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Postcards of Earth and Mortal Sights

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ABSTRACT

In this paper I explore images of the Earth as matters of scale- from the very distance to the minutely close. Earth monitoring initiated by late 60s space programs proliferates as visualization technologies for multiple purposes; weather tracking, military, communications, etc. Authors like Virilio have discussed how these technologies produce new architectures of war and subjects of surveillance. The image of an Earth floating in space also produces self-consciousness regarding our place in a universe, and on the planet. This paper surveys these regimes of visibility- inquiring as to how they inscribe a sense of mortality- both of the planet and of the individual in a new way, inquiring after their meaning for those of us to live on this planet.

James Lovelock chose *Gaia* as the name for an earth-as-organism after the ancient Greek Earth goddess. While this was considered sloppy science, he was intentionally aligned with the humanistic-cultural- associations of this naming, indexing the Earth as something living and beyond human comprehension. *Gaia* as a cultural attitude moves toward the “re-enchantment of nature,” and is embraced by many people as a techno-ethical guide. Lovelock and others suggestively extend the metaphoric potential of this living Earth by locating the human subject as a part of a larger body called *Gaia*, asking us to re-imagine the locus of pain, damage, healing, etc. I will conclude with a discussion of bacteria and the visual imagination of small organisms as a basis of life, as imagined through contemporary land/earth and biological artwork.

POSTCARDS OF EARTH AND MORTAL SIGHTS

“..the evolution of homo sapiens, with his technological inventiveness and his increasingly subtle communications network, has vastly increased Gaia's range of perception. She is now through us awake and aware of herself. She has seen the reflection of her fair face through the eyes of astronauts and the television cameras of orbiting spacecraft. Our sensations of wonder and pleasure, our capacity for conscious thought and speculation, our restless curiosity and drive are hers to share.” (Lovelock, 1979)

HOW TO REPRESENT A BIOSPHERE? Would the result of this endeavor be visual or would it take other forms? This paper speculates on how images of the earth signify, according to the distance from which they are acquired and the technologies used to acquire them. I contrast the proliferation and popularization of photographic imagery of the earth from space, to the research associated with Gaian science (today this is called earth systems science in the academy), a scientific field and philosophy also originating from 1960s era space research. I attempt to draw out distinctions between imagery that constitutes the Earth as a series of images, angles, targets and climate events, as opposed to a complex biological system supported by heterogeneity of circulating media that produces a felicitous environment of resources for life. Perceiving the earth as a vivid dynamic situation propelled by life is radically different from the static and distant views obtainable from space. Such distinctions in visualization have much to do with how we apprehend planetary resources, our roles as human inhabitants, and by extension, human responses to climate change.

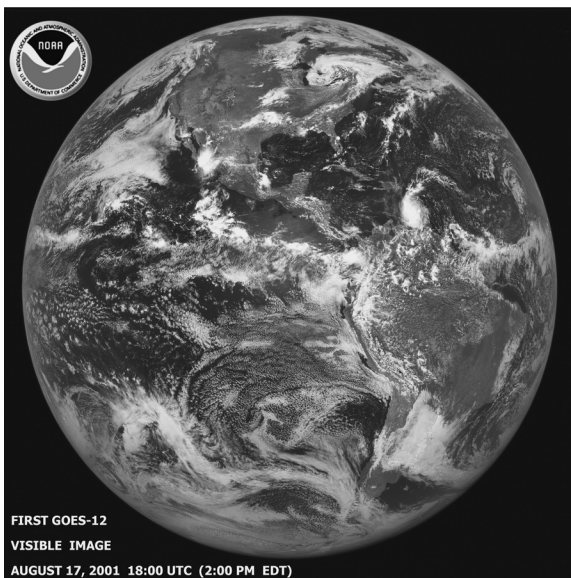


Figure 1.
*Geostationary Operational
 Environmental Satellite image.
 First GOES 12 image. August 2001.
 Source: GOES-NASA.*

During the late 1960s, the U.S. space program focused attention and resources on the development of new satellite based imaging technologies to be used for both military and domestic purposes. The pictures of that emerged from these technologies, such as those created through the Geostationary Operational Environmental Satellite program (GOES, Figure 1) were like the cinematic long shot; establishing images that set the scene and opened a movie about earth as a biotic economy. In a way, these iconic images of the whole earth from space became the establishing shots for the environmental movement of the period and for a contemporary reflexive way of thinking about the conceptual position of humans in the universe and on the earth. This innovation in earth imagery was preceded by a succession of events throughout the 60s that drew public attention to the environment in a new way.

An expository introduction to the environment seen as spectacle, Rachel Carson's highly publicized *Silent Spring* (1962), produced a new public awareness of the impact of chemical compounds from military-industrial agricultural on the non-human environment. A year after the BP deep well blowout, it seems that the kind of "close ups" that work like Carson's offered for seeing the environment have not been persistent enough to challenge continued disinformation about Gulf waters clean up. Environmental health at the very small scale is the territory of experts, quibbled over in epidemiological journals and by corporate lobbyists, despite the high stakes, for both non-humans and humans. How might life at the small scale be represented in refreshing ways? Does the proliferation and ubiquity of satellite imagery help people comprehend connections between activities on the earth's surface and events in its atmosphere, or does it occlude their relationships? And, returning to the cinematic metaphor, does the procession of images beamed from space encourage passivity in the face of the spectacle of a planetary-scale bio-system undergoing a rapid decline?

