

Roundtable:

The future of culture in more-than-human worlds of being

Geo-societal More-than-Humanness

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Natural sciences paradigms guide this essay's perspectives. Given the complex-adaptive dynamics of the Earth System, cultures are drivers and prompts of human and natural (sub)systems, respectively. The essay combines geo-philosophical thought and Semiotic Cultural Psychological Theory to depict an ideal-typic narrative of people's sensemaking culture as an intrinsic part of the Earth System. Generic characteristics of marine operations (e.g., mining at the seabed) illustrate the description. The essay claims that human culture is an attribute of the Earth System, i.e., the nexus that ties human socio-cultural domains and planetary technosphere, biosphere and geosphere, and that more-than-humanness is one of the nexus' attributes.

Introduction

This essay expands on previous studies (Bohle, 2020), including more-than-humanness as an attribute of geo-societal sensemaking. The essay depicts an ideal-typic description of the Earth System, i.e., the planetary, social-ecological aggregate of ecosystems and ergosphere (Donges, Winkelmann, *et al.*, 2017). The description emphasizes Earth System dynamics, people's affective-rational sensemaking, and human culture feedback.



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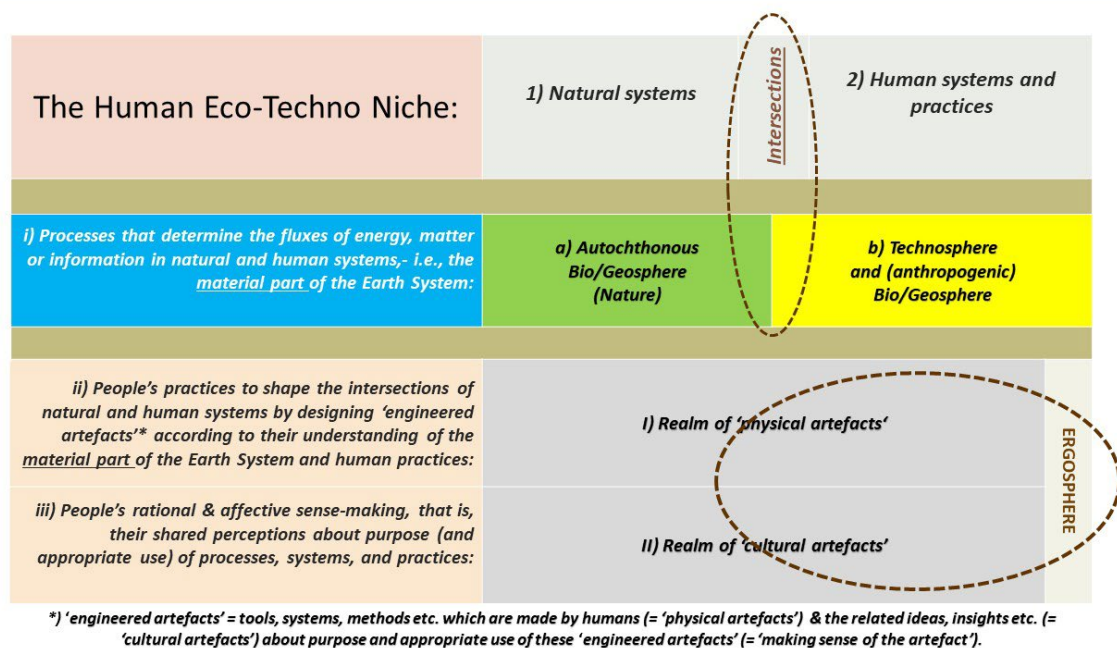
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When considering themselves, humans should refer to culture considering other-than-human beings and related attributes of the Earth System. The intersection of human and other-than-human realms on Earth (Otto *et al.*, 2020; Rockström *et al.*, 2024) has a material matrix: physical matter, energy, and information fluxes. How people perceive the intersecting realms depends on their variant of human culture. A hypothetical concept of culture referring only to humans must postulate segregated material realms and decoupled dynamics. Notwithstanding whether people recognize a more-than-humanness of human cultures, they relate to other living and non-living beings because of the underlying material matrix (Steffen, 2022; Wallenhorst, 2023).

It is a simplification to decompose the Earth System conceptually into parts like geosphere, biosphere, technosphere, or Nature and World. Often, such simplifications shall circumvent the counter-intuitiveness of complex-adaptive dynamics (CAD) because, otherwise, analyses might be empirically (too) complex and theoretical descriptions (too) general.¹ Nevertheless, this essay stays at these levels of abstraction, taking the risk of being an example of ‘too complex and too general.’

Fig. 1 Systems, processes, practices, and perceptions making the Human Eco-Techno Niche



Conceptual Frameworks

This essay uses four concepts to describe the human niche (Fig. 1): (i) The human niche is a set of SES combining the World and Nature (Fuentes, 2016; Ellis, 2024) through planetary energy, matter, and

¹ Complex Adaptive Dynamics:

- multiple cause-and-effect pathways; structural parts are multi-functional; the same function may be duplicated;
- outputs & inputs may not relate proportionally; minor changes in controlling driver can cause rapid, system-wide behaviour; major changes in controlling driver may cause slow and limited system-wide response.
- dynamic interactions may amplify minor inputs in cascades of major effects causing surprise and uncertainty; a local intervention may modulate system-wide organisation.

information fluxes. (ii) These SES exhibit CAD, which, in turn, tie the natural and human-made structures (techno/ergosphere) of the Earth System (Lenton and van Oijen, 2002; Preiser *et al.*, 2018; Dorninger, Menéndez and Caniglia, 2024). (iii) The technosphere (Haff, 2014; Donges, Lucht, *et al.*, 2017), i.e. the ensemble of 'engineered artefacts' people deploy, modulates the planetary energy, matter, and information fluxes. (iv) The ergosphere, i.e. the technosphere plus the associated social processes (Renn, 2020), such as rational-affective sensemaking (Salvatore, Avdi, *et al.*, 2019), shapes the modulation of the planetary energy, matter, and information fluxes.

The following subsections depict the building blocks of geo-societal sensemaking (Bohle, 2020) [p. 33-38]. Re-interpreting them indicