

Article

Where Humans and the Planetary Conflate—An Introduction to Environing Media

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Abstract: In this essay, we provide an outline of historical and contemporary examples to illustrate the theoretical concept of environing media. We first discuss how humans have environed their surroundings long before the advent of scientific modernity and the rapid evolution of media technologies that helped in making the planet governable. Against this background, we argue that a fundamental shift in the human–Earth relation happened after 1500 and that this shift is attributable to the development of environing media employed in the process of terrestrial globalisation. We see the present profound renegotiation of the human–Earth relation as a continuity, albeit with a different intensity as exemplified by the work in Earth system science. Finally, we invert Mike Hulme’s call for scientists to meet the humanities into an appeal to humanists to embrace the environmental sciences and pursue more integrative research. Recent developments in environmental history have seen an increased interest in the shaping of environments by means of technology. To this end, scholars have developed theoretical concepts like “environing technologies”, which are based on the premise that the environment is a historical formation by people and societies who form their surroundings as well as their sense of place. In the same vein, historical ecology has shown that premodern peoples also shaped the natural world to their purposes far more than what has generally been understood. The central premise is that what is understood as the environment is the result of human intervention and that *environing* technologies structure the way that it is used, perceived, and understood. These insights resonate with core notions in media theory, but they have never before been brought together. Given that all of our understanding of the environment today is the product of several processes of mediation, the theory of environing technology would benefit from stronger theorisation of the role of media. While the scale and intensity of information storage, processing, and transmission by media today are unprecedented, the logic of mediated data processing essentially remains the same as five centuries ago when agents of the Spanish Empire took part in shaping the understanding of the environment of the Americas and the globe. For these purposes, we propose the concept of *environing media*, as a means of both joining intellectual forces and pushing theoretical analysis of both branches further. The paper outlines the theory of environing media using examples from the Global South, in particular the shaping and sensing of landscapes in and around the Philippines. From early modern to late modern times, this region of the world has been influenced by environing media, most importantly circumnavigating ships and orbiting sensing satellites. The result is landscapes made and remade according to colonial and later capitalist priorities operating on a global, and eventually a planetary, scale.

Keywords: Amazonia; Anthropocene; artificial intelligence; circumnavigation; colonial; Earth system science; environing; environment; history; media; Philippines; satellites; scale; technology

1. Introduction

With the advent of the Anthropocene and the rapidly escalating eco-crisis of mass extinctions, desertification, and other life-altering processes, the environment has gone from being understood as *nature*—that which is out there and that humans can destroy or save—to become an acute political, social, and philosophical concern. And yet, the levels of analysis keep being conflated in different ways. Is it about humanity? Is it about capitalism? Is it about technology? Or is it about the planet? How, in fact, are these levels conflated? As we leave behind the old notion of a nature separate from culture and begin to reflect on human planetary interventions of various sorts and scales, it becomes all the more urgent to accurately describe how the conflation of humans and environments actually happens (Connelly 2017).

Our theorisation of a redefined human–Earth relationship starts from the insight that the environment is not a fixed object awaiting discovery but something that is continuously produced, intellectually and materially, and that media play a significant role in this production. Media technologies used for creating knowledge about a global environment also influence our alterations of and interventions into that environment. Attempts to know the planet have historically been connected to processes that change the very object of study. For example, the charting of wind patterns in the Pacific by Portuguese and Spanish seafarers in the sixteenth century led to the establishment of systematic globalised trade between three continents. This process would change both land and ocean over time as a result of the new ways of knowing the weather system.

By using the concept of *environing media*, we wish to clarify how humans always exist in relation to processes of environmental change. The problem could be summarised as a question about how epistemological configurations of the natural world—including the humans and non-humans that inhabit it—are produced in processes of mediation.

Related ontological problems of human–nature and human–technology interactions have been addressed in several intellectual schools, particularly in environmental humanities and media theory over the past decade (Pritchard 2013; Siegert 2015). Within this context, we have contributed to the development of the critical concepts of *environing* (Gärdebo 2019) and *media* (Wickberg 2018a), which we now propose to join and integrate. The aim is to improve our understanding of the “in the middle of” (environ) and the “in between” (media) of the human–Earth relationship in the past, present, and future.

