INCIPIT GAIA THE GROTESQUE GARLANDED WITH SATELLITES: RE-IMAGINING THE ANTHROPOCENE AS A POST-PLANETARY AGE

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ABSTRACT: Over the last decades environmentally engaged literary critics and historians have begun to embrace a characterization of our current age as planetary. This essay presents a somewhat contrary view. It argues that to fully appreciate the gravity of our current situation we must also attend to what lies beyond the planet, acknowledging the degree to which our current scientific understanding of the Earth comes from extraterrestrial remote sensing technologies, and so historically is a product of the Space Age. Drawing on this insight, and in light of the increasing degradation of near space environments as a result of New Space capitalism, it argues that the Anthropocene ought to be re-framed in extra-planetary terms so as to include anthropogenic environmental degradation taking place on planet Earth but also beyond the limits of the atmosphere. Embracing the Anthropocene as post-planetary involves shifting consciousness and care outwards to include the extended critical zone of the impact of our artifices as opposed to limiting this environmental consciousness to the natural limits of our planet and its atmosphere.

KEYWORDS: Anthropocene; Capitolocene; Environmental humanities; Outer space; Astroculture

Debris…much, sharable
Pitch TVCDAP Starts Here…Modor
PitchDap Bankrupt Stoker[1]
-- Moonbit, James E. Dobson and Rena J. Mosteirin

[1] Dobson, James and Moseirin, Rena, *Moonbit*, Santa Barbara, Punctum, 2019, p.114.

PLANETARY OR POST-PLANETARY?

Over the last decades environmentally engaged literary critics and historians have begun to embrace a characterization of our current age as planetary. The planetary age is characterized by—in the words of Dipesh Chakrabarty—the emergence of planet Earth "as a matter of broad and deep human concern alongside more familiar apprehensions about capitalism, injustice, and inequality."[2] The planetarization of our collective care has been inseparable from the diagnosis that we now live in the Anthropocene, an era in which, to echo Steffen, Grinevald, Crutzen, and McNeill: "the human imprint on the global environment has now become so large and active that it rivals some of the great forces of Nature in its impact on the functioning of the Earth system."[3] Stated somewhat differently, within the planetary age, scientists, writers and virtually everyone else are beginning to recognize that the Earth System—described by planetary scientist Tim Lenton as the interrelated planetary totality of physical systems extending from the top of the atmosphere to the whole interior of the planet is being radically changed by human actions—and for the worse.[4] This has led, again quoting Chakrabarty, to a collapse of the distinction between "natural history" and "human history," such that the two, in the Anthropocene understood as a planetary age, have become enmeshed.[5] In response to this rising tide of concern for a changing planet, leading thinkers such as Bruno Latour are urging us to "come back to Earth," to embrace "that which is experienced from close up," and so historians, philosophers, sociologists and other environmentally concerned humanists are engaged in efforts to rethink our disciplines in planetary terms.[6] This essay, however, shall present a contrary view. It argues that to fully appreciate the gravity of our current situation we must also look beyond the planet, recognizing and acknowledging the degree to which our current understanding of the Earth is a product of the space age, and more specifically a

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[2] Chakrabarty, Dipesh, *The Climates of History in a Planetary Age*, Chicago, University of Chicago Press, 2021, p.1.

[3] Steffen, Will, Grinevald, Jacques, Crutzen, Paul and Mcneill, John, 'The Anthropocene: conceptual and historical perspectives' *Philosophical transactions of the Royal Society*, Series A, 2011, Pp. 842–867, p. 369.

[4] Lenton, Tim, *Earth System Science: A Very Short Introduction*, New York, Oxford University Press, 2018. Kindle Edition, p.17.

[5] Chakrabarty, *Climates*, 26.

[6] Latour, Bruno. *Où suis-je ?*, Paris, La Découverte, 2021, pp. 26-27.

result of research carried out on Earth and on other planets—using various kinds of remote sensing technologies, i.e., satellites, drones, rovers, and the like. Drawing on this insight and taking on board the idea that the very material conditions for coming to know how the Earth system functions lie beyond the Earth system, as well as the ongoing extension of extractive capitalism out beyond the limits of the planet, that the Anthropocene ought to be re-framed in post-planetary terms, as a phenomenon describing anthropogenic environmental degradation that is quite obviously taking place on planet Earth, but which is also, and increasingly, taking place beyond the limits of the atmosphere. In this sense, we argue that we should now understand the Anthropocene not as a planetary age, but rather as a post-planetary age, and we seek to make clear what this shift in consciousness implies.

ON THE EMERGENCE OF THE PLANETARY AGE

The current conception of the planetary age should be understood as the result of a space age counter-Copernican revolution that interpreted accounts of the experience of the voyage beyond the Earth in such a way as to re-place the Earth at the center not in the spatial center of the physical universe, but rather at the core of the semantic universe. In doing so, the current advocates of the planetary age interpret the meaning of living on a planet in a way that is wholly different from the sense of being planetary employed immediately following the Copernican and Galilean discovery of what Kuhn called the "planetary Earth."[7] Characteristic of the Galilean usage is the idea that Earth is just one planet among others rotating around the sun and not, as was thought by Ptolemaic and Aristotelian cosmologists, the cosmic center. Before the coming of the planetary age, the Earth was understood in such a way that its cosmic significance mirrored its physical location in the universe, which is to say that it was understood as being generically equivalent to other planets. Leading *lumière* Bernard le Bouvier de Fontanelle, for example, speculated that "the moon was inhabited because it resembles the Earth, and the other planets as well, because they resemble the moon."[8] Later thinkers, such as Nietzsche, diminished the significance of our

[7] Kuhn, Thomas, *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought*, Cambridge, Harvard University Press, 1957, p. 228.

[8] Fontenelle, *Entretiens sur la pluralité des mondes*, Paris, Flammarion, 1998, p. 198.

planet (and ourselves) below equivalence by noting that the Earth was but one "star" located in "some far off corner of an outer space which was poured out of innumerable glittering solar systems."[9] This view of the cosmic mediocrity of the Earth perhaps reached its high point among early twentieth century space visionaries such as Russian rocket scientist Konstantin Tsiolkovsky, who confidently asserted that the Earth was but a cosmic "cradle" whose shackles humankind would soon outgrow as it realized its cosmic colonial destiny.[10]

Yet the new planetary thinking breaks with this older tradition by putting Earth at in the referential center of the cosmos. That this is the case becomes clear when we compare Chakrabarty's claims that nature and history are now intertwined against the views of the relationship between nature and history that are put forwards by Big Historians such as David Christian and Eric Chaisson.[11] While it makes sense to say that nature and history are one with respect to the Earth, and this idea perfectly well describes the situation that is prevailing in the "nature" of the Earth System, it is patently absurd with respect to a notion of nature that is assumed to refer to the cosmic totality. To offer but one point of reference, consider how absurd Chakrabarty's idea that nature and human history are entangled seems when applied to what is happening on exoplanets off Alpha Centauri. That said, and despite its non-univocal application of the concept of nature, the new planetary thinking does not claim to be myopically restricted to the Earth. Chakrabarty notes that Earth System Science, the scientific paradigm that he relies on to argue that human history is affecting biological history, is derived from comparative planetology, and so always keeps "other planets in view." In saying this he reveals a certain degree of what Isaac Asimov has called "planetary chauvinism," namely the idea that there are only planets in space, and part of our task in this paper will be opening up our eyes to the fact that there are not only planetary environments in the universe, even if it will also be devoted to defending precisely why an extended view on the planet, and not the fully open totality of the cosmos, ought to remain the object of

[9] Nietzsche, Friedrich, "Über Wahrheit und Lüge im aussermoralischen Sinne" in *Kritische Studienausgabe*, ed. Colli, Giorgio and Montinari, Mazzino, vol I, Berlin, De Gruyter, 1999, 875-890, p. 875.

[10] Tsiolkovsky, Konstantin, "The Future of Earth and Mankind," *Russian Cosmism*, ed. Boris Groys, Cambridge, MIT Press, 2018, Kindle location 1997.

[11] Chaisson, Eric, *Epic of Evolution*, New York, Columbia University Press, 2007, p.7.

ecocritical concern. But leaving that aside for now, suffice to say that the new planetary thinking clearly imagines the Earth as a cosmic exception, as the one and only place in the universe that really matters to us as human beings.

In light of our claim that we must become post-planetary, it is important to emphasize that the historical truth of the planetary era, which is to say its factual emergence as a different epoch in human history from the planetary Earth era, was inextricable from the first human steps beyond the Earth, or rather more precisely from the first reports sent back by drones, probes, rovers, and people from elsewhere in the solar system. Arguably, no single image gave the collective imagination a greater shove towards the planetary than the image of the "whole Earth" seen from space.[12] Understanding this impetus, however, requires taking account of how their reception was colored by what might be called the great deception of the arrival on the Moon. If we went to the Moon, it was because we had the expectation—perhaps a trace of Fontanelle's Enlightenment optimism—that there was something there to worth seeing. However, the experience of the reality of the moon cooled expectations. Astronaut Bill Anders, the man responsible for the famous *Earthrise* photo, likened the moon to "a dirty beach…with lots of footprints on it," lacking "definition" and made up of nothing but "bumps and holes." [13] The moon was an anticlimax. But if space sucked, the Earth seen from space was a revelation. Frank Borman, a member of the Apollo 8 mission, claimed that Earthrise was "the most beautiful, heart-catching sight of my life, one that sent a torrent of nostalgia, of sheer homesickness, surging through me. It was the only thing in space that had any color to it. Everything else was simply black or white. But not the earth."[14]

