage transdisciplinary dialogue about and access to the scientific, cultural, and political concepts that form our collective image, or *construction*, of a continent. This work explores the role of visualization in stimulating engagement with the most socially and geographically isolated continent on Earth.