Earth's Future

COMMENTARY

10.1029/2020EF001917

From Anthropocene to Noosphere: The Great Acceleration

Boris Shoshitaishvili[1]

[1]The Department of Anthropology, The University of California, Berkeley, USA

Key Points:

- The Anthropocene and the Noosphere are divergent paradigms for understanding the anthropogenic changes of the Great Acceleration
- The Anthropocene envisions the Great Acceleration as material-energetic rupture; the Noosphere as an increase in global awareness
- A balanced global understanding of ongoing anthropogenic change requires the integration of insights from both paradigms

Correspondence to:

B. Shoshitaishvili,
borissh@berkeley.edu

Citation:

Shoshitaishvili, B. (2021). From Anthropocene to Noosphere: The Great Acceleration. *Earth's Future*, *9*, e2020EF001917. https://doi.org/10.1029/2020EF001917

Received 24 NOV 2020
Accepted 6 DEC 2020

Abstract The complex set of human-driven global, social, technological, and environmental changes intensifying dramatically since 1950 has been identified as the "Great Acceleration." This period of time represents a radical shift in our collective relationship to each other as well as to the Earth system as a whole. In this article I consider two major paradigms now taking shape to offer different perspectives on the Great Acceleration: The Anthropocene and the Noosphere. I explore the scientific-intellectual traditions from which each paradigm derives and contrast their nearly opposite normative evaluations of global transformation. The Anthropocene has emerged as the paradigm of rupture, materiality, and warning; the Noosphere as the paradigm of development, mind/culture, and hope. I also highlight preliminary attempts at bringing the two divergent paradigms closer together into a more unified and balanced vision of planetary change.

Plain Language Summary Since 1950, humanity has accelerated its population growth, energy use, and release of greenhouse gases, along with a variety of other environmentally and socio-economically significant trends. Taken together, this set of accelerated human-driven trends has been called the "Great Acceleration," and its occurrence helps explain recent climate change and ecological disturbance. In this article, I explore two dominant but divergent paradigms for what is happening to our species as it becomes globalized and continues in the Great Acceleration. One of the paradigms is related to the newly proposed geological epoch of the "Anthropocene" (the Age of the Human Being), which sees the Great Acceleration as a rupture in our relationship to the Earth System. The other paradigm centers on the concept of a "Noosphere" (a sphere of thought) and proposes that human beings are forming a planetary awareness through these interlocking and accelerating trends. I argue that we need to learn from both paradigms to achieve a balanced understanding of the Great Acceleration.

1. Introduction

Seventy years ago population growth and collective human interaction with the Earth system entered a period of unprecedented change. This world-historical inflection after the Second World War has been identified as the beginning of the Great Acceleration (McNeill & Engelke, 2014). A series of graphs depicting a striking variety of human-driven global trends has become iconic of the Great Acceleration (Figure 1).

These enormous anthropogenic trends have challenged human beings to understand our capacities on the global scale as a species, and not simply as discrete individuals, communities, or nation-states (Chakrabarty, 2016). Their ramifications are not only ethical, political, and social, but also geological and biological (Chakrabarty, 2009).

To clarify these greater stakes, I review in Sections 2.1 and 2.2 two major paradigms that seek to make sense of humanity's Great Acceleration and its relevance in the Earth system. I relate these two paradigms to the increasingly well-known terms of the "Anthropocene" and the "Noosphere" and explore how they differ from each other in their conceptions of our species significance as well as in their evaluative charge. I pursue this comparison by considering closely the etymologies of the two umbrella terms and the different scientific-intellectual traditions signified by their word origins.

The Anthropocene paradigm interprets the Great Acceleration as a world-historical shift in which humanity becomes a technologically empowered and primarily material planetary force, signaling the start of a