The “environment” is a concept used since the mid-twentieth century to describe the global interconnectedness of life on Earth, with the emphasis during the last decade shifting towards its verbal form—“environing”—to describe the making of the environment. The concept of “media” has traditionally been associated with processes of communication and has mostly been referred to metaphorically as ecological (Scolari 2012). Media studies have only recently become oriented towards environmental issues. Since 2019, there is even a journal, *Media + Environment* (University of California Press) devoted to this subfield. And yet, media scholars have often refrained from crossing disciplinary boundaries while also remaining reluctant to engage in policy-making or politics (Cubitt 2019). In fact, there are hardly any studies on the epistemic or scientific basis of the relation between media and environment.

Our concept of *environing media* is an attempt to address these white spots by pushing media theory into Earth system science, where the processing, storage, and transmission of data are arguably key to our knowledge *of*, and politics *for*, the global environment. The concept also posits explanatory power in better understanding our past, particularly environmental history, since the understanding of media as part of shaping and being shaped by the environment is also applicable to enterprises such as seafaring, navigation, mapping, natural histories, hot air ballooning, and railroad construction.

The field of environmental history has simultaneously gravitated toward a processual understanding of the environment as a conceptual product of historically changing human–Earth relations (Chakrabarty 2018). This orientation implies that media and infrastructure play an important part in the construction of the environment, not least with regards to the scale of the global environment

(Renn 2020; Warde et al. 2018). Yet, there is a lack of a more robust understanding of the role of media technologies in this process. We therefore propose a conceptual integration, in particular of enviroing—shaping the natural world into a conceivable object discursively and materially over time—and of media, or mediation—understood as data processing.

In this essay, we provide an outline of historical and contemporary examples to illustrate the theoretical concept of enviroing media. We first discuss how humans have enviroined their surroundings long before the advent of scientific modernity and the rapid evolution of media technologies that helped in making the planet governable. Against this background, we argue that a fundamental shift in the human–Earth relation happened after 1500 and that this shift is attributable to the development of enviroing media employed in the process of terrestrial globalisation. From there we see present-time’s profound renegotiation of the human–Earth relation as a continuity, albeit with different intensity, as exemplified by the work in Earth system science. Finally, we invert Mike Hulme’s call for scientists to meet the humanities into an appeal for humanists to embrace the environmental sciences in a pursuit of a more integrative research. Throughout the text, we exemplify and point out the scale-changing function that enviroing media have had over the past five centuries for integrating humans within their environment.

We have reached a point where it seems possible to recast media as the middle ground of data processing between an environmental phenomenon and its scaled (up or down) status as epistemic knowledge. Relating media with enviroing reconnects the concept to its ancient etymological roots in both the Latin word “medias” for middle (Guillory 2010) and to the Greek medium voice that stands between active and passive voice (Vismann 2013). The integration of enviroing and media is a significant step forward in that it brings the theoretical forefront of media studies and environmental humanities into an exploration of the various historical, present, and future ways of enviroing the planet that avoid conflating human action with the planetary scale of change that has been ongoing, as we suggest, for quite some time.

2. Enviroing before Terrestrial Globalisation

Understood as a species, humans are an Earth-bound life form that already 5000 years ago had spread across the planet and thrived in highly different conditions on six continents (Ruddiman 2018). Historical ecologists have demonstrated that, contrary to popular belief, the species did not thrive by adapting itself to a given environment—a perspective denominated as ecological determinism—but rather by adapting the environment to its needs, for example, the use of ploughs to shape landscapes that in turn naturalised these as agricultural landscapes, despite requiring external input of fertilisers to sustain crop yields (Erickson 2008; Warde 2004, pp. 17, 66). This process can be understood as an early example of enviroing technologies of shaping (Sörlin and Wormbs 2018), and constitutes an important theoretical background to our qualification of enviroing media, which focuses on mediation as constitutive for the historically changing human–Earth relationship. Enviroing technologies of shaping alter the environment by restructuring, moving, elevating, flattening, emptying, and filling. These technologies played a key role in pre-industrial agriculture and include herding, forestry, irrigation, and fishing. Enviroing technologies of shaping are close to the original nineteenth century meaning of the German word *Kulturtechnik*, from which the media theoretical concept takes its ontological point of departure in investigating how an alteration, or ontic operation, like drawing a line in the ground with a plough can produce an ontological concept like territory (Vismann 2013).