"Once a photograph of the Earth, taken from outside, is available -once the sheer isolation of the Earth becomes known -a new idea as powerful any in history will be let loose."

In the 1950s, the British astronomer Fred Hoyle, accustomed to looking up at space through telescopes, noted the lack of photographic images of the planet earth from that returned the gaze from space. He cannily predicted such an image would have a great impact, although in the surviving well-circulated quote, he doesn't say how, and perhaps he did not yet know. Critical cartography is concerned with how graphic representations of the earth simultaneously determine and conceal territorial desires. The naming of territories, for example, reflects power conferred upon or seized by those who name; likewise, the alignment of maps and globes toward the polar north weights attention toward the developed Northern hemisphere. The globe was thus long imagined as a discrete entity before the first photographs were taken from space, and before the shutter was engaged, the meanings inherent in whole earth imagery were tied by an umbilical to

older histories of imperial conquest, to the development of data-derived perspectives that permitted conceptual representations of what could not be directly observed, and the concomitant desire for frictionless travel. (Cosgrove 263)

The globe as an icon was an always present and repeatedly elaborated novelty at international expositions, Olympic games and World's Fairs, where spectators learn to perceive of the world "as [an] exhibition". (Cosgrove 226; Mitchell 218) These representations serve to naturalize the image of the world as consumable, and as both spectacle and surface for the projection of spectacle. After the world wars, the globe itself became the commodity, as commercial airlines began luring new civilian customers to air travel through the use of global maps with smooth graphic arcs connecting exotic destinations. The Unisphere, a representation of the globe built for the 1964-1965 New York World's Fair still located in Flushing, Queens New York is likewise embraced by the stylized orbit of imaginary satellites, cast in stainless steel.

In *Apollo's Eye*, a survey of the idealized, global perspective in Western cartographic history, geographer Denis Cosgrove discusses how in the 20th century, global imagery becomes framed "in terms of [...] the convergence of flight and photography," that reconfigures the relationship of viewer and place "... the earth became a target as far removed from the personal experience of the observer... as a distant planet" (Cosgrove, 239). As with visual technologies used in warfare, there is an anesthetizing advantage to this removal, familiar today in the use of drones; but also as a domestic pastime. Games like "America's Army," used for both training and combat by the U.S. Army offer simulated views from space that are similar to the digital imagery of the ground taken by astronauts and cosmonauts from the space stations.

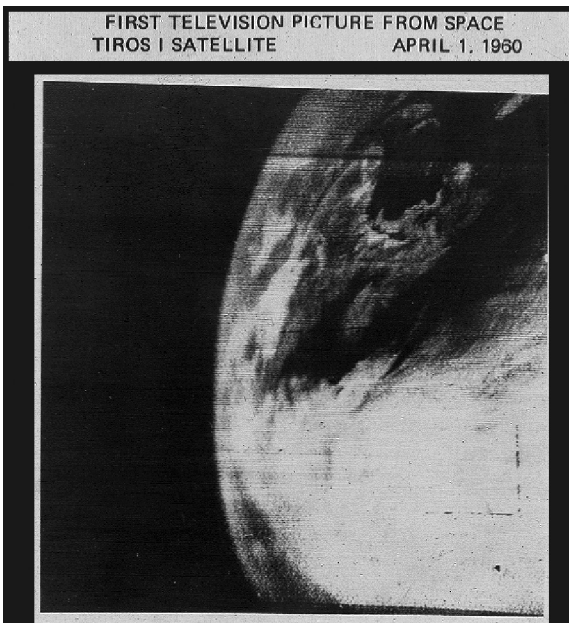


Figure 2.
 First picture taken by TIROS
 weather satellite system, 1960.
 Source: NASA.

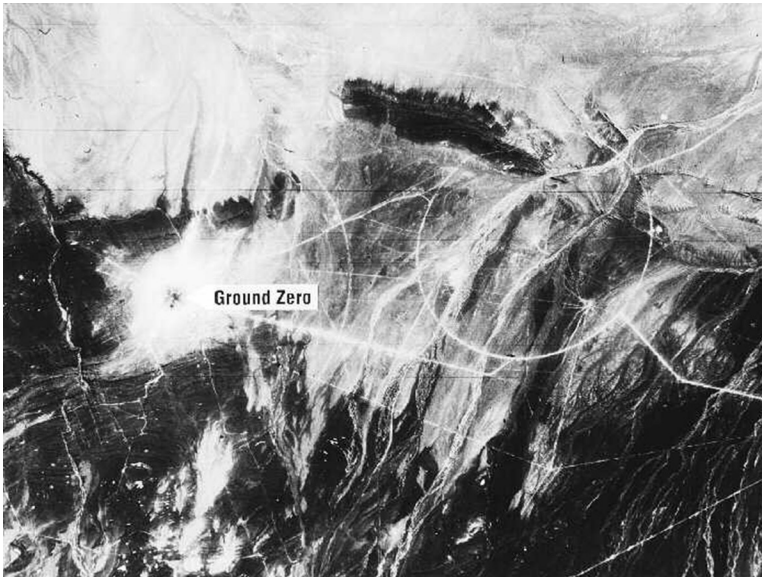


Figure 3.
Lop Nur
Nuclear Test
Range, shot from
the TIROS system
in 1964. Source:
NASA.