The collective cognitive shift set in motion by the uncovering of the reality of the moon and the rediscovery of Earth from space was perfectly dramatized by American Poet Laureate Archibald MacLeish in his poem *Voyage to the Moon*, a

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[12] On the role of these images in the formation of planetary consciousness and the environmental movement in general see Poole, Robert, *Earthrise: How Man First Saw the Earth*, New Haven, Yale University Press, 2008. Also Cosgrove, Carmen. *Apollo's Eye: A Cartographic Genealogy of the Earth in the Western Imagination*, Baltimore, Johns Hopkins University Press, 2001.

[13] Quoted after Benjamin, Marina, *Rocket Dreams: How the Space Age Shaped our Vision of a World Beyond*, New York, Free Press, 2003, p. 49.

[14] Benjamin, *Rocket Dreams*, p. 48.

text composed just after he watched the first Apollo landing. The first lines of the poem register the excitement and anticipation, calling the moon a "wonder" an object of "longing past the reach of longing,/ a light beyond our light." Yet upon arrival, the poet describes the moon as a place of "cold" "death" and "unfathomable emptiness," while the Earth, when it appears on the horizon, becomes what the moon once was, and perhaps even more:

> wonder to us past the reach of wonder
> a light beyond our lights, our lives, the rising
> earth
> a meaning to us,
> O, a meaning!"[15]

From space, the Earth was reborn as the essence and totality of all meaning. It assumed a place in the center of the semiotic universe. Philosopher Peter Sloterdijk summed up this new paradigm perfectly when he interpreted the lesson of the moon landing to be the teaching that "life was a planetary phenomenon" and that space was "void of significance."[16]

POST-PLANETARY CONSIDERATIONS

The new planetary discourse situates the Earth as the heart of cosmic significance. Yet it is also and paradoxically true that this re-valuation of the Earth, and indeed the development of our current picture of the Earth system and its functioning, would have been impossible without incoming data from space. Consider what NASA did during the period that it wasn't launching manned rockets to the Moon and Mars. It underwent what former NASA administrator Sally Ride called "Mission to Planet Earth," a large scale attempt to use space technology to observe the Earth that has culminated, among other things, in the development of Earth System Science, the invention of Gaia, and the gathering of much of the data informing our current picture of the critically changing planet.[17] In this way, any value that we attribute to the Earth depends

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[15] Macleish, Archibald, *Collected Poems,* New York, Houghton Mifflin, 1990, pp. 17-18.

[16] Sloterdijk, Peter, *Im Weltinnenraum des Kapitals*, Frankfurt a.M., Suhrkamp, 2009, p. 24.

[17] Ride, Sally, *Leadership and America's Future in Space: A Report to the Adminstrator*, Washington: NASA Press, 1987, esp. pp.23-26. Erik Conway's work fascinatingly documents the leading role played by NASA science

on sites in near space, sites whose environmental value, or even existence as sites within environments, would tend to go unrecognized, since they are situated outside of the planetary system as it is defined by scientists and cared for by environmentalists.

The exteriority of places in near space from planetary environmental concerns would not matter if it were not for the emergence of the new space economy. Sometimes called Space 2.0, the new space economy refers not to a rebirth of hopes for creating a human future in space so much as it describes a shift in the financing of human space efforts. While New Space advocates such as Elon Musk do take up Astrofuturist discourses about colonizing other planets that were promulgated by earlier space visionaries, the primary novelty introduced by new space is a coupling of the capitalist economy with space expansionism. Where previously governments financed off-planet projects either to advance knowledge or symbolically consolidate their technopower, now individuals are investing in space technologies in the interest of accruing short-term gains (which does not, of course, preclude them also engaging in what might be called blackwashing, a space version of greenwashing, in which bold pronouncements about securing the 'long-term future of humanity' are presented as justifications for projects primarily aimed at profiting themselves and their investors). In practical terms, the new space economy includes a wide range of activities, from the development of space tourism to the installation of space infrastructure to support 5G and 6G satellite-supported internet, with other recent developments including the construction of the in-orbit industrial park Orbital Reef. More speculative—i.e. as yet unrealized but nevertheless currently funded—projects include off-world mining ventures and in-space manufacturing plants. Most, (but not all) of the current space economy is Earth-bound insofar as the monetization of investments comes via services provided to clients on Earth, but it would be false to say that the new space economy is thereby terrestrial, since these technological installations are indeed located out beyond the atmosphere. The emergence of the new space economy, then, marks a turning point in economic history that should also be understood be coupled to a shift in ecological thinking, to the extent that environmental historians must now begin

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and technology in the development of our understanding of planetary climate change. Conway, Erik, *Atmospheric Science at NASA: A History*, Baltimore, Johns Hopkins University Press, 2008.

to attend to and caring for environments that exist beyond the limits of planet Earth.