Historical ecology can contribute to this understanding by unsettling previous ideas that humans sought adaptation to an immutable and fixed natural environment. Consider that in present-day reporting on deforestation in the Amazon rainforest, the biome is predominantly understood as primordial nature unaltered by human intervention. This idea presumes that the humans dwelling there for the last 10,000 years remained in hunter-gatherer societies and never really went through the Neolithic revolution. Nothing could be more wrong.

According to Clark Erickson, whose research we rely on here, and who spent his career studying the paleoarchaeology of Amazonia, “humans created, transformed and managed cultural or anthropogenic landscapes that suited their purposes” (Erickson 2008, p. 199). The area of modern-day Bolivia called Beni, located in the southern Amazon basin, is a good example of how pre-Columbian indigenous Americans were altering and shaping their environments on a large scale. In addition to building roads, causeways, canals, dikes, reservoirs, mounds, and raising agricultural fields, the population living there also trapped fish in the seasonally flooded grassland with dense networks of fish-corralling fences. The maintaining of this complex ecosystem also implied the selective burning of vast grasslands of the Amazon forest undergrowth to allow for the flooding and fish farming. These practices of cultivation flourished more than 5000 years ago. So, when Columbus arrived in 1492, he did not encounter pristine land untouched by humans, but a continent with an environment that had been shaped by human interaction for thousands of years.

Much of Amazonia was occupied by dense populations of urbanised societies practicing a mix of different agricultural systems that significantly contributed to creating the environment that is appreciated today. Based on new data, Erickson suggests that a new paradigm is needed for understanding Amazonia as a manufactured landscape. The claim is that pre-Columbian people had a far larger impact on vegetation in Amazonian ecosystems than previously thought, beginning around 5000 years ago. These impacts consisted of seasonal forest burning and selective domestication of edible rainforest plants that later became hyper-dominant, including the agave tree and the cacao tree (Erickson 2008). The envired landscapes of the Americas in general and of Amazonia in particular then drastically changed following Spanish and Portuguese colonisation which effectively led to the mass death of 65 million people and the abandonment of an equal number of hectares of farmed and controlled land (Koch et al. 2019).

The scale of the present-day Amazonian rainforest is to a significant extent the result of a rebound effect created by the removal of people previously living there, along with their activities. This decrease in population, also known as the Great Dying in the Americas, occurred initially through European diseases but effects were aggravated by civil wars, ethnocide, slavery, and resource expropriation (Erickson 2008; Lewis and Maslin 2017). This enviring process, whose primary agents were microbes, viruses, and bacteria, also led to a quick carbon dioxide uptake by the growth and spread of the rainforest without human intervention, leading to a dip in global CO₂ around 1611 from 285 to 272 ppm over 50 years, which is the last low point before the steady rise to our current 415 ppm. The decrease in CO₂ concentration also led to a planetary cooling of about 0.5 degrees Celsius. These data have been used to argue for a starting date of the Anthropocene in 1611 known as the Orbis hypothesis (Lewis and Maslin 2015). Every activity on a global scale necessarily results from processes of enviring media, and this is an important qualification of the concept enviring media from enviring technology. This is equally true for the processes of colonisation in the sixteenth century as for the data on which the graphs for an Anthropocene Golden Spike starting date are based.

The whole process of colonisation was entirely dependent on enviring media of oceanic navigation and terrestrial mapping for its advancement in the years coinciding with the CO₂ dip during 1570–1620 (Wickberg 2018b). The interconnected chain of events necessary was made possible by scale-changing enviring media, like early modern rutters, charts, maps, and registers—developed and used in the service of colonisation—to microbes and viruses unintentionally being transported to the Americas and killing off the indigenous population, to the regrowth of forest on farmland once used by humans, and finally the CO₂ uptake by those trees and the planetary cooling that resulted from it.