Aerial photographic technologies have been a militarily strategic part of the U.S. space program since the late 1950s. In 1958 the U.S. Department of Defense began transmitting television images of large swaths of the globe, its curvature and cloud patterns from satellites stationed in the sky above the poles through the TIROS—Television Infrared Observation Satellite program. Like many visualization projects, TIROS was initiated by the Department of Defense, and then transferred to the Environmental Science Services Administration (ESSA) and the national space agency, NASA. The weather-monitoring National Ocean and Atmospheric Agency (NOAA) which replaced the earlier ESSA continues as a dually civilian and military agency under the Defense Meteorological Satellites division. (NOAA 2006) In 1958, the Central Intelligence Agency (CIA), with the participation of the Air Force deployed CORONA, a system of reconnaissance satellites mounted with cameras capable of shooting panoramic swaths of the planet's surface. While these also monitored weather, their primary use was for the survey of ground targets and activity. From 1960 to 1972, these satellites, kitted out with photographic equipment capable of remote image capture, were used strategically in Vietnam and in the Cold War.

Over a ten-year period, the manned Apollo Space Program that culminated with a successful moon landing in 1969 also produced a number of iconic pictures of the earth from space. Although image collection was not the priority, Apollo mission astronaut-photographers pointed Hasselblad cameras with 70mm lenses through mist covered windows under weightless conditions. (Cosgrove 2001, 316) Astronauts who have witnessed earth from space speak with humility about their encounter with earth's astonishing beauty and physical finitude, as exemplified by Frank Borman's reflections which were widely circulated in *Newsweek* in December 1968; "When you're finally up on



Figure 4.
William Anders. 1968.
Earthrise. Source: NASA.

the moon, looking back at the earth, all these differences and nationalistic traits are pretty well going to blend and you're going to get a concept that maybe this is really one world and why the hell can't we learn to live together like decent people?" (Cosgrove 2001, 258)

After the publication of the first images of the earth from space, there was such an outpouring of sentiment about our responsibility to the earth that Denis Cosgrove summarizes: "...marvel at a vast yet tiny earth, reflection on the insignificance of self, and yearning for human unity." Captain Jim Lovell, following up on his Apollo 8 mission, wrote, "When you see Earth from the moon...you realize how fragile it is and just how limited the resources are. We're all astronauts on this spaceship earth—about six or seven billion of us—and we have to work and live together." (Brokaw 2007) These ideas were celebrated and embellished by popular period authors such as Archibald MacLeish and Carl Sagan who in 1990 requested the Voyager I spacecraft capture an ultra-wide shot of the earth against the vastness of the solar system. (Greenfieldboyce 2010) Taken from 3.7 billion miles out in space, the resulting NASA photo titled *Pale Blue Dot* has also circulated widely to serve as a metaphor for Earth's isolation. It is significant that Sagan sought a specific image to denote his idea for it is the human hand and intelligence behind the camera-eye that lends these images their aura as well as their romantic sensibility. Two images shot during the Apollo program have performed most regularly as containers for this longing for brotherhood, consciousness and humility. *Earthrise*, (Figure 4) in which a shadowed earth hangs over the moon's drab horizon was snapped



Figure 5.

NASA_AS17-148-22727 shot during the final Apollo mission number 17, 1972. Source: NASA.

by Astronaut William Anders, in 1968. The second photo, dubbed AS17-22727, (Figure 5) was shot during the final mission in 1972 and is, according to NASA, the most circulated and reproduced image in the world.

Even while signifying global cooperation and brotherhood, the images were also seized upon to illustrate technological dominance and spatial destiny, a speculatively schizophrenic agenda. Bruno Latour in *We have Never Been Modern* discusses how the modernist separation of disciplines makes such distinctively contradictory meanings inherent in the identical object possible. Environmental historian Neil Maher points out how *Earthrise* perfectly bridged past and future territorial aspirations of the United States; “figuratively depicting Kennedy’s New Frontier in its sloping lunar surface, the Apollo 8 photograph helped extend America’s Manifest Destiny into the ultimate wilderness—outer space.” (Maher 2004) Such associations were no accident, for NASA public relations supplied language for these stories in press releases, to wit: “space is a frontier”; “space exploration is territorial conquest continuous with the exploration and conquest of the New World”; “space travel marks the latest, and triumphant, phase in evolution, a grand meta-narrative of which Humanity is the hero.” (McGuirk) In 1966, American economist Kenneth Boulding coined the spaceship earth metaphor often attributed to Buckminster Fuller wrote in a cautionary essay about infinite growth, that “The image of the frontier is probably one of the oldest images of mankind, and it is not surprising that we find it hard to get rid of...” (Boulding 1966)

During the four years between *Earthrise* and *Photo 22727*, a shift in social concerns ostensibly moves Humanity aside a little, however, and turns the photos into symbols for a nascent international environmental movement. The blue marble of the earth floating on a featureless black ground was now imagined to represent humility regarding our place in a universe, invoking brotherhood toward all planetary dwellers.



Figure 6.
Discovery mission. 1996.
 Source: NASA.

This was timely; in 1969 there were several prominent ecological disasters in the U.S. including a substantial oil spill from an offshore platform in Santa Barbara, California, additional spills on the east coast. In Ohio, the polluted Cuyahoga River in Ohio caught fire. Register the dramatic visibility of such crisis, compared to the molecular invisibility of toxins like DDT as described by Carson.

In the wake of these catastrophic events, the “Whole Earth” photos NASA had collected become emblematic of 1970s environmental consciousness. Entrepreneur and publisher Stewart Brand takes credit for persuading NASA to release them, and he furthered their popularity by using them as theme and cover art for the *Whole Earth Catalog*. (Turner 2006) In this context, the images invoked contradictory ideas-for and against human centrality. Cosgrove notes how the image appealed as well to progressive desires for a world “without a privileged center and subordinated periphery, in which all voices across a decolonized globe, regardless of location, claim equal rights to their unique place, memory and vision.” (Cosgrove, 261) Like the halftone of Che Guevara that has also found its way around the world, the unifying utopianism of the Whole Earth image conducts a plethora of inconsistent messages about the condition of the planet, its inhabitants and power relations. This symbolic unifying globe is further widely used in advertising today, as part of a message of cultural and economic homogeneity; any quick search on the internet will reveal dozens of ads for global coverage and accessibility.

What does it mean to look at a planet? As Photo 22727 slipped into place as the West’s long-desired planetary vantage point, denoting human mastery and objectivity, the lack of a three dimensional graticule, and the elimination of geographic boundaries opened opportunities for appropriation. The disk of the earth glowing against the black universe in Photo 22727 represented fragility and finitude for some, but for others it



Figure 7.
NASA. Image
Science and
Analysis
Laboratory,
NASA-Johnson
Space Center.
“The Gateway
to Astronaut
Photography of
Earth.”

expanded the frontier. Denis Cosgrove distinguishes between “a ‘whole-earth’ discourse stress[ing] the globe’s organic unity and matters of life,” and “a ‘one-world’ discourse that concentrates on the global surface, on circulation, connectivity and communication.” While the latter might be associated with demands for friction free capitalism and characterized by global market liberalization, both of these formulations construct a new global citizen, through the equalization of geographies and the elimination of continental distinctions based on capital, resources and development.

Underscoring *Photo 22727*’s malleability as a container for contradictory ideologies is its *objective* status as a photographic document. In this abstracted web of signification, fantasies of perfect connection and resource availability rides alongside the romantic image of a delicate bejeweled but finite garden that needs careful stewardship. A recent article refreshes NASA’s hyperboles by drawing us to the view—“the ultimate overview is of the universe itself—it is the actions of pioneering individuals that drive us forward, discovery by discovery, view by view.” (Glass 2007) The optical pleasure derived from these images is evidence of the goodness of the technologies making them possible, and that they make possible, although they have been taken, as Kevin MacGuirk reminds us, from nowhere, at least nowhere that can produce a socially positive ideology for the ground, or that place called the local.

The caption on the astronomy website Space.com on April 22, 2008 declares “Space.com wishes all its readers a great Earth Day with two photos that show how far mankind has come while riding Spaceship Earth.” The diptych they presented consisted of the remotely gathered 1960 TIROS image (Figure 1) and a 1996 shot from the Discovery mission; their pairing highlighted resolution improvements in space photography and the addition of color. In the superbly composed and highly resolved 1996 photo (Figure 6), the robotic arm of a space shuttle floats above the planet and its atmosphere, framed by gleaming solar flares. The visible prosthetic directs us to imagine the vehicle from



Figure 8.
Suit Satellite. Source: NASA.

which the picture is being taken, while the composition center directs the eye beyond the earth's arc into the distance not yet transgressed, above the "earth laid out in splendor beneath the bright sun." Although the shuttle photo most eminently celebrates optical pleasure and technological achievement in imaging, the caption nods to global relations, "Such images may serve to remind people that we live in an increasingly interconnected global society, and that Earth remains a precious and still-unique drop of life in the vast unknown." (Our First and Finest Earth 2008) Sociologist John Urry describes how the global, in particular, responds to a preference for the visual, "eclipsing other forms of sensory information" and "producing a false dichotomy between local and global." (Urry 46) Adrift between the two, but not in the shot, is an earthbound spectator with no footing in a global market, who is swept into a form of globalization that has been naturalized and made inevitable through a recycled strain of manifest destiny.