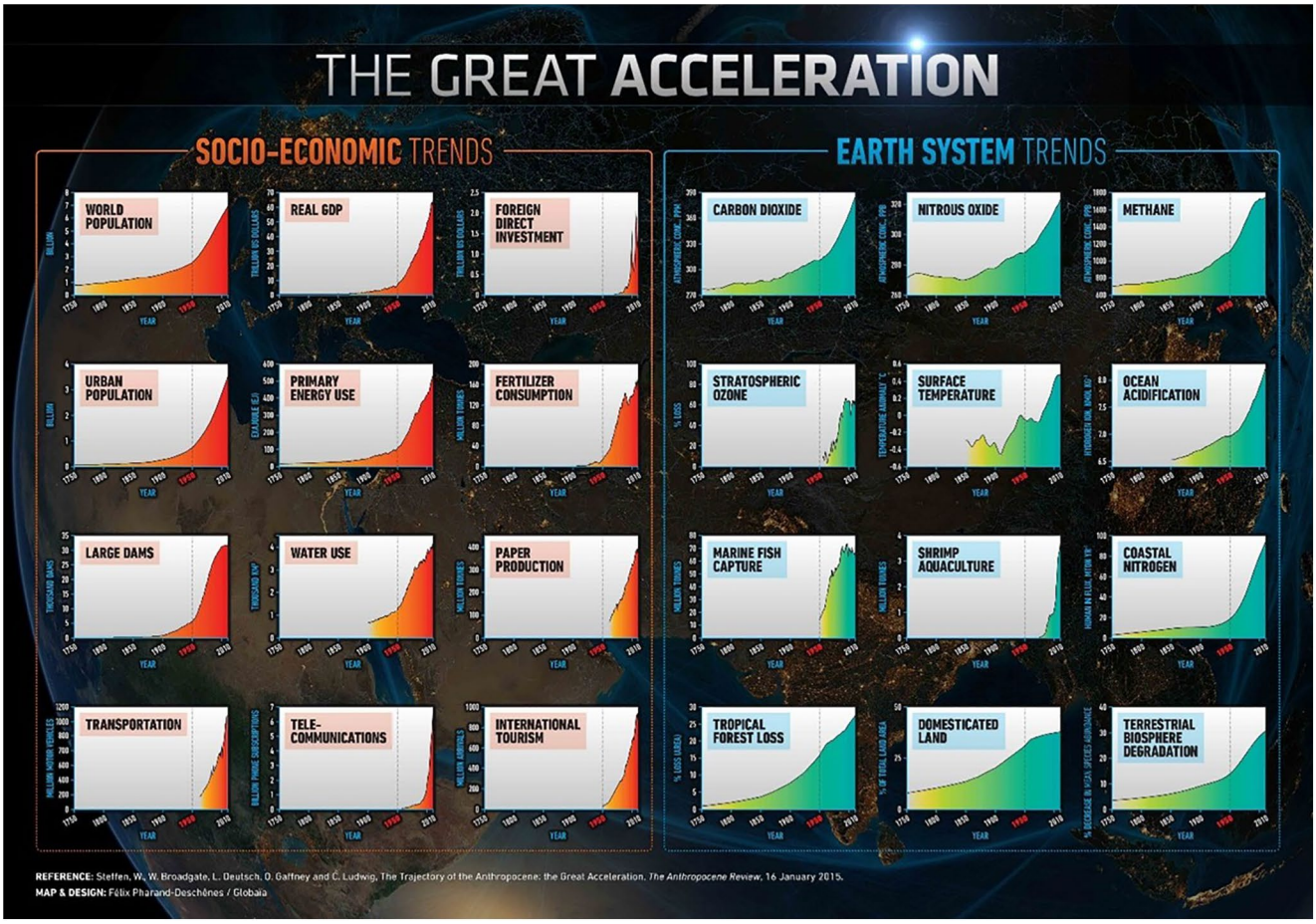

Figure 1. Some of the interlinked and human-driven global trends that together have been identified as the Great Acceleration, from the International Geosphere-Biosphere Program (Steffen et al., 2015).

new geological epoch. Anthropocene accounts are often cautionary and sometimes predict catastrophe for humanity and the living world. They are centrally concerned with the human impact on the Earth system and its physical subsystems such as global climate.

The Noosphere paradigm also treats the current period as a world-historical transformation but places less emphasis on the process's materiality and environmental disruption. Noosphere accounts present the Great Acceleration as a stage toward an integrated humanity achieving planetary significance in globally interconnected culture, technology, and awareness. In contrast to the Anthropocene, the Noosphere paradigm's mood is primarily hopeful and occasionally becomes utopian.

In addition to divergences in content and mood, the two paradigms are geographically divergent: the Anthropocene serves as a key concept for understanding anthropogenic global change among scholars and thinkers in Western Europe and the Americas (Hudson, 2014); meanwhile, the Noosphere is central to Eastern European scholars and scientists working on comparable topics (Bernstein, 2019; Ronfeldt & Arquilla, 2020).

In Sections 3.1-3.4, I explore potential steps toward reconciling the divergent Anthropocene and Noosphere paradigms. Although a single coherent scientific narrative for the Great Acceleration is elusive, an integration of the Anthropocene and the Noosphere would go far in bringing the work of different scholarly traditions together and providing a balanced understanding for human-caused global changes.

2. The Anthropocene Versus the Noosphere

2.1. The Anthropocene as Rupture and Physical Impact

The term Anthropocene belongs to the nomenclature of geochronology and chronostratigraphy, the subdisciplines responsible for establishing the official geologic time scale. Descriptively, it is a strictly temporal category. In 2019, the Anthropocene Working Group (AWG) of the Subcommission on Quaternary Stratigraphy (SQS) voted in favor of proposing the Anthropocene as the latest geological epoch to the International Commission on Stratigraphy (ICS), with plans to submit the proposal to ICS for official review by 2021 (Anthropocene Working Group, 2019). The rationale behind distinguishing the Great Acceleration in geological terms as the start time of the Anthropocene was the realization that since the 1950s humanity has left multiple geologic traces of its mass effect on fundamental cycles of the Earth system (Zalasiewicz et al., 2019). While the concept of a new human-caused geological division had predecessors in the 19th century such as Antonio Stoppani's suggestion of an "Anthropozoic Era" or the "Psychozoic Era" named in the work of Joseph LeConte and T. C. Chamberlin, the Anthropocene Epoch is the first such concept to move toward official proposal to the ICS (Hamilton & Grinevald, 2015).

Yet the Anthropocene has also quickly become more than a technical geochronological term. In contrast to earlier geologic epochs such as the Holocene and Pleistocene, the implications of the Anthropocene are being widely and intensely debated in the humanities and social sciences, as well as in nonacademic areas, especially environmental activism (Kress & Stine, 2017; Horn & Bergthaller, 2019).

A comparison of the etymology of the Anthropocene to the names of prior geologic epochs reveals key features that have made the term relevant far beyond geochronology. The word "Anthropocene" is a product of the same naming system used for the seven preceding epochs of the overarching Cenozoic era. All seven epochs end with *-cene*, echoing the Cenozoic era's *Ceno-* and deriving from the Greek word for "new" (*kainos*/καινός). But the *-cene* of Anthropocene signifies a different kind of "new" from the "-cene" of preceding epochs.

This difference is best recognized by comparing the naming logic shared by the two preceding epochs. The earlier of these, the Pleistocene, means the epoch that is, "mostly (*pleistos*/πλεῖστος) new (*-cene*)." Charles Lyell coined this name based on mollusk fossils in strata he was studying in Sicily: a high proportion of these mollusk species (~70% or "most," i.e., *pleistos*) were still extant ("new," *-cene*) in his time (Wilmarth, 1925).

The subsequent Holocene is based on the same naming logic as the Pleistocene. Its name means "completely (*holos*/ὅλος) new (*-cene*)" because the fossils preserved in the geological formations of this epoch are of species that do not predate *Homo sapiens* (Gervais, 1847). Therefore, the difference in naming between the Holocene and Pleistocene is quantitative rather than qualitative: "all" of the fossils found in Holocene strata are as "new" as anatomically modern human beings, while "most" of the fossils in Pleistocene strata are as "new" as humans. For both, the *-cene* part refers to the novelty of *nonhuman* fossils. In other words, the novelty belongs to other species, while humans are simply the reference point.

Although the Anthropocene reproduces the *-cene* component of the prior epochs, it represents a radical change in naming logic and a kind of novelty unique in the Cenozoic Era. In the Pleistocene and Holocene, humanity served as the passive metric of novelty; in the Anthropocene, humanity becomes the collective agent of novelty. Rather than fossils of other species being new in relation to human beings, it is humanity as a whole that actively determines a new epoch for the planet. The Earth is made "new" in the Anthropocene through human activity.

This etymological transformation to an unprecedented type of novelty highlights the key quality of the Anthropocene: rupture with the past. As historian Julia Adeney Thomas has expressed,

> Bigger and more shocking [than "climate change"], the Anthropocene encapsulates the evidence that human pressures became so profound around the middle of the 20th century that we blew a planetary gasket (Adeney Thomas, 2019).

Taken together the Great Acceleration and the Anthropocene treat the emergence of globalized humanity as an alarming disruption in geological and world history (Hamilton, 2017; Haraway, 2016). Anthropocene

accounts tend to emphasize this sense of rupture and the widespread instability associated with the course of the Great Acceleration, especially human destabilization of deep time global features such as climate, atmospheric composition, and species distribution and diversity.

But the *anthropos*/ἄνθρωπος portion of the term points toward another equally important quality. Unlike the *pleisto-* or *holo-* of the prior epochs, which conveyed quantity/proportion ("most" or "completely"), *anthropo-* serves to highlight the new protagonist: the "human being" (*anthropos*).

It is worthwhile to consider what this word indicates about the nature of the protagonist. *Anthropos* was a generic term in ancient Greek. Like the English word "human," *anthropos* does not register differences in gender, race, or ethnicity. This generic quality means that *anthropos* can symbolically consolidate the billions of diverse human beings into one abstract but active figure. The term Anthropocene accordingly implies that all human beings have participated in causing geological rupture, an immense generalization which has sparked important debates over responsibility, equity, and climate justice (Hecht, 2018; Malm & Hornborg, 2014). The Anthropocene therefore reconfigures human commonality into a destructive planetary-scale personification (a "who" rather than a "what"): the figure of "humanity" casts the Earth into this new geologic age, like the Titan Atlas throwing the world from his shoulders.

At the same time, the word *anthropos* tones down the ontological significance of a globalized humankind. From its earliest recorded appearances in Homer the word was frequently used in opposition to the Greek *theos*/θεός, the word for the divine (Liddell et al., 1996). Unlike the gods, *anthropos* is metaphysically limited. Thus, the term Anthropocene exhibits a particular tension: it presents humanity as a radically new figure of planetary force, as a world-changing figure without precedent, but it denies this titanic humanity a corresponding metaphysical significance. The collective protagonist of the Anthropocene is equipped with untold material power, is able to use technology to deeply transform the Earth, and is in some sense ethically liable for the changes that occur, but the name of *anthropos* persists as a reminder that our planetary impact has physical but not metaphysical import.

Similarly, human culture and consciousness lose some of their salience in Anthropocene accounts of the Great Acceleration. Culture and consciousness, qualities which have resisted straightforward description in terms of matter and energy, tend to be assumed as part of the backdrop of humanity in the Anthropocene. The primary focus of the Anthropocene is the human-driven rupture of planetary matter and energy cycles, rather than the emergence of globalized human culture and new modes of thought. The material aspects and effects of *anthropos* remain at the center of the Anthropocene.

This twin emphasis on rupture and materiality combines to give Anthropocene discourse a predominantly negative evaluative charge. If humanity now drastically disrupts the Earth system in entangled ways, and if its ability to manipulate matter and harness energy is the main defining characteristic of the *anthropos*, then it is unclear how this collective protagonist can avoid bringing catastrophe on itself and other species. Perhaps human culture and consciousness, or a sense of greater significance, would allow the *anthropos* to learn to balance or redirect the technologically amplified destabilization of the Earth system, but these are the very features of the collective protagonist that are pushed to the background in the Anthropocene framework. Consequently, the prospect of such balance remains dim and the arrival of the new geological epoch appears ruinous for the living world.

The etymology of the Anthropocene highlights how it became the paradigm home to those narratives sounding the alarm about the sudden anthropogenic environmental, energetic, and material disturbance of the Earth in the 70 years of the Great Acceleration. The Anthropocene framework continues to be critical for mobilizing attention to human-driven rupture but a way through the crisis created by humanity as *anthropos* is difficult to discern within it.

2.2. The Noosphere as Cosmic Transformation

As opposed to the Anthropocene's etymological relationship with time and novelty, the Noosphere is spatially conceived (Mohorčich, 2017). The word designates a global topology of human awareness emerging through recent technological and cultural interconnection. Just as the scientific-descriptive aspect of the

Anthropocene (geologic time) can be conceptually distinguished from its broader pragmatic and rhetorical charge (the sense of alarm), the scientific-descriptive dimension of the Noosphere as the global span of accumulating knowledge and conscious interaction exists alongside its predominantly positive evaluative charge.

The "-sphere" of Noosphere derives from the Greek *sphaira/σφαῖρα*, which has a richer history than our abstract geometrical concept of "sphere." From the 6th century BCE through the middle ages, *sphaira* was the key category of the geocentric model of the universe, which consisted of concentric spheres nested around the Earth. Each of the *sphairai* enclosed different planets, and the movement of the spheres resulted in the planets' motion in their orbits. Moreover, the relative positions of these celestial spheres marked spiritual significance, a sphere having greater meaning the farther it was from Earth. The outermost spheres, such as the Empyrean, were imagined to be dwelling places of the divine. This vision of a cosmos of nested meaningful spheres with Earth at the center persisted for more than a millennium until it was disrupted in modernity, first in the Copernican revolution toward heliocentrism and then in the spatial relativization of the entire universe (Lewis, 2012).

An aspect of the traditional cosmology of the spheres survived the modern decentering of Earth and the universe. In current geochemical nomenclature, the concentric spheres have been reconceived as the constitutive elements of Earth (rather than greater layers of the entire cosmos). This nomenclature consists of a series of compound words ending with "-sphere," such as the lithosphere and hydrosphere, as well as the more familiar atmosphere and biosphere.