Global change in the Earth system caused by human activities is usually associated with the recent past of the twentieth century, with a strong focus on the Great Acceleration of the post-war era. Recently, a strong case has been made for treating the early modern global cooling—a dip in the Earth’s carbon dioxide levels during late 1500s popularised as the Little Ice Age—as at least partly caused by the Americas’ population collapse of 65 million people following the Spanish colonisation, with an

estimated equal amount of hectares of farmed land abandoned and left to CO₂ trapping regrowth (Koch et al. 2019). This insight allows us to rethink the time and place for when human activities first led to perturbations in the Earth system on a global scale. It was enabled by, and would not have occurred without, the use of enviroing media like ships, charts, and other nautical instruments being used on a global scale.

These examples suggest that historical ecology has strong affinities with enviroing media in terms of ontological assumptions and methodological approach, but differs in scope and aim. While enviroing media is particularly apt for analysing the human–Earth relation since 1500 and the rise of terrestrial globalisation, historical ecology is generally concerned with the pre-modern. Although pre-modern societies' enviroing can be understood in terms of media (Peters 2015), scientific and technological developments since the 1500 onwards constitute a continuous trajectory that differs from the past due to the use of scale-changing technologies.

At an epistemological level, we would not have been aware of these changes as Earth system events were it not for enviroing media like ice core records and lake sediment analysis of historical changes in CO₂ concentration in the atmosphere. This point is also evident in the discovery of the ozone hole above Antarctica in the 1980s, which the assigned satellite had registered for a decade but the programmed algorithm had interpreted as an error due to its unlikeliness to contemporary knowledge (Grevsmühl 2017; Lenton 2016, p. 13).

3. Enviroing Media and Terrestrial Globalisation

Our argument is that human enviroing, more specifically *terrestrial globalisation*, radically changed after the year 1500 by henceforth presupposing media that changed scales. Peter Sloterdijk describes terrestrial globalisation as a spatial revolution that homogenises all locations on the planet by aggregating each place as points of equal value. In particular, efforts of circumnavigation radically changed the ontology of human dwelling on Earth: “anyone living today, after Magellan and after Armstrong, is forced to project even their hometown as a point perceived from without” (Sloterdijk 2013, p. 30). What Sloterdijk points out concerns ontology and epistemology, both ways of being in and of knowing the world. As we face disruptive change in these areas today, through an escalating eco-crisis and the rapid development of digital technology in general and AI in particular, we think these processes should be understood in the longer historical trajectory of their development since the 1500s. Our position also resonates with the growing body of work pursued in decolonial environmentalism of locating the roots of the climate crisis in our colonial legacy (Wickberg 2020).

Magellan's circumnavigation 500 years ago inaugurated the use of enviroing media and European colonial mapping enterprises further accelerated their use (Wickberg 2018b). Apart from establishing a global trade triangle, these media gave rise to new notions about various environments, and their rapid changes, around the world (Chaplin 2012). While Magellan's circumnavigation 1519–1522 was the first of its kind, the Spanish cosmographers Miguel de Legazpi and Andrés de Urdaneta were sent on an expedition to Southeast Asia by the Spanish Empire to establish a base on the spice route and disrupt Portugal's monopoly over trade in the region. They chose the Island of Cebu and established a Spanish settlement which was named the 'Philippines' after their king, Philip II.

From the strategic position offered by the Philippines, the Spaniards hoped to pursue both trade and war with China (Parker 1995, p. 247). Several attempts had been made during the sixteenth century to find a navigable route from New Spain to Southeast Asia and back. All had failed however, due to difficulties of handling the extreme strength of winds and currents when sailing back across the Pacific Ocean. Urdaneta carefully prepared the expedition for five years, using the best available nautical science, before setting sail in 1564. He became the first to successfully complete the return trip in the following year, establishing the Manila Galleon route, and thereby revolutionised navigation in the Pacific. In particular, the route enabled the Spanish Empire to gain control over a vast ocean connecting the American continent with the Asian (Fuertes-Manjón 2016, p. 22).

By carefully studying wind patterns and meteorology, assessing seasonal changes such as the monsoons, and drawing on the best scientific treaties on the matter, such as Pedro de Medina's *Art of Navigation* from 1545, he was able to pursue a complex route ascending and descending the north and south latitudes to follow the navigable winds and currents and make use of the movement of the trade winds. This expedition was the culmination of the nautical sciences in the sixteenth century, and the result of a detailed planning and scaling that took into account the complexity of global wind and current patterns. These data had been collected in nautical charts over the sixteenth century by Portuguese and Spanish seafarers, and were primarily instruments for navigation rather than representations of the world (Leitão and Gaspar 2018). In our account, nautical charts were media that envired the Pacific Ocean and changed both conceptions and physical relations between the continents. Urdaneta's successful return trip between Manila and Acapulco was globalisation in action.