New architectures of viewing come into being that are at once remote from life and the senses, but pertain to them. The space suit offers the ultimate environmental control for sensory information. In Figure 7, Mission Specialist Robert Curbeam works on the International space station, a figure over the ground of atmosphere. In Figure 8, a disembodied spacesuit orbits the earth, transmitting radio signals.

If these images seem familiar, it is because they are in the public domain and are reproduced to adorn dormitory rooms and mouse pads. Back on earth, ham radio aficionados track these signals, while tourists lean on cruise ship railings to watch glaciers melt and icebergs calve. Fishermen, farmers, truckers and sailors sit in truck stops and country stores to watch the weather as captured and imaged by technologies initially engineered for military purposes. Subjects watch storms surge toward them, both real and abstracted by a vantage point 22,300 miles away, delivered by cable, internet and wireless networks. (Figure 9)

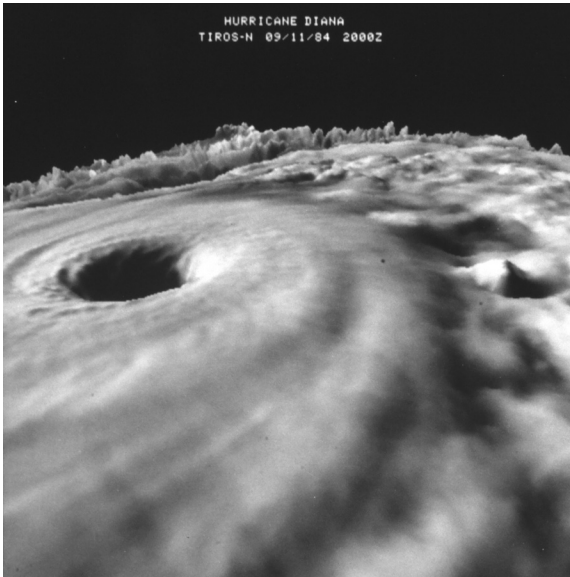


Figure 9.
1985 TIROS image of Hurricane
Diana. Source: NASA

Such mediations inherently construct distance, while also complicating the positioning of the viewer to what is seen; whose location might well be the target of these weather phenomena. People in rural locations in the U.S. purchase personal reception gear and families stock up on provisions; the two are bound together and conceivably preclude alternate, public or community-based responses. In what ways can we explain the cognitive function of these images, particularly the televised ones? Are they paralyzing and addictive, or do they produce exhilaration and pleasure as the contemporary sublime? How does the buildup of financial production and consumption of these images relate to the expansion of the production of risk itself as an instrument of capitalization, through weather derivative and futures markets? These are questions to investigate further. Depending on where the spectator is watching from, the images relayed by weather satellites are not just images, but cinematic dances with death. Watchers become targets, warriors, refugees, forced to make the decision to fight or flee. In what way *does* watching the weather from the vantage of the sky inscribe mortality, of both planet and the individuals who live on it. What kinds of literacy regards these images, that conceivably operate at both conscious and unconscious levels? The subjects of scrutiny include the thickness of polar ice, Gulf Stream movement, and fire cover. As current news, the hurricane season each year brings a flurry of captivatingly beautiful images of storms blowing in from the warming oceans; stunning shows of powerful atmospheric phenomena driven to extreme proportions. Acknowledging their entertainment value, NASA makes their GOES sequences of the hurricane seasons available to the public in a downloadable archive of films in any size and resolution, with and without royalty-free “caribbean” music. (NOAA-NASA) To understand the most extreme of these weather spectacles as catalyzed by annual events of heat, cooling, land and sea cover is to read into them an infection of the bio-system or a system out of whack.

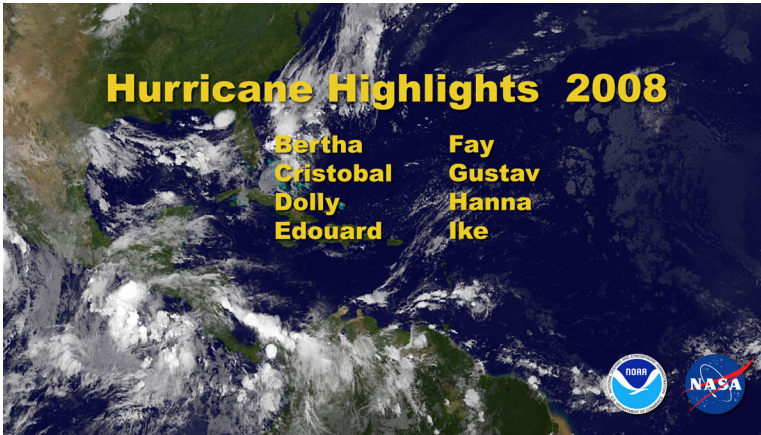


Figure 10.
Hurricane Alley
2008 first frame.
Source: NOAA-
NASA GOES
Project.