In particular, the theorization of the biosphere is important as immediate context for the first conceptions of the Noosphere. The initial description of the biosphere in Eduard Suess's (1875) *Die Entstehung der Alpen* (*The Formation of the Alps*) contains the key elements that later became further developed in the Noosphere concept, including traces of the ancient cosmic legacy of the concentric spheres:

> The unevenness of the surface of the **lithosphere** and the insufficient volume of the **hydrosphere** mean that the latter is incomplete and this incompleteness creates the contrast between sea and dry land.
>
> One thing seems to be **foreign** on this **large celestial body consisting of spheres**, namely, organic life. But this life is limited to a determined zone at the surface of the **lithosphere**. The plant, whose deep roots plunge into the soil to feed, and which at the same time rises into the air to breathe, is a good illustration of organic life in the region of interaction between the **upper sphere [atmosphere]** and the **lithosphere**, and on the surface of continents it is possible to single out **an independent biosphere** (Suess, 1875; trans. Smil, 2002, emphasis added).

In Suess's formulation, the spheres are no longer realms of existence extending beyond the Earth; instead, the planet itself is differentiated into spheres. Suess first highlights three different physical spheres making up the inanimate Earth: the lithosphere of its crust, the hydrosphere covering much of the lithosphere, and the upper sphere (atmosphere) embracing both. These three geochemical spheres recall the concentricity of the traditional cosmology, but differ from it in not fully overlapping each other. As Suess explains, dry land exists precisely because the hydrosphere does not fully envelop the lithosphere.

The other important difference from the older cosmology is Suess's description of organic life as a new kind of "foreign" sphere that interweaves the others. He outlines how the biosphere, exemplified by the growth of a plant, crosses the boundary between two of the other spheres, having roots in the lithosphere while the rest of it extends upward into the atmosphere. We can add to Suess's description that the plant is also drawing water from the soil, an example of the biosphere traversing the separation of the lithosphere and hydrosphere as well as the separation of the lithosphere and atmosphere. Thus, organic life taken comprehensively as the biosphere is an exceptional sphere whose boundary-crossing creates active connections among at least the three outer spheres of the planet.

This 1875 excerpt from Suess is important for understanding the Noosphere because it presents the two thematic components that 50 years later became foundational for this latest sphere. One component is the enduring sense of the cosmic celestial spheres and their concentric order. Suess evokes this sense of

ordered concentricity in his description of Earth as a "large celestial body consisting of spheres," although it has become faint in comparison to millennia prior. The other is Suess's introduction of the biosphere as a new form of planetary sphere emerging from, and actively interconnecting, the primordial physical spheres.

In its intellectual history, the Noosphere can be understood as the speculative extension of these two components from Suess. Vladimir Vernadsky, inspired by Suess's short description, expanded and popularized the concept of the biosphere at the turn of the 20th century (Vernadsky & McMenamin, 1998). His lectures on geology, chemistry, and the biosphere in Paris brought him in contact with Pierre Teilhard de Chardin and Édouard Le Roy. With the idea of the biosphere as context, the three thinkers began to envision yet another "thinking sphere" emerging among human beings through culture and technology to envelop the planet. Accelerating human connectivity on a global scale (what today is called globalization) was interpreted by them as a process leading to the formation of this new sphere, the Noosphere.

It is illuminating to compare Teilhard's, Le Roy's, and Vernadsky's shared vision of the Noosphere to the two components of Suess's (1875) description of the biosphere identified above. First, like Suess's presentation of the biosphere, the Noosphere both emerges from and extends active connections across the Earth's older spheres but does so profoundly and at a much faster pace. With the help of technology, the social and cognitive interactions of globalized humanity implicate themselves deeply into the material of the planet's crust (lithosphere), its flowing water and bodies of water (hydrosphere), and its air (atmosphere). Moreover, the Noosphere represents the regulation, conservation, disruption, and destruction of vast portions of the biosphere as well as the human interconnection with it through animal and plant domestication. Thus, the Noosphere comes into view as an amplified version of Suess's boundary-crossing biosphere. These material and energetic implications of the Noosphere resemble aspects of the Anthropocene's *anthropos*.

But the Noosphere also represents a simultaneous retrieval and transformation of the other component from Suess. Suess has situated the biosphere among the imperfectly overlapping but foundational geochemical spheres comprising the Earth, a system that reimagined the traditional cosmology of concentric celestial spheres. The Noosphere adds a sphere of different order to the modern geochemical modern system which serves to bridge this system, in an unexpected manner, with the ancient concentric vision.

The Noosphere's potential to bridge the ancient and the modern is located in the "noos-" part of the compound word, whose etymological origin is the Greek *noos/νόος*, meaning "mind." The primary associations of *noos* are clearest by contrast with *anthropos*. Unlike *anthropos*, which in Greek often delimited the human being in opposition to the gods and their greater metaphysical significance, *noos* is the precise quality of soul and intellect that human beings share with the gods as well as with the ordered universe as a whole. In Aristotelian philosophy, it is the cosmic *noos* of the Prime Mover in the outermost sphere that initiates the motion of the lower celestial spheres and that permeates especially the cognition of human beings. And Greek philosophers before Aristotle, such as Plato and the Presocratics, saw not only humans but the rest of the living and nonliving world as participating in *noos* (Menn, 1992).

Thus, the *noos* of the Noosphere highlights the growing metaphysical and mental import of human interconnection in the Great Acceleration rather than the crisis of environmental rupture. The sphere of mind is less familiar and less easy to define than the prior geochemical spheres and the biosphere, but a material basis for the Noosphere's development is suggested by the increasingly worldwide coverage of internet cables, mobile phones, satellite radio, and television, in addition to many other technologies of interconnection. Taken collectively, these could be cited as early illustrations of the Noosphere's description of a global concentricity of interacting minds (Cobb Kreisberg, 1995; Wyndham, 2000). And proponents of the Noosphere may suggest that through humanity's ventures into space this new mindful sphere is beginning to tentatively expand itself amebalike beyond Earth's atmosphere (Pitt & Samson, 2012). However, growing concerns about new forms of polarization and fragmentation emerging in a world interconnected by technology, as well as the possibility of outer space becoming the site of a new colonization/militarization paradigm, have complicated a purely hopeful vision of this process (see Section 3.3 below).