In this light, I argue that the Anthropocene concept can be extended off planet by resizing the current Earth system to encompass the limits of what Peter Haff calls the "technosphere" "the large scale-networked technologies that underlie and make possible" modern civilization and the modern economy.[18] In this way, the real and extended impact zone, or extra-planetary human footprint becomes the basis of our environmental thinking, not only the 'natural' limits of our habitat understood as the Earth system. Such an extension seems to make all the more sense if we are to understand the Anthropocene as synonymous with the Capitolocene, which is to say that we understand, following Jason Moore, that the principle "driver" of our environmental crisis is the pursuit of "cheap nature," i.e. extractive zones which can be inexpensively appropriated by capital.[19] Needless to say, once we acknowledge this, we see that the devaluation of the rest of space at the expense of the Earth which lies at the core of planetary thinking is complicit in signifying outer space as a vast expanse of cheap and even environmentally meaningless nature.

WHY SPACE ENVIRONMENTS MATTER

Of course, the most obvious objection to reframing the Anthropocene in post-planetary terms is the idea that space environments simply don't matter. No one—not even microbes—apparently lives in LEO, and so no one is clearly hurt by the growth of the new space economy. This is exactly the dominant logic put forward by planetary thinking. Space is cheap, it is something like the spatial equivalent of the *homo sacer* in Agamben's thought, that which can be killed without being sacrificed, with the devaluation of space being already implicitly accepted in the constitution of the planetary imaginary.[20]

But are space environments so cheap as to make their loss no sacrifice? One

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[18] Haff, Peter, "Technology as a Geological Phenomenon: Implications for Human Well-Being," *A Stratiographical Basis for the Anthropocene*, ed. Waters, C.N. et al., London, Geological Society Special Publications, 2014, pp. 301-2.

[19] Jason Moore, *Capitolocene or Anthropocene? Nature, History and the Crises of Capitalism*, New York, PM Press, 2016.

[20] Giorgio Agamben, *The Omnibus Homo Sacer*, Palos Altos, Stanford, 2017.

way of answering this question is simply to consider the significance of what is already happening because of the vast expansion of in-space objects due to the growth of the new space economy. In 2021 satellite launches went up 27.9% compared to 2020, a year which had already eclipsed all previous years in terms of launch numbers.[21] This rapid proliferation of satellites, which is reflective of what Joseph Pelton has described as the "gold rush" mentality within the new space community, is increasing incidences of damage caused to remote sensors and launches by in-space debris.[22] This puts at risk not only satellites that are in space, but also human beings in the ISS and at the Tiangong space station. It is also increasing the risk of Kessler syndrome, a chain reaction in which space object crashes into space object in an ever-growing cascade of random collisions that may well culminate in the production of a wave of tiny particles so thick that Earth cut off from space and all our space stations and satellite installations are annihilated.[23] The likelihood of impact events is obviously favored both by the rapid expansion of the space economy and by the "fast and cheap" approach to innovation and deployment favored by Space X and other commercial space companies.[24] Such an event would basically kill satellites. No people or animals would be killed, no part of the Earth system would be affected. Yet to understand the significance of this event we must think about ecological impacts differently. We need to see that even if space junk may not directly affect what happens below the boundary of the Earth's atmosphere, some of the satellites that would be destroyed or damaged in such an event would be the same ones with which we currently track changing weather patterns and ocean currents, determine losses of arctic ice, oversee the felling of forests and the loss of habitat, not to mention the provide data necessary for producing smart cities and other optimizations of our currently unsustainable modes of living.[25] Somewhat restated, the destruction of space environments would not so much destroy our environment,

[21] https://www.geospatialworld.net/blogs/how-many-satellites-are-orbiting-the-earth-in-2021/

[22] Pelton, Joseph, The New Gold Rush: The Riches of Space Beckon!, New York, Springer, 2016.

[23] Gorman, Alice, *Dr Space Junk vs The Universe*, Cambridge, MIT, 2019.

[24] On fast and cheap at Space X, see Berger, Eric, *Liftoff: Elon Musk and the Desperate Early Days that Launched Space X*, New York, Harper Collins, 2021, p.33.

[25] Gabrys, Jenifer, *Program Earth: Environmental Sensing Technology and the Making of a Computational Planet*, Minneapolis, University of Minnesota Press, 2018, p. 4.

as deprive us of the means that currently allow us to monitor and understand our Earth environments. This amounts to saying that were the Kessler effect to occur, we could no longer effectively monitor and create data-driven models of the Earth system and its anthropically-driven changes. That—in no uncertain terms—would be a very bad thing.