In the same manner, geodetic surveys, for example, both produced models of a global environment and enabled the physical expansion of infrastructures for moving experts, expertise, and later exports on a global scale as part of securing the colonial territories of Spain and other European empires. These scientific enterprises were at the same time also part of formulating environmental arguments, for example, how knowing nature was central to safeguarding it (Widmalm 1990, pp. 35–36; Harley and Woodward 1987).

Environing media is also an attempt to retain and reinforce the belief in the strong explanatory value of history for current planetary changes. The development of *scale*, in particular, is a historical example that illustrates the entwinement of technologies and global environmental knowledge. Changes of scale were a defining factor already when Alexander von Humboldt climbed Mount Chimborazo in the Andes and coined the concept of isotherms, which he described as a curve drawn through points on a globe which receive an equal quantity of heat (Humboldt 1817).¹ The isotherms could explain how it was possible to find the same flowers on Andean mountains as in the European Alps due to similar climate zones. From the top of the mountain, Humboldt found an overview of the landscape which could be classified and ordered in discrete parts and later connected across space, thereby laying the foundation for a scalar concept of "environment".

The strive to improve a defining view from above and outside of the planet continued in the nineteenth and twentieth centuries through the use of various environing media, like hot air balloons, airplanes, and satellites. In addition to new means of *gathering* data was the addition of epistemic objects for *processing* data. As media in the critical sense are defined by the processing, storage, and transmission of data (Kittler 1990, p. 369), environing media allow for scaling up and down, in addition to abundantly disseminating scientific insights. The companion Aimé Bonpland helped with illustrations while Humboldt himself drew the map of the mountain to lay out the global isotherms on one object. The epistemic object densifies information with the effect that it emphasises relations that neither human perception nor the particularity of a singular datum itself can accomplish. It is in this scale-changing sense that environing media are integrative for humans and their environment. Every globe, satellite, and roadmap as well as every catalogue or natural history can thus be conceptualised as environing media.

While media used for surveying were primarily a means of translating rather than transforming environments (Scott 1998, pp. 25–33; Warde et al. 2018, p. 9), they did spread into new elements of media—changing from a horizontal to a vertical expansion—with measurements conducted at new oceanic depths and aerial heights (Williams 2013, p. 28). Overview imagery, using hot-air balloons, had been deployed for military operations since the early 1800s. A hundred years later, at the outset of World War I, the combination of photography, introduction of heavier-than-air flight, and standardised training of military pilots had resulted in interdisciplinary institutions for monitoring first the enemy

¹ It should be noted, in addition, that the environing impulse of the isotherm can also be traced back to sixteenth century Jesuit and natural philosopher José de Acosta.

and later the environment. Importantly, aerial imagery was first used for managing colonial peripheries before being used for societal planning of the imperial metropolises (Haffner 2013, pp. 12–14).

When aerial imagery in the mid-1900s expanded into orbital space on artificial satellites, there were already numerous practices in place for gathering data and making global overviews (Cosgrove 2001; Poole 2008; Cosgrove and Dora 2009). While these overviews were an institutional continuation of aerial overviews (Heymann 2010; Fleming 2010; DeVorkin 1992, p. 146), they also expanded the combination of media. Measurements from different remote regions, the deep sea, and outer space became part of similar datasets (Doel 2003; Hamblin 2005), and were analysed using new computing technology (Edwards 1996; Edwards 2006). A growing industry of microelectronics contributed to the digitisation of data (Mitman 1996), making it possible to reproduce global data but also distribute them globally (Grevsmühl 2014, p. 186).