Nevertheless, unlike the Anthropocene, the Noosphere paradigm has tended not to focus sharply on potential negative and calamitous outcomes of humanity's impact on planetary processes or of the development of new forms of global communication. (Table 1) The possibility of an emerging expansive global culture/

Table 1
A Summary of Key Differences Between the Two Paradigms Across Five Conceptual Categories (Spatiotemporal Emphasis, Spatial Mode, Temporal Mode, Medium, Mood)

Paradigm	Anthropocene	Noosphere
Spatiotemporal emphasis	Time	Space
Spatial mode	Planetary	Planetary
Temporal mode	Rupture	Development
Primary medium	Matter & energy (*anthropos*)	Mind & culture (*noos*)
Primary mood	Crisis & warning	Transformation & hope

awareness and, through it, of potential (re)connection to cosmic meaning gives the Noosphere a distinctly positive evaluative charge. The interconnected global changes of the Great Acceleration appear in the vision of the Noosphere less as rupture and more as rapid transition, as a period of interrelated transformations by which humanity congregates to create global culture with a global awareness or ethic.

3. Reconciling the Anthropocene and the Noosphere

For navigating the collective global challenges of the Great Acceleration, humankind would benefit from a more unified vision. Yet the Anthropocene's material focus and warning of destabilization stand in opposition to the Noosphere's metaphysical emphasis and promise of interconnection. These two concepts have so far precluded the possibility of a coherent scientific narrative to make sense of ongoing global change.

In the following sections, I consider two initial steps that have been taken toward reconciling the Anthropocene and the Noosphere (Sections 3.1 and 3.2) as well as two sites of conceptual overlap between the paradigms that already exist but remain mostly unacknowledged (Sections 3.3 and 3.4). The initial steps draw on narrative techniques, treating the Noosphere and Anthropocene as different elements in a greater human story or history. First, theorists have begun to reconceive the Anthropocene as a crisis or pivot point within a fuller story of Noosphere formation, thus nesting one paradigm within the other. Second, more recent efforts have sought to unify the global protagonists of the Anthropocene and the Noosphere into a single collective entity causing the Great Acceleration. The areas of conceptual overlap include the more positive visions of a "Good Anthropocene" and the fears of a subverted destabilizing Noosphere, as well as the shared predicament of assumed universality in both paradigms.

3.1. Nesting Anthropocene Rupture Within the Process of Noosphere Formation

Of the limited scholarly efforts at bringing the two concepts closer together (de Jong, 2019; Lemmens, 2018; Nordblad, 2014), one of the most important early attempts appeared briefly in a 2005 paper co-authored by Paul Crutzen, the atmospheric chemist who first coined the term Anthropocene 20 years ago:

> Will the Anthropocene simply turn out to be a very short era in which humanity blindly careens forward, continuing to transform the Earth until the planet loses its capacity to support us? Or might humanity rises to the challenge posed by Vernadsky, becoming the reflective, thinking, and proactive agent that transforms the biosphere into a noösphere, and consciously striving to shape a niche for ourselves in a sustainable Anthropocene? (Clark et al., 2005).

Clark, Crutzen, and Schellnhuber present the Anthropocene as historically pivotal: it will either be "a very short era" leading to disaster, or it will be an intense time of challenge in which humanity successfully becomes the "reflective, thinking, and proactive agent that transforms the biosphere into a noosphere." Therefore, the Anthropocene may indeed be a world-historical crisis, a monumental rupture as its etymology suggests, but through it humankind may pass into a Noosphere.

This perspective reinterprets the Anthropocene's critical and material bent as the part of the story in which humanity first confronts (in appropriate collective dismay) the Earth system destabilization that has attended our

Great Acceleration. However, this reinterpretation also lends greater significance to the Great Acceleration than the dire realization of the Anthropocene on its own. Through the Great Acceleration and the Anthropocene, the Noosphere, carrying the promise and meaning of global interconnection, has sped up its formation.

In other words, the two paradigms can be reframed as nested features of the Great Acceleration. The Anthropocene captures the entanglement of human-caused global changes in their suddenness, disturbance, and scale, while the Noosphere gives name, significance, and orientation to the overall transformation. The one concept balances the associations of the other: The Anthropocene prevents the Noosphere from being heedless and utopian, while the Noosphere prevents the Anthropocene from becoming meaningless and dispiriting.

3.2. Combining the Global Protagonists of the Anthropocene and the Noosphere

In addition to reconciling rupture and formation, the implied protagonist of the Anthropocene, humankind personified as *anthropos*, can be reconciled with the global protagonist that appears in some of the earliest theories of the Noosphere. These theories interpret the formation of the cosmic sphere in organic terms as being tantamount to the development of a global superorganism.

Pierre Teilhard de Chardin, the Noosphere's key early theorist alongside Vernadsky, imagined it to be not only a cosmic zone of human thought developing from and transforming the biosphere, but a living superorganism, a new organic unity in evolutionary history emerging from human beings' cultural and technological interconnection. Teilhard went so far as to analogize specific organ systems taking shape in this global human superorganism, including a supernervous system (global interactions via communication technologies), a superinheritance system (intergenerational transmission of accumulating cultural archives), a supercirculatory system (the global economy's movement of goods and capital), and a supermusculoskeletal system (mechanical and automated industry) (Miller, 1978; Teilhard de Chardin, 2004). In this particular Noospheric tradition, the Great Acceleration quite literally represents the physical growth, or more accurately, growth spurt of the global superorganism.