THE LIMIT PROBLEM AND THE LOGIC OF THE POST

As Earth System scientist Timothy Lenton explains, the first step in modeling a system is to "identify your system and its boundaries," in other words, to decide what is "within the system and what is outside it." [26] In the case of the Bretherton model used by ESS, this boundary is the top of the atmosphere, but a post-planetary model of the Anthopocene would need to situate that boundary elsewhere, i.e. somewhere short of the totality of the cosmos that is taken as the ultimate system by Big Historians, but farther out than the limits of the terrestrial atmosphere. Yet such limit-setting is easier said than done, at least in part because of what might be called the observation paradox. The planetary age in general is a product of local observations of the Earth around us, coupled to global observations of the earth as it appears in the images and other non-visual data gathered and transmitted back from space, but in its purely planetary form it leaves unthought and unobserved the extra-terrestrial environments around those remote sensors that make our observations of the Earth possible. Yet attending to these means of observation, observing the sensors that observe the Earth itself, would require new remote sensors, in deeper space, which in their turn might demand yet more remote sensors, *ad infinitum*. In other words, practically encompassing and monitoring the techno-sphere as such is impossible. But it is also the case that all observational boundaries are to some extent ontologically arbitrary, even the boundary between the Earth system and space, in light of the very real and very measurable impacts of the sun, solar weather, and comets on the Earth's geological and climatological history. This compromise status of posited limits, however, is no critique of the value of monitoring and studying systems, but it is one of the reasons why here I will not argue for a specifical new frame, but content myself with insisting, more vaguely, that we must engage in post-planetary reflections and that we must also be open to the

[26] Lenton, *Earth System Science*, p.14.

idea of monitoring space assets, one the understanding that it is not so much putting things in space that is problematic, but the rapid acceleration of space expansionism in the name of short term profit that poses questions.

This insistence on the post- is meant to counter the idea, put forward by Michael Gormley, that by expanding our thinking—and our technosphere—out beyond the Earth that we will somehow enter into a post-Anthropocene, an "Astropocene" or a "universal ecosystem," i.e. a larger system in which we are not, and may never become, the dominant drivers of change.[27] This is so precisely because humankind is either already in the universal ecosystem (which is how the Big Historians interpret history), or because in going to space we will ever remain in local ecosystems within a yet larger space environment, say the Earth-Moon system or the Earth-Moon-Mars system but never a total cosmic total system. This is so not only because having a system depends on positing a boundary, but also because the extension of the techno-sphere out beyond the Earth is never to the totality of the cosmos but always to and from some location in placed space. It is also arguably true that in systems with little or no life—as is the case in most of near space—the entropy increase caused by the appearance of even one living being—either humans or technologies—is relatively important. To give a factual example, as Alice Gorman has pointed out, the Moon is already littered with numerous traces of the human passing, including geological evidence—literal footprints—persisting from the first moon landings. But those traces of our lunar heritage have already been partially effaced not by space weather or other natural factors but by anthropogenic detritus coming from other launch projects over the course of the last half century.[28]

As our technosphere extends so too will extend the Anthropocene —at least insofar as this extension is coupled by environmentally destructive cultural practices. In this light, Gormley's idea that there could be an Astropocene , or a return to an extra-terrestrial state of nature is more a symptom of the defects inherent in the planetary framing of reality than a real description of any future human relationship to the extraterrestrial. It results from extraterrestrial places being imagined with insufficient granularity and attention, namely as the

[27] Gormley, Michael, *The End of the Anthropocene*, London, Lexington, 2021.

[28] Gorman, *Dr Space Junk*, ch.5.

negative or repressed made present, as something akin to the quintessence of space in space, and not as real and placed sites. Gormley's reading of Weir's *The Martian* is thus a version of the planetary fantasy of the extraterrestrial that Timothy Morton has recently descried—with reference to *Star Wars*—as hyperspace, which in his mereology amounts to a place beyond our local and planetary framing of space and time and possibility and impossibility, a sublime manifestation of the negative become present, somewhat akin to the experience of Nirvana in the Buddhist imaginary.[29] But imagining extraterrestrial places in this way only encourages blindness: Gormley imagines Mars not as Mars, but as a version of utopia, and thus falls prey to positively constructed ideologies aimed at encouraging Mars colonization efforts, such as the efforts made by NASA scientists to circulate images of the red planet possessing of a familiar, and even nostalgic, wild-west quality, that have been so fascinatingly documented by Janet Vertesi.[30] There is no escape from the Anthropocene, just as there is no escape from our technosphere.