Similar to the first ships circumnavigating the globe, satellites orbiting the planet function as enviroing media for the surface environment beneath their trajectory. One salient example is the mapping of the Philippines between 1987 and 1988, 450 years after Urdaneta's globalisation in action that connected Manila and Acapulco. Swedish satellite experts managed to align the interests of different national authorities, transnational experts, international financiers, and a French satellite to conduct a land cover map of the entire Philippines and in the process influence subsequent Filipino legislation on deforestation. Such satellite maps not only classified landscapes in the Philippines but their relevance was later scaled up to ascribe aesthetical, ethical, and political imperatives for monitoring and managing environments in numerous developing countries of Southeast Asia and later elsewhere (Wormbs and Gärdebo 2019). As these operations could be standardised and reproduced in many settings, satellite sensing has in the decades since become mandatory in projects claiming to monitor environmental change and also instrumental for actors making claims about sustainable management of these environments. By the present time, the linkage between monitoring and managing the environment is so taken for granted by the UN that continued reproduction of digital datasets of a global environment is considered necessary for any policy framework to safeguard that global environment (UN Global Sustainable Development Report 2019).

The circumnavigations of the 1500s that turned the Earth into a navigable sphere had by the 2000s culminated in an orbital technosphere, encircled by satellites providing real-time monitoring of melting ice caps and raging wildfires on the planet, along with data processing to assess their immediate and long-term geo-physical consequences (Gärdebo et al. 2017). It was in this epistemological configuration that the Earth system emerged as a lens through which one could study planetary changes caused by humans.

4. Enviroing Media and the Planetary

Earth system science is an emerging epistemological category that relies heavily on media and mediated data for its results as well as for its rationale. As insights about the state of the Earth system become available, politicians and policy-makers are increasingly considering new technological ways of regaining equilibrium by means of human intervention. The best example of this tendency is probably the technique called Bioenergy Carbon Capture and Storage (BECCS), which attempts to lower excessive levels of CO₂ in the atmosphere by capturing CO₂ and storing it underground. While theoretically promising, to be effective on a planetary scale the technique would require a third of the planet's arable land to grow and burn forest for this purpose alone (Anderson and Peters 2016). Enviroing media tries to clarify such interplay between discourse and materiality by studying the media of the Earth system and its global enviroing predecessors, which is at the heart of emerging humanities theories on the conflation of human activities and the planetary scale (Chakrabarty 2019).

Enviroing media are also a critical humanist response to the issues of planetary boundaries, understood as the enumerated levels of human perturbation in the Earth system and beyond which its functioning may be substantially altered (Steffen et al. 2015). It involves analysing conditions that make possible knowledge of how human activities are changing the Earth's atmosphere, lithosphere,

hydrosphere, biosphere, and climate from historical to present times. While graphs and numbers of Earth system science have convinced a majority of policy-makers about the emergency in the current state of affairs, graphs and numbers are not able to formulate answers or alternatives for a revised human–Earth relationship. Instead, this is a task that a variety of humanists have now started to take on, with the concept of envioning media representing a radical step forward. To understand how, we must now turn to Martin Heidegger.

While Heidegger is a foundational reference for German media theory, the ontological understanding of environment (Umwelt) in his philosophical work merits further attention because it holds potential to help in explaining the environment both as a process (envioning) and as an ontological quality in human dwelling on Earth (Hörl 2021). Heidegger dissects modern science in its relation to the representation of the world, which allows it to be calculated in its future course or verified as a calculation about its past. For Heidegger, in the age of the world picture, nature and history become the objects of representation and “only that which becomes objects in this way *is*—is considered to be in being” (Heidegger 1977, p. 127). In other words, the map *is* the territory because it forms the essential epistemological condition of existence for any empire (Siegert 2011). This idea seems particularly apt to explain the relation between environment, media, and epistemology that we want to capture with the concept of envioning media. The techniques of scaling and calculation aid the understanding of the world through projects of charting and mapping lands and oceans of the globe, which since the sixteenth century onwards have been understood as a sphere.