ANOTHER WAY OF LOOKING AT EARTH

"The astronauts who saw the whole Earth from Apollo 8 gave us an icon that has become as powerful as the scimitar or the cross... The meaning of that cloud-speckled ocean-blue sphere was made real to me that their newly won scientific information about the Earth and its sibling planets Mars and Venus. Suddenly, as a revelation, I saw the Earth as a living planet." (Lovelock, 2001, 241)

In the mid-1960s, James E. Lovelock, an atmospheric chemist employed by NASA to research the possibility of life on Venus and Mars compared the content of atmospheric gasses on these two planets to those of the Earth. He was struck by how the Martian atmosphere, mostly carbon dioxide, was chemically dead, fully oxidized, unreactive. It could be understood with chemistry and physics. The Earth's atmosphere, by contrast was volatile, with high amounts of reactive elements such as oxygen and nitrogen. There were questions—what maintained oxygen at twenty-one percent of total atmospheric concentration, when slightly more would create a conflagration? How could so much methane be pumped into the air, without changing overall levels? The data he collected on Earth's atmosphere could only be explained through biology. Lovelock concluded there was no life on Mars, or Venus and began investigating the Earth's unstable atmosphere. His findings led to the Gaia Hypothesis, a proposal that life on Earth has co-evolved with its atmospheric environment to form a geophysiological steady-state that ensures the continuity of good conditions for life. As a system, this involves the modulation of feedback loops that integrate the metabolic bi-products of living organisms from respiration, digestion, and waste production into a system that continually seeks equilibrium. Lovelock's 1969 hypothesis that Earth is a living organism was anticipated by earlier research including that by the Russian biologist V.I. Vernadsky. (Margulies and Sagan 1997, 156.)

While it is complicated to understand the science, the integrated nature of this bio-system is intuitively attractive. Gaia was imagined initially as a singular gigantic organism that included the earth's surface, waters, crust, atmosphere, and all resources,

living and inert. Air, water, and soil are understood not only as substances in themselves but as conveyors that supply materials to different layers of the atmosphere, producing a fluctuation of gases with the capacity of self-correction. In explaining a homeostatic living system, Lovelock and an early collaborator, microbiologist Lynn Margulies, point to how bees very precisely modulate hive temperature, moisture and other conditions. Combined biotic activity, from a forest's respiration to bio-geochemical cycles like rock weathering, sedimentation and oxidation, integrates with the metabolic activity of millions of species of microscopic organisms to contribute to a dynamic mix that incessantly circulates within the earth's atmosphere. The complexity of this proposal went against traditional science, which preemptively clears out contaminating information by extracting organisms from their environment, rather than promoting syncretic models. A Gaian framework demonstrates how scientific specializations inherently obscure complexity.

Although naming the hypothesis *Gaia*, after the ancient Greek Earth goddess injured Lovelock's scientific reputation, it tapped into a rich vein of pre-modernist cosmology. Responding to accusations that the idea of earth as single organism implied both a singular intelligence and an unproven teleology, Lovelock developed a model to demonstrate how planetary homeostasis can be achieved when organisms operate according to individual interests. In the Daisyworld model, clusters of light and dark daisies adapted to specific temperature ranges compete for solar exposure and impact the planetary surface temperature. Dark daisies tolerating lower temperatures will proliferate until they warm the planetary surface through their absorptive capability. Less tolerant of cool temperatures, light, heat-loving daisies take over until they cover so much surface that their white surfaces, through the albedo effect, reflect back the solar energy. In a chilling environment, black daisies begin to increase again. The model demonstrates how positive and negative feedback mechanisms change environmental conditions and provided a simulation that invoked the experience of living in place. (Lovelock, 1988)

The idea of earth as *Gaia* aligns with humanistic-cultural notions of place as sustenance and *dwelling*, and as beyond human, compelling an entire *animas*. And while the scale of human existence to a viewer from space is diminished so as to be negligible, the dimensions of a human through a Gaian lens might have impact. *Gaia* as a popular cultural attitude is part of a renewed techno-cultural ethics that favors the re-enchantment of nature. Lovelock, now called the "prophet of climate change" has been proven generally correct about climate equilibrium (although he is not really alone in this role of "prophecy"). He calls atmospheric warming "a fever." Writers after him extend the image of a living Earth by locating humans as a part of a larger body, asking us to imagine loci of damage on the earth in the terms of a living body that has the capacity to regulate, heal or degenerate, and of which we are a part, both complicit and dependant.

Lovelock's insight was to connect the general distant appearance of the planet to a useful way for understanding the minute nature of material evolution and interspecies

social production. His early collaborator Dr. Lynn Margulies contributed important biological insight to the project, for key to understanding the Gaia Hypothesis is not the gargantuan, but the tiny. Ecologists agree that if large mammalian life declines, bacteria, proctists and insects will still thrive. From Margulies we learn that it is the micro-animals, and the impact of their wastes from breathing, eating, shitting etc, that play the crucial hand in creating a livable atmosphere. Research from other fields expands the idea, creating a picture of life that challenges accepted versions of species competition, pointing to evolutionary achievements made through cooperation and interdependency.