It is part to resist such fantasies that we have chosen to characterize our current situation as post-planetary. The fact that the substantive remains the planet reminds us of the fact that we still do live on planet Earth, while the post- incites us to draw our attention outwards, prompting us to acknowledge that our impact zone extends out beyond the limits of the Earth system. By maintaining a focus on the planet, the intention is to stop short of claiming that we live in a universal environment in which our own agency—and so our own responsibility—is inconsequential, while focusing our attention, and sense of responsibility, on a yet more expansive sense of what is real and what matters than is normal within planetary discourse. In a way, the post-planetary Anthropocene substitutes an extensible artificial threshold—the limit of the technosphere—for a firm natural threshold—the limits of the atmosphere. Such a substitution follows completely in the line sketched out by Chakrabarty when he suggests that human history has become one with the natural history of the planet, though it does so in a way that that is better anchored in the dynamic

[29] Morton, Timothy, *Spacecraft*, New York, Bloomsbury, 2022, pp. 53-92.

[30] Vertesi, Janet, *Seeing Like A Rover: How Robots, Teams, and Images Craft Knowledge of Mars*, Chicago, University of Chicago Press, 2015, esp. ch.8.

historical reality of the human relationship to the cosmos.

Yet there is no denying that this proposal stands at countercurrent to the dominant line of ecological thinking on the Anthropocene, insofar as it quite frankly assumes—at a minimum—that the future of the Earth system will be steered by us, and with reference to the data coming in from high-tech remote sensors in orbit, and not by some Gaia figure of a re-enchanted nature who will, once we cease our climate forcing, magically take things back in hand. The post-planetary Anthropocene thus builds into its theoretical framework a striving after what David Grinspoon has described as a "good Anthropocene."[31] This may seem objectionable. Clive Hamilton for example, has suggested that the good Anthropocene is a "failure of courage, courage to face the facts," while Elizabeth Kolbert has tweeted that "good & Anthropocene" are "2 words that probably should not be used in sequence."[32] Yet despite this resistance, and obviously acknowledging the stupidity of rushing ahead with attempts to Geo-engineer or terraform the planet, it seems that there is no rational way of dealing with our current situation other than by using technology, including space technology, to gather data on our changing planet and to adapt our activities accordingly. These data-driven adaptations of our behavior are nothing less than strivings towards a good Anthropocene, and continuing these efforts demands not only observing the Earth from space, but also striving to attend carefully to the environments and the environmental impacts linked to our means of observation.

TERRA IN THE HOSPITAL WITH BIOSENSORS

The planetary age was born out of a feeling of hope. The Earth was re-envisioned, no longer seen as a wasteland or "as if the earth under our feet/ were/ the excrement of some sky" as William Carlos Williams unforgettably put it in 1923. Rather, to quote astronaut Jim Lovell, it was the Heaven that you go to "when you're born." [33] This becoming heavenly of the Earth surely influenced the birth of the environmental movement to such a degree that, as philosopher

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[31] Grinspoon, David, *The Earth in Human Hands*, New York, Grand Central Publishing, 2016, p.242.

[32] Quoted in Grinspoon, Earth, p. 242.

[33] Williams, William Carlos, "For Elsie," *The Collected Poems of William Carlos Williams*, Vol. 1, ed, Litz, Walton and MacGwan, Christopher, New York, New Directions, 1991, p. 218. Lovell is quoted after Bezos, Jeff, *Invent and Wander*, New York, Harvard Business Review Press, 2020, p.244.

Hans Blumenberg has pointed out, 1969 was both the year of the moon landing, and the year in which the term "environmental protection" (*Umweltschutz*) was introduced into the German language.[34] Yet if our new sense of the importance of the environment is salutary, some of the inheritances of this new planetary imaginary are less so. As Blumenberg himself pointed out, the very elevation of the Earth to a kind of paradise reborn was only accomplished due to what he calls a "back-projecting overinterpretation," what in other terms we might call a nostalgia-tinted gaze, which was blinded by the distance, and which saw the whole Earth—"pure" and beautiful—as if there were "no human beings, no works and rubbish, no desertification."[35]

Thus blinded, the figure of the planet or the whole Earth could be nostalgically imagined to signal the possibility of a return from the condition that, writing in the immediate aftermath of the launching of Sputnik, the first artificial satellite, Hannah Arendt claimed that we suffered from "world alienation," by which she meant a historically and science and technology generated feeling of separation between the field of technologically mediated knowledge and the grounded Lebenswelt of lived experience. But world alienation could also be interpreted as a gap between the Earth and the Earth, the one that we saw, and the pastoral essence that we imagined that we glimpsed from space. For Arendt, Sputnik and the space program were symptomatic of this alienation because they were expressions of a technological relationship to the world, one that failed to appreciate the intimate entanglement of life and planet, the fact that "the Earth is the very quintessence of the human condition, and Earthly nature, for all we know, may be unique in the universe in providing human beings with a habitat in which they can move and breathe without effort and without artifice." In such lines we can already see how a certain romantic environmentalism, with its longing to return to the celestial Earth of the whole Earth, saw technology and technological thinking as contributing to the alienation from, and destruction of, the Earth, in a literalization of the "transcendental homelessness" that Arendt's teacher, Martin Heidegger, characterized as the Being of modern humankind. [36]

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[34] Blumenberg, Hans, *Die Vollzahlbarkeit der Sterne*, Frankfurt a.M., Suhrkamp, 2011, p. 439.