In contrast to Heidegger, Dipesh Chakrabarty has developed an understanding of “the planetary” that builds on a distinction between the concepts of “planet”, “world”, “globe”, and “Earth”. Planetary sciences, like Earth system science, produce a different conception of the planet than that of (human) globalisation (cf. Steffen et al. 2015). As Chakrabarty points out, it puts a phenomenon like global warming into a different perspective by understanding it as one of many planetary warmings, albeit caused by humans (Chakrabarty 2009). Chakrabarty also notes how the sense of what Earth is for humans—exemplified in two foundational texts of Hobbes and Arendt—was dependent on the history of European expansion, trade, mapping, and navigations of sea and air as well as the development of instruments of mobility and navigation. Heidegger’s term “planetary imperialism” (Heidegger 1977, p. 152) comes under scrutiny and along with other examples forms the notion of an anthropocentric and anthropological globe of globalisation which Chakrabarty wishes to distinguish from the concept of planet produced primarily by Earth system science (Chakrabarty 2019).

From our point of view, and in response to Chakrabarty, it seems less certain that Earth system science really does take us away from an earth- and human-bonded imagination or that this science affects a profound unsettling of the narrative of globalisation.² In many ways, Earth system science can be understood as a continuation of the attempts at calculating the Earth’s past, present, and future that started in earnest with navigation in the sixteenth century. Planetary views of Earth were emerging already in early modern astronomy, and were consolidated with the rise of geology in the nineteenth century (Rudwick 2009). The work of Alexander von Humboldt has repeatedly been considered to prefigure Earth system science (Wickberg 2020; Jackson 2019; Jackson 2009). Scholars like Peter Sloterdijk and Tim Ingold, who build on Heideggerian philosophical understandings of the Earth, support this notion (Sloterdijk 2015; Ingold 2015). Similar perspectives have been suggested recently also by Bruno Latour and Timothy Lenton (Latour and Lenton 2019; Lenton and Latour 2018). To us, it appears both possible and desirable to think of the planetary as having a longer history than Earth system science. But it is an open question whether the emergence of the planetary should be understood as a break with past ways of thinking about the Earth or as a continuity of the globe that emerged in the sixteenth century after Magellan.

² For a similar argument in early modern research on circumnavigation, see (Leitão and Gaspar 2018).

We believe, rather, that the tools and models of Earth system science, such as the planetary boundaries, constitute an intensification and acceleration of shaping and being shaped by the environment, both as an epistemic object and a material practice. The conflation of the natural and cultural history produced by the Anthropocene (cf. [Chakrabarty 2009](#)) can be understood as a result of the integrative nature of enviroing media. It is no coincidence that Earth system science historically coincides with the development of digital media and cybernetics in the 1960s. The same is true for James Lovelock's famous Gaia theory—which understands all life on Earth as part of a self-regulating system—as well as Lynn Margulis, the evolutionary biologist who showed that evolution at the earliest multicellular level is based on symbiosis as much as competition. They contributed to a new conception of the Earth by pursuing new knowledge through scale-changing techniques of enviroing media, from the smallest life form to the ensemble of life forms taken as a whole ([Lovelock 2000](#)).

The integration of all environmental scales in Earth system science is not only a question about epistemic power but also about property. Similar to the previous example where Swedish satellite sensing accounted for forests in the Philippines as the sum of digital trees, digital environmental data are the currency with which our present-day ecological crisis is being enumerated, described, and known, and increasingly also the focus of commercial interest as a commodity. A number of initiatives by tech firms like Microsoft, Amazon, and Google show a growing interest in environmental data, in particular to apply artificial intelligence (AI) as a tool for surveillance capitalism to manage everything from natural resources to wildlife conservation ([Joppa 2017](#)). For example, Microsoft has recently invested USD 50 million in their program “AI for Earth”, claiming they can reduce greenhouse gas emissions while boosting GDP by up to USD 5 trillion by 2030 ([Joppa and Herweijer 2019](#)).

Environmental data are an expansion of tech firms' business models to claim ownership of personal data as societies are penetrated by web platforms, like Facebook, AirBnB, and Uber ([Van Dijck 2018](#)). These tech firms make use of AI to sell behavioural prediction and modification based on AI analysing personal data, what scholars have labelled “surveillance capitalism” ([Zuboff 2019](#)). These current uses of big data and algorithms in the public sector have been found to aggravate inequality ([O'Neil 2017](#)) and undermine democracy ([Bucher 2018](#); [Wylie 2019](#)), which should all be cause for concern with regards to how environmental data are to be used next.