Considering Darwin's last book, about earthworm biota, sociologist Eileen Crist finds it suggestive of a commons rather than a field of competition. "The[se] commons are not .. deliberately maintained, but consist in emergent biogeochemical phenomena such as element cycling, waste use, recycling, decomposition and regulatory feedback loops—in all of which living organisms, as interdependent players, have the leading role." (Crist, 2004, 165)

A SPECIFIC BIOSHPERE: YOUR BREATH INTO A BAG

The Gaian biosphere re-orientes the idea of "environment," by asking us to imagine a flux that moves materials around in order to understand the planet. The iconic *whole earth* as a symbol of the *environment* removes the viewer from such specificities. Anthropologist Tim Ingold challenges the fundamental logic of a *global environment*, as inherently technological and removed from experience with place and the senses, as if the environment was something we can step away from, as we view a globe. (Urry, 2000, 45-46) For Ingold, a *global environment* is an oxymoron. He contrasts the global concept with the spherical geometry of medieval world structures where there is a matrix of lived experience at the center, becoming more remote as it moves outward. Urry describes the production of this distance as a constructed visual preference that "reproduce[s] the alleged dichotomy between what is global and what is local." (46)

This is not unlike how microbiologists explain the cooperative evolutionary interaction between microbes and environment. The microorganism eats, shits and breathes, and in this production of waste, the nucleus of an *environment* begins when a localized pocket of air begins to form. Ingold also describes the local as enabling a different kind of attention than one can apply to what is in the distance, an attention both intimate and rooted in time and place (Ingold, 2000, 216). Looking for the signs of local life invites the renewal of social pedagogies and of new skills. The accompanying figure is puddle water magnified at 400x.

To shift in scale from the global to the microscopic is a conceptual starting point that produces experience and addresses problems of distance and objectivity. Returning from remote visions of an untouchable earth invites a look at the kinds of relationships humans maintain with microorganisms, wild yeasts (Figure 13), fungi and bacteria through our food production. Bacteria, for example, are the smallest, simplest form of earthly life.

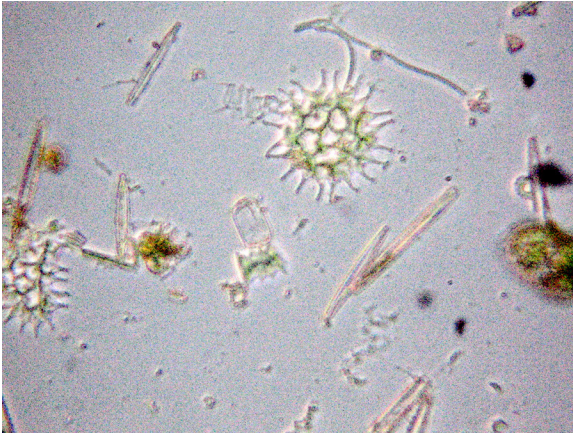


Figure 11.

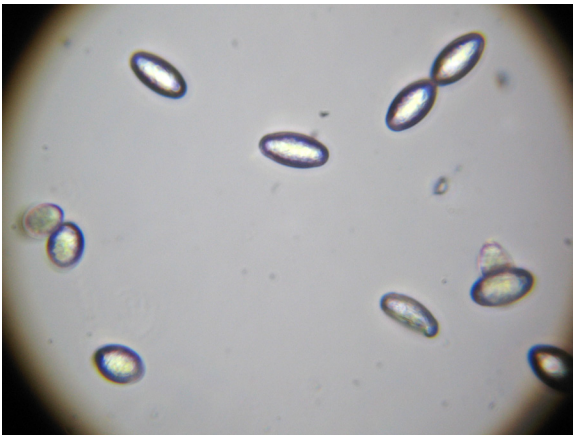


Figure 12.

We are taught to be fearful of this entire kingdom, rather than acquainting ourselves with it. Biologist Betsy Dexter Dyer's *Field Guide to Bacteria* invokes wonder by introducing bacterial signs that can be "read" in the field by amateurs. Bacteria are so diverse that scientists not only have not identified them all, they decline to make fine species distinctions. Lynn Margulis explains that the genetic material in bacteria is so unstable that, as an example-one could jump into a swimming pool with brown eyes, and have blue eyes upon getting out. (Margulis, 2006)

This kind of volatile sexiness –that the potential for multiple strategies of DNA exchange suggests-takes place outside laboratories without special instruments all the time. With cheap microscopes, people can examine microorganisms in ponds and puddles, observing, even with the naked eye, changes in coloration and aspect as the organisms mine the resources and minerals around them. The close up landscape is full of a plenitude both historically and biologically charged. In Figure 14, a group of people investigate extremophile micro-organisms that live in ponds where the saline southern end of San Francisco Bay intersects with commuter railroad road beds.



Microorganisms have been identified that share properties for mutual benefit; a photosynthetic one-celled animal might join up with a flagellate -with a tail, to produce a swimming photosynthesizing composite-hybrid. Such voluntary cooperative evolutionary strategies are now found to be part of our own composite nature as large animals too. Bodies without organs indeed!

Margulies and other biologists note that symbiotic and cooperative evolutionary strategies have been almost entirely ignored by scientific funders; symbiosis, like mutualism and the Gaian hypothesis itself are ideologically unpopular, as they flow against the normative currents of individualism and competition.