The Noosphere as global superorganism could potentially give an evolutionary and life history to the Anthropocene's more abstract figure of *anthropos*. Moreover, the Teilhardian concept advances the conviction that the human superorganism/*anthropos* must develop new levels of mind and mindfulness (*noos*). At the same time, the Anthropocene's focus on the alarming activity of its *anthropos* protagonist complements this Noospheric vision by emphasizing how disruptive and dangerous to the Earth system and biosphere the early formation of a conjectural human superorganism can be/has been. No less than the Noosphere would enhance the Anthropocene, this reverse complementarity is crucial, since the monumental fact of Earth system disruption and climate change was hardly foreseen by the early Noosphere thinkers, who wrote before the environmental consequences of globalizing humanity became widely recognized.

A seed of such reconciliation through combination of the two global protagonists can be glimpsed in the astrobiologist David Grinspoon's (2016) book *Earth in Human Hands*, in which he proposes a new criterion for the beginning of the Anthropocene:

> Self-conscious global change is a completely new phenomenon. It puts us humans into a category all our own and is, I believe, the best criterion for the real start of the era. The Anthropocene begins when we start to realize that it has begun. This definition also provides a new angle on the long-vexing question of what differentiates our species from other life. Perhaps more than anything else, it is self-aware world-changing that marks us as something new on the planet. What are we? We are the species that can change the world and come to see what we're doing.
>
> By this alternative criterion, the true Anthropocene—what we might call the "mature Anthropocene"—is just getting started (Grinspoon, 2016).

Grinspoon's vision of a "mature Anthropocene," which he later explains should follow our species's "technological adolescence," brings the abstract disruptive *anthropos* of the Anthropocene closer to the Noosphere's developing superorganism. Humankind, in Grinspoon's framework, is growing and maturing like an organism (or superorganism), and the process of maturation is correlated with growing consciousness

and awareness, the dimension privileged in Noosphere discourse. Furthermore, the presentation of the Great Acceleration as humanity's collective adolescence allows Grinspoon to underscore the simultaneous precariousness and promise of the moment, to balance the Anthropocene's warning and the Noosphere's hope without letting either slip from view. Formulations such as Grinspoon's "mature Anthropocene" are possible beginnings for more systematic reconciliation of these two global protagonists.

3.3. The "Good Anthropocene" and the "Subverted Noosphere" as Overlapping Approximations

Grinspoon's use of the phrase "the mature Anthropocene" echoes other recent attempts to reframe the Anthropocene as an epoch that is not characterized solely by warning or evaluated purely negatively. A minority of Anthropocene researchers and activists is publishing on possible "Good Anthropocene" scenarios (Preiser et al., 2017), their work often associated with the ecomodernist movement (Fremaux & Barry, 2019; Nordhaus et al., 2015). These amount to a reorientation of some Anthropocene discourse toward the kind of positivity that predominates in the Noosphere paradigm. Of particular interest is the collaborative "Seeds of a Good Anthropocene" project jointly led by McGill University, the Stockholm Resilience Center at Stockholm University, and the Center for Complex Systems in Transition (CST) at Stellenbosch University, which describes its objective in Noosphere-like terms:

> We aim to counterbalance current dystopic visions of the future that may be inhibiting our ability to move toward a positive future for the Earth and humanity. We will do this by soliciting, exploring, and developing a suite of alternative, plausible "Good Anthropocenes"—positive visions of futures that are socially and ecologically desirable, just, and sustainable. We expect that any "Good Anthropocene" that emerges will be radically different from the world as people know it today. Yet we also know that these futures will be composed of many elements already in existence, which we call "seeds," which could combine in unique and surprising ways to create an almost unimaginable future (The Seeds of a Good Anthropocene Project – About Us 2019).

This vision of existing seeds combining to give rise to a promising future resonates with the themes of convergence, interconnection, and positive development marked in Noosphere discourse, perhaps resembling most directly early Noosphere descriptions of "grains of thought" coalescing (Teilhard & Appleton-Weber, 2015). Yet, by seeking to network specifically environmental efforts on their platform, the Seeds project is bringing Noosphere thematic undercurrents in closer contact with the Anthropocene's material-energetic concerns.

Meanwhile, scholars in the Noosphere paradigm are growing more attuned to how expanding global communication can lead not only to positive shared awareness manifesting in global institutions but to fragmentation and loss of agency when human beings fall under the sway of hardly understood algorithmic dynamics—in social media, in surveillance, and even in our habits of reflexively signing electronic contracts (Frischmann & Selinger, 2018). This concern has been expressed in the idea of the "technosocial dilemma" or the notion that in the information age it is "the infosphere [that is becoming] the ultimate successor of the noosphere... Rising above thought like an algorithmic leviathan" (Wilson, 2017).

In this sense, theories of what one might call a "Subverted Noosphere" are approximating the Anthropocene's attention to the radical disruption of ecosystems. However, the ecosystems at risk in a subverted Noosphere or an out-of-control infosphere are more typically our shared mental, social, and political spaces, and the disruption comes in the form of personal and institutional destabilization due to the unforeseen consequences of globalized electronic communication, such as filter bubbles or disinformation (Ronfeldt & Arquilla, 2020).

Therefore, even as a few Anthropocene thinkers and activists have begun to explore "Good" variations characterized by Noosphere-like convergence, some Noosphere thinkers are now widening their pragmatic and rhetorical frame to include possibilities of a more disruptive Noosphere.

3.4. The Overlapping Predicament of the Universal Assumption in the Anthropocene and Noosphere

Finally, the Anthropocene and the Noosphere paradigms both face the challenge of justifying their baseline assertions of global scope. For the Anthropocene, there continues important debate over whether it is

appropriate to identify "humanity as a whole" (*anthropos*) as the agent responsible for material-energetic Earth system disruption if individuals, communities, and nations have differentially contributed to the process (Chakrabarty, 2015). For the Noosphere, its proponents face questions about the degree to which it is developing as something truly global in the way the word suggests, given extremely disparate access to internet and education as well as to even more basic fundamentals. Moreover, the Noosphere must grapple with how to reconcile within its global scope preexisting nonglobal imagined communities, ways of life, and diverse collective identities, such as distinct nation-states and religious traditions (Sideris, 2017). Although different in their specifics, the challenges inherent to the assumptions of a universal humanity in both paradigms would benefit from collaborative exploration.