[35] Blumenberg, *Sterne*, p.440.

[36] Heidegger, Martin, *Die Grundbegriffe der Metaphysik. Welt-Endlichkeit-Einsamkeit*, Frankfurt a.M., Klostermann, 1983, p.12.

But as we discover the Earth—and we are now doing this, and in a large part thanks to ever better satellite images and coverage which correct the myopia of the astronauts' views—we do not like what we find, for the Earth that we thought we knew reveals itself to be what Bill McKibbon calls "Eaarth," a "tough new planet." It is only in pastoral fantasies that Earth has been inhabitable without effort or artifice, which is not to say that environmental degradation is itself an illusion or false problem. Nevertheless, the deeper problem with the planetary imaginary is its failure to acknowledge the existence and meaningfulness of things extra-terrestrial, which is not to say that this meaningfulness extends to all 'outer' space. The idea that the planet is somehow a self-enclosed unit walled off from the cosmos, the only thing of meaning and significance in the universe, was never factually coherent in the first place given the very real geological evidence of the impact of asteroids and solar weather on the long history of the planetary system. Planet-centric holism is only thinkable at the cost of bracketing out a great deal of reality, at the cost of pretending that we have considered the whole when we have thought only about the planetary system or even about the signifier Earth as it is imagined by finite human subjects. Surviving the Anthropocene cannot happen by cultivating nostalgic entanglements to an enclosed locus amoenus invented out of myth, myopia, and inattention to mediators, but rather demands courage and imagination to face immensities and complexities that are perhaps not as we might otherwise desire. The Earth mother of the present, this being emergent from the entwining of the human and natural history of the planet, is not a blue pearl or marble but a patient on an operating table, a grotesque cyborg being surrounded a garland of remote sensing devices which monitor her every vital sign, and in so help us to understand which pharmaceuticals, which poisons that heal, which might permit her to survive. She is no longer a natural planet but an artificial being kept livable for us and our co-evolved creatures only at the cost of endless monitoring and adjustment.

Few modern writers dare to challenge us to face up to this aspect of the Anthropocene hypothesis, to strive to encourage us to see imagine Earth as grotesque, imperfect, prosthetic, and yet lovable. Kim Stanley Robinson is one of these, and his recent The Ministry for the Future depicts the Earth of today and perhaps tomorrow with brazen eyes. A tome too vast to easily summarize, dealing with everything from economics to geo-engineering, Robinson strives to

depict a future in which humanity engages, "over the long haul," to produce a historical ledger which includes "more good than bad." Somewhat shockingly given the Gaian pieties of much contemporary ecological naturalism, Robinson's book begins with an account of the events leading up to the first attempts at stratospheric aerosol injection, i.e. geo-engineering, and then follows with passages describing the new faces of the Earth, including a fascinating evocation of the future face of the Arctic Ocean which exposes fully the aesthetic challenges inherent in prompting us to acknowledge and love the Earth that has become.

In Robinson's warmed future the Arctic's vast expanse of ice is melted, but to the "great shock" of Robinson's characters, the sea is now yellow, with this color resulting from dye which has been put in the ocean to alter its albedo, since "yellow water didn't allow sunlight to penetrate it, and even bounced some sunlight back into space." This yellow tide, Robinson notes, "looked awful, like some vast toxic spill." More to the point, it was in a way just that: as Robinson explains, the dyes used were a mix of petroleum-based and natural dyes, with the first being "only mildly carcinogenic" and the latter being "only a little bit poisonous." Yet despite this toxicity, despite this ugliness, "the energy and heat savings in terms of albedo were huge—the albedo went from 0.06 for open water (where 1 was total reflection and 0 total absorption) to 0.47 for yellow water." Translated into somewhat more general terms, the monstrous yellowing of the Arctic Ocean sufficed to keep the world from tipping over "irrevocably into jungle planet." Robinson's Arctic is yellow, his Earth is putrid, but we can still find it lovable, and his characters still fight to preserve its future—and their own. It is an Earth that has been changed utterly, but in such ways that the worst effects of global system change—mass extinction—have been avoided and a terrible beauty lives on.

One of the limits of Robinson's book, however, is that despite its unflinchingly modernistic depictions of beloved Earth beyond pastoral nostalgias, he fails to offer us much of a sense of extraterrestrial zones that are experienced via technologies but by human observers. Put somewhat otherwise, while Robinson does embrace non-human narrators, including dedicating the second chapter to an unnamed narrator that seems to be Gaia herself, his narrators remain sensual beings, not computers running forms of consciousness that are other than our

own. Yet to fully grapple with the extra-planetary techno-sphere we doubtless need to cultivate forms of empathy that seem to go beyond what we can experience, and narrate, as human observers, while resisting the temptation to merely imagine computers as our super-intelligent others. Bits of space junk travel around the Earth at more than 17,000 miles per hour, meaning that even if we were in LEO we could not see space junk before it struck us. What can track and avoid space junk are remote sensing technologies coupled to computers capable of treating data inputs at many times the rate available to human minds. A bridge towards grasping the alien experience of these dwellers of the next environmental frontier is rendered—in all its alien monstrosity—in James Dobson and Rena Mosteirin's Moonbit, a collection of poems—if that is the right word—remixing the segments of code from the Apollo Guidance Computer (AGC), in other words, transforming into verse instructions given to the computer system used to ensure that the first Moon landings.

As the authors explain, their investigation bears on "the idea of computer code and the affordances and limitations of a language that is machine-oriented yet human authored," but it is equally true that this code bears on the ways in which humans, via code, can develop successful and machine affordance mediated interactions with the utterly alien environments of outer space.[37] As Don Eyles, the NASA and MIT programmer who wrote the source code for the lander and for Dobson and Mosteirin's writing explains, what he built was the "the brain and nervous system for the Apollo spacecraft."[38] That mechanical brain and nervous system were ecologically evolved—even if that is perhaps not the right word—for their extraterrestrial environment, a product both of the mechanical aspects of the space craft and its computers, the fragile biophysical character and capacities of the flesh and blood astronauts, and of the specificities of the moon environment, its peculiar gravity, its available points of data-driven orientation such as the Earth, the sun, and the stars, and its uneven surface of boulders, craters, and rocks. Much of this poetry—by which I mean ultimately the coded text which is presented to human readers, and which is already

[37] Dobson, Mosteirin, *Moonbit*, p. 15.

[38] Eyles, Don. *Sunburst and Luminary: An Apollo Memoir*, Boston, Fort Point Press, 2018, Kindle Edition. Loc.441.

something of a halfway between the machine language used by the ship's computers and the code language employed by Eyles—is almost overwhelmingly incomprehensible, and not only because it is in a code we may not know, but also because it encodes variables, i.e. extraterrestrial realities—that may well be unimagined, or even invisible to human eyes or imperceptible to the human sense of orientation:

GOTO **RPREXIT**
RTORPA **CALL** **#EARTH COMPUTATIONS**
EARTHMX
GOTO #MPAC=L=(-AX, AY, O) RAD B-o
RTORPB[39]

Of course, other poems in the collection have been more strongly re-worked into humanly meaningful patters which seem to at least beckon on the edges of sense to even the code-illiterate reader, perhaps at the cost of becoming functionally irrelevant to the machine itself. These include the lines that I have put at the start of this text, and which I repeat here:

Debris…much, sharable
Pitch TVCDAP Starts Here…Modor
PitchDap Bankrupt Stoker[40]

Debris, pitch, evasion. To think the Anthropocene in our post-planetary age, we must learn to think debris, and we must learn to think them as would a machine in orbit and not in our atmosphere, we must strive for a more granular appreciation of extraterrestrial realities that we cannot ever directly experience, but on which Earthly life itself depends.

ENVOY

Thinking the Anthropocene as post-planetary reminds us that even if we are not planning on going to live beyond the Earth ourselves, even if we know we will never be able to see with our eyes precisely what we are called upon to think, we must still learn to think beyond the planet. But this going on is no exit strategy,

[39] Dobson, *Moonbit*, p. 94
[40] Dobson, *Moonbit*, p. 113.

no colonial endeavor at beginning again anew or at enslaving space for the good of humankind. Protecting our planet and our future on or off planet demands developing an alien imagination to go with the factual new extensions to our habitat, weird, incomprehensible, and even undesired as these new depths of our reality may be. Beyond the Earth there is not nothing. Sometimes our bodies lack the faculties to perceive what there is, almost always our bodies lack the capacity to survive uninsulated in that *Umwelt*. Yet there is a sense in which we must learn to integrate these alien realities more fully into our environmental imaginations if we are to truly try to exercise responsibility in the Anthropocene, attending to the full and now extra-terrestrial destruction that we are creating. We must learn to love the new Gaia, with her implants, her exoskeleton, and her electronic life support system.