WAYS OF DISCERNING THE SMALL

How could one promote an imagination of the very small? What is the visual index or vocabulary that might challenge the persistent global image of the whole earth, with all of its liabilities? Conceptual interventions that demonstrate the social production of earth-as-system projects have a stake in making new meanings vis-à-vis global climate phenomena and, potentially, in influencing perceptions and behavior. I conclude with a few visual arts projects that create sutures rather than

Figure 13.

Gathering micro-organisms with biologist Wayne Lanier in Alviso, California, San Francisco Bay.

Source: author.



Figure 14.
 Amy Balkin. 2004-2009. *Public Smog*. Billboard in Doala, Cameroon. Source: <http://www.publicsmog.org/> Image credit: Benoit Mangin.

ruptures of connection, drawing together global systems with local investigations or interventions. While these projects operate on different frameworks, they attack the problem of disconnected representations by re-scaling parts of the atmospheric system by making the disconnections obvious or by re-connecting biological and social systems in unexpected ways.

In *Public Smog*, (Figure 15) a multi-year project that started as a website promoting futures in a smog market, artist Amy Balkin portrays the atmosphere as a commons created through the purchase and retiring of carbon credits. While the project articulates the problem of carbon emissions as human waste, it also turns critical attention to the artificial solutions created by financial markets.

Two projects concern themselves with the problem of our distance from the non-human entities that often are the basis for our own biological survival. In a 2002 installation called *Workhorse Zoo*, Julia Reodica and Adam Zaretsky examined our dependency on the lab and the lab animal through an exhibition in which they displayed themselves for a week in a clean room with eight commonly used lab species, including fungi, animals, plants and bacteria. They withheld outside food to challenge species that have lived, as Zaretsky noted, for generations in the laboratory to forage on their own, and perhaps even reproduce. The artists' antics in the observation chamber chaotically cobbled together activities associated with a biota and lifecycle, a performatively hysterical satire about how life removed by science from its landscape continues to try to produce life.

In his *Weather Diaries*, the late videomaker George Kuchar, drawn by the spectacle and adrenaline of extreme weather, made a yearly pilgrimage to the Midwest, where he stayed in cheap motels hoping to film a tornado. Usually, the storms eluded him, but pointing his camera at the motel television set, he would videotape daily newscasts and footage of the twisters that were about in the region. In the edited *Diaries*, these news updates appear interspersed with highly intimate images of a conceptually localized weather. In a motel's bathroom, mirrors, and windows, we see a man waiting



Figure 15.
 Frontispiece to Sachse de
 Lowenheimb Oceanus
 Macro-microcosmicus
 (1664) (from Wellcome
 Institute for the History of
 Medicine, London)
 Accessed at [http://history.
 nasa.gov/CP-2156/p97.htm](http://history.nasa.gov/CP-2156/p97.htm)
 on Feb. 12, 2012

for atmospheric changes from an air-conditioned motel room, using techniques of cinematography to distort perceptions of scale and distinction, as he muses obsessively and equally on the local weather and motel denizens, on the expulsions and working of his own digestive tract, and the more dramatic weather events displayed on the television. On a more extravagant scale, Olafur Eliasson, known for elaborate atmospheric installations, produced an indoor weather simulation for the Tate in 2003. The massive turbine hall was lit on one end with an aggregation of yellowish lamps forming a disk shape—a sun. A fine mist sprayed the air, and overhead was a faint mirror where spectators could see themselves. I include this installation not for the verisimilitude of the weather effect, but rather for how visitors found the simulated environment resembled church or a symbolic spiritual site, so much that a small religious assembly attempted to give services in the hall before getting evicted by the Tate. A different kind of example for its spectacular scale and perhaps hubristic ambition, it invoked a conscious cosmological experience for those who visited it.

Magical, enchanted nature is still associated with forms of cosmologies for many people. Ingold, in his discussion about the technological gloss of global frameworks, directly opposes these to a cosmological system. I think the problem is not with the technologies per se, but with questions of proximity and meaning that technological controls obscure. The most extreme perspectives contributed by Gaian thinkers imagine the human as an extension of the earth, diminishing human centrality in relation to the system as a whole.

Like the ancient concepts of globe discussed by Cosgrove, Gaia is not really new. The *Oceanus Macro-Microcosmos*, from a 1664 anatomy book illustrates and analogizes “between the circular motion of water from and back to the sea and the circular motion of the blood to and from the heart.” Margulis and Lovelock included this image in their articles and presentations in the 1970s as an illustration of the closed system in which our atmosphere circulates. (Margulis and Lovelock, 1981, 97) There are two circles, one above, the other below. At top, rivers flow down a mountain like veins, winds are produced by a trans-evaporative cycle, and a tiny man in the foreground pumps water to animate an encompassing hydrological system. At bottom, a partially splayed human show the location of veins, arteries, heart and lungs, foregrounding a relationship between body, water, and landscape is fore-grounded. By juxtaposing two views, the difference of scale between the wide shot of the earth and the close-up of the grounded life that breathes into its atmosphere are resolved.

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