4. Conclusion

The Great Acceleration represents a set of interrelated anthropogenic global trends that are profoundly impacting human and living beings as well as the Earth system as a whole. It is therefore crucial for humankind—simultaneously the collective agent and patient of the Great Acceleration—to have available broadly shared, scientifically compatible, and globally acceptable paradigms in which to understand this period of immense change. Indeed, in the absence of such global paradigms, it is unclear how we can fully recognize the precarities and prospects of our own species in the 21st century.

Today, the Anthropocene and the Noosphere are the two major paradigms that have begun to make sense of the Great Acceleration, yet they have developed mostly in isolation from each other. As I have shown in Sections 2.1 and 2.2, they derive from different scientific-intellectual traditions, and they offer nearly opposite normative evaluations of global changes driven by humankind. The Anthropocene has taken shape in its pragmatic and rhetorical dimensions as the paradigm of rupture, materiality, and warning; the Noosphere as the paradigm of transformation, mind/culture, and promise.

A balanced understanding of the global transformation in which we as a species are increasingly embroiled will require the insights of both paradigms. Consequently, what is needed is not a wholesale paradigm shift from one to the other but a new process of paradigmatic dialogue. In Sections 3.1 and 3.2, I have outlined two promising preliminary attempts that have been made as beginnings of reconciliation: the first nests the crisis of the Anthropocene within the formation of the Noosphere; the second seeks to unify the global protagonists of the two paradigms. While these attempts are starting points for future dialogue between the Anthropocene and the Noosphere, more extensive scholarly effort is necessary to bridge the great conceptual distance that has opened between them. In Sections 3.3 and 3.4, I have suggested two promising areas of overlap for such effort.

A crucial first step, the central concern of this article, is to recognize the Anthropocene and the Noosphere as the two major paradigms through which humanity now strives to comprehend this Great Acceleration that has swept up all of us, most of the living world, and much of the physical environment. It is by building on our recognition of these divergent paradigms that we can begin the essential process of reconciling them and thus developing steady global perspectives on uncertain worldwide change.

Acknowledgments
Funding for this research was provided by the Human Energy Project, a nonprofit initiative of the Kacyra Family Foundation. I am thankful to David Christenson, Francisco Cruces, Terrence Deacon, Adiv Johnson, Ben Kacyra, Brian Pines, Parham Pourdavood, Nick Romeo, Jaida Samudra, Max Shokhirev, Brian Swimme, Clément Vidal, and the members of the Teleodynamics Research Group for valuable insights and suggestions. I am also very grateful to the two anonymous reviewers whose suggestions and critiques strengthened the manuscript significantly.

References

Adeney Thomas, J. (2019). Why the "Anthropocene" is not "Climate Change" and why it matters. *AsiaGlobal Online*. Retrieved from https://www.asiaglobalonline.hku.hk/anthropocene-climate-change/

Anthropocene Working Group (2019). *Results of binding vote by AWG*, Subcommission on Quaternary Stratigraphy. Retrieved from http://quaternary.stratigraphy.org/working-groups/anthropocene/

Bernstein, A. (2019). *The future of immortality: Remaking life and death in contemporary Russia*, Princeton, NJ: Princeton University Press.

Chakrabarty, D. (2009). The Climate of History: Four Theses. *Critical inquiry*, *35*(2), 197–222. https://doi.org/10.1086/596640

Chakrabarty, D. (2015). The human condition in the anthropocene. *The Tanner Lectures on Human Values*, *35*, 137–188. Retrieved from https://tannerlectures.utah.edu/Chakrabarty%20manuscript.pdf

Chakrabarty, D. (2016). Humanities in the Anthropocene: The crisis of an enduring Kantian fable. *New Literary History*, *47*(2–3), 377–397. https://doi.org/10.1353/nlh.2016.0019

Clark, W. C., Crutzen, P. J., & Schellnhuber, H. J. (2005). Science for global sustainability: Toward a new paradigm CID Working Paper No. 120. *Center for International Development, Harvard University*, Cambridge, MA: Science, Environment and Development Group. https://doi.org/10.2139/ssrn.702501

Cobb Kreisberg, J. (1995). *A globe, clothing itself with a brain*, San Francisco, CA: WIRED. Retrieved from https://www.wired.com/1995/06/teilhard/