In contrast to the detailed environmental targets that datafied information enables, little is known about how to govern the data that make up the global environment. As public production and use of digital environmental data grow, analysis and ownership of data become increasingly reliant on a few tech companies. Issues over integrity regarding how personal data are owned, accessed, and used scale to a planetary level when similar trends of corporate ownership are noted with regards to environmental data. During the past decade, management of environmental data has shifted from government-funded national organisations to international tech corporations, like Microsoft, Amazon, and Google. Knowledge of the global environment shifts from public to private institutions, which may decrease democratic insight into environmental governance as a whole.

In December 2019, NOAA (the US National Oceanic and Atmospheric Administration) entered a multiyear contract with numerous tech companies to manage its environmental data, a milestone in the Big Data Project initiated by the current Trump administration. The signing of this agreement coincided with budget cuts to NOAA and the controversial nomination of Barry Meyers—owner of the US leading private weathercasting service Accuweather—as head of NOAA, a move which raised concerns over possible conflicts of interests. It is not hard to see how trade-offs between natural protection, national security, and private revenue can result in serious conflicts that jeopardise future progress and stability in the global environment.

The field of AI implementation for environmental issues is still in a start-up phase, but a lot suggests that the coming decade will see a surge in national and corporate initiatives of using machine learning and automated systems to tackle escalating environmental problems. As has been the case with the use of AI by Silicon Valley firms in optimising their business model of surveillance capitalism,

chances are that the technology-first approach will lead to realisations of serious ethical and social issues after the fact. From the perspective of enviroing media, AI for Earth and other large-scale projects constitutes the latest of many ways the human–Earth relationship is changed through the use of media.

5. Meet the Sciences

In 2011, Mike Hulme spelled out the implications of climate change being as much a societal problem as a physical one—natural scientists would have to “meet the humanities”. Analysis of anthropogenic climate change needed to rely both on positivist disciplines as well as interpretive ones (Hulme 2011, pp. 177–79). Now, nearly a decade later, and after a field of environmental humanities has emerged, there are ample examples of scientists taking interest in philosophical, political, and social questions relating to climate change. The scientists have started to meet the humanities. To aid the dialectical pendulum swinging back, as described by the late David Lowenthal (Lowenthal 2019, pp. 192–93), it is time for humanists to become involved in the sciences of climate change. We suggest that one way of doing so is by reconsidering and closing the theoretical gap between media and environment.

What is building up in the various efforts of thinking through the environment may be nothing less than a cognitive revolution changing the foundations of ontology and epistemology that have remained relatively stable since the advent of modernity. Some scholars, like Bruno Latour and Timothy Lenton, speak of the need for a new cosmology and say that we are dealing with a new worldview and cultural paradigm shift comparable in scope to the one introduced around the time of the scientific revolution by Galileo Galilei.

The time has come to call upon humanists to meet the sciences. In particular, Earth system science and schemes for human interventions and perturbations in the Earth system are areas that inform what the human–Earth relationship is, as well as what is to be done about it. The role of concepts like enviroing media is to meet these scientific endeavours and make them humanistic, historicise their practices, create reflexivity concerning their policy recommendations, and enable critical alternatives for how to mediate and eventually environ life on Earth. Enviroing media is a philosophical development that articulates the present-day human–Earth relationship through its mediated epistemological configurations and attempts to break the paralysis by infusing the planetary sciences with critical thinking. As such, it represents a major step forward in developing an integrated thinking through the planetary.

We propose that the past five centuries be understood as a period of accelerated use of technologies for mediating the environment. These technologies have shaped our environmental understandings while simultaneously and continuously producing new alterations of the planetary surface. The environment is the result of enviroing processes, in which humans engage with their surroundings and change them over time. By the continuous integration of knowledge and practice, human ideas about what is natural, mundane, and recurring in their relationship with the environment are reformulated. These processes can take centuries and as a rule it is only during times of rapid changes that nature appears as environment, which by definition is a changing of one’s surroundings. Enviroing thus has a strong dimension of scale to it, as the construction of the epistemic objects relies on connecting local phenomena to each other on a more or less global scale.

The integration of media and enviroing is able to produce historically specific understandings of how ideas, humans, and machines come together in the production of environmental knowledge. The potential of this perspective is to open up for a truly novel way of studying global politics, environment, and science over 500 years as one deep history of our current state and entering into the Anthropocene.

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