Crutzen, P. J. (2002). Geology of mankind. *Nature*, *415*(6867), 23–23. https://doi.org/10.1038/415023a
de Jong, T. (2019). *The noosphere concepts of Pierre Teilhard de Chardin and Vladimir Vernadsky reassessed, in the pursuit of a future after the Anthropocene*. Academia. Retrieved from https://www.academia.edu/38978074/The_noosphere_concepts_of_Pierre_Teilhard_de_Chardin_and_Vladimir_Vernadsky_reassessed_in_the_pursuit_of_a_future_after_the_Anthropocene_2019_
Fremaux, A., & Barry, J. (2019). The "good Anthropocene" and green political theory: Rethinking environmentalism, resisting eco-modernism. In F. Biermann & E. Lövbrand (Eds.), *Anthropocene encounters: New directions in green political thinking* (1st ed., pp. 171–190). Cambridge University Press. Retrieved from https://doi.org/10.1017/9781108646673.009
Frischmann, B., & Selinger, E. (2018). *Re-engineering humanity* (1st ed.). Cambridge, UK: Cambridge University Press. Retrieved from https://doi.org/10.1017/9781316544846
Gervais, P. (1847). Mémoires de la Section des Sciences (Vol. 1, pp. 399–413). Montpellier: Académie des sciences et lettres de Montpellier.
Grinspoon, D. H. (2016). *Earth in human hands: Shaping our planet's future* (1st ed.). New York, NY: Grand Central Publishing.
Hamilton, C. (2017). *Defiant Earth: The fate of humans in the Anthropocene*. Cambridge, UK ; Malden, MA: Polity.
Hamilton, C., & Grinevald, J. (2015). Was the Anthropocene anticipated? *The Anthropocene Review*, *2*(1), 59–72. https://doi.org/10.1177/2053019614567155
Haraway, D. J. (2016). *Staying with the trouble: Making kin in the Chthulucene*, Durham, NC: Duke University Press. https://doi.org/10.1215/9780822373780
Hecht, G. (2018). *The African Anthropocene*, Melbourne, Australia: Aeon. Retrieved from https://aeon.co/essays/if-we-talk-about-hurting-our-planet-who-exactly-is-the-we
Horn, E., & Bergthaller, H. (2019). *The Anthropocene: Key issues for the humanities*. Key Issues in Environment and Sustainability (1st ed.). New York, NY: Routledge.
Hudson, M. (2014). Placing Asia in the Anthropocene: Histories, vulnerabilities, responses. *The Journal of Asian Studies*, *73*(4), 941–962.
Kress, W. J., & Stine, J. K. (Eds.). (2017). *Living in the Anthropocene: Earth in the age of humans*. Washington, DC: Smithsonian Books, in association with Smithsonian Institution Scholarly Press.
Lemmens, P. (2018). Re-Orienting the Noösphere: Imagining a New Role for Digital Media in the Era of the Anthropocene. *Glimpse*, *19*, 55–64. https://doi.org/10.5840/glimpse2018196
Lewis, C. S. (2012). *The discarded image: An introduction to medieval and renaissance literature*. Cambridge: Cambridge University Press.
Liddell, H. G., Scott, R., Jones, H. S., & McKenzie, R. (1996). *Greek-English Lexicon With a Revised Supplement*. Oxford; New York, NY: Clarendon Press; Oxford University Press.
Malm, A., & Hornborg, A. (2014). The geology of mankind? A critique of the Anthropocene narrative. *The Anthropocene Review*, *1*(1), 62–69. https://doi.org/10.1177/2053019613516291
McNeill, J. R., & Engelke, P. (2014). *The Great Acceleration: An Environmental History of the Anthropocene since 1945*. Cambridge, MA: The Belknap Press of Harvard University Press.
Menn, S. (1992). Aristotle and Plato on God as Nous and as the Good. *The Review of Metaphysics*, *45*(3), 543–573.
Miller, J. G. (1978). *Living systems*. New York, NY: McGraw-Hill.
Mohorčich, J. (2017). Scale, noosphere two, and the Anthropocene. In P. Heikkurinen (Ed.), *Sustainability and peaceful coexistence for the Anthropocene*. Abingdon, Oxon; New York, NY: Routledge.
Nordblad, J. (2014). The future of the noosphere. *Forum Interdisziplinäre Begriffsgeschichte*, *3*(2), 33–42.
Nordhaus, T., Shellenberger, M., & Mukuno, J. (2015). Ecomodernism and the Anthropocene. *Breakthrough Journal*, (5).
Pitt, D., & Samson, P. R. (2012). *The biosphere and noosphere reader: Global environment, society and change*. Hoboken, NJ: Taylor and Francis.
Preiser, R., Pereira, L. M., & Biggs, R. O. (2017). Navigating alternative framings of human-environment interactions: Variations on the theme of 'Finding Nemo.' *Anthropocene*, *20*, 83–87. https://doi.org/10.1016/j.ancene.2017.10.003
Revkin, A. (2008). Earth is Us. *Dot Earth*, New York, NY: The New York Times. Retrieved from https://dotearth.blogs.nytimes.com/2008/01/28/earth-is-us/
Ronfeldt, D. F., & Arquilla, J. (2020). *Whose Story Wins: Rise of the Noosphere, Noopolitik, and Information-Age Statecraft*. Santa Monica, CA: RAND Corporation. https://www.rand.org/pubs/perspectives/PEA237-1.html
Sideris, L. (2016). Anthropocene Convergences: A Report from the Field. *RCC Perspectives*, (2), 89–96. https://doi.org/10.5282/rcc/7450
Sideris, L. (2017). *Consecrating science: Wonder, knowledge, and the natural world*, Oakland, CA: University of California Press.
Smil, V. (2002). *The Earth's Biosphere: Evolution, Dynamics, and Change*. Cambridge, MA: MIT.
Steffen, W., Broadgate, W., Deutsch, L., Gaffney, O., & Ludwig, C. (2015). The trajectory of the Anthropocene: The Great Acceleration. *The Anthropocene Review*, *2*(1), 81–98. https://doi.org/10.1177/2053019614564785
Suess, E. (1875). *Die Entstehung der Alpen*, Vienna, Austria: W. Braumüller.
Teilhard de Chardin, P. (2004). *The future of man* (1st Image Books ed.). New York, NY: Image Books/Doubleday.
Teilhard de Chardin, P., & Appleton-Weber, S. (2015). *The Human Phenomenon*, East Sussex, UK: Sussex Academic Press.
The Seeds of a Good Anthropocene Project (2019). *About Us*, Montreal, Canada: Future Earth. Retrieved from https://goodanthropocenes.net/om/
Vernadskiĭ, V. I., & McMenamin, M. A. (1998). *The biosphere*. New York, NY: Copernicus.
Wilmarth, M. G. (1925). *The geologic time classification of the United States geological survey compared with other classifications, accompanied by the original definitions of era, period and epoch terms*, Washington, DC: Bulletin (Geological Survey (U.S.)). U.S. Government Printing Office.
Wilson, A. (2017). Biosphere, Noosphere, Infosphere: Epistemo-Aesthetics and The Age of Big Data. *Parallax*, *23*(2), 202–219. https://doi.org/10.1080/13534645.2017.1299297
Wyndham, F. S. (2000). The sphere of the mind: Reviving the noösphere concept for ecological anthropology. *Journal of Ecological Anthropology*, *4*(1), 87–91. https://doi.org/10.5038/2162-4593.4.1.5
Zalasiewicz, J. A., Waters, C. N., Williams, M., Summerhayes, C. P., Head, M. J., & Leinfelder, R. (2019). *The Anthropocene as a Geological Time Unit: A Guide to the Scientific Evidence and Current Debate*, Cambridge, UK: Cambridge University Press. Retrieved from https://doi.org/10.1017/9781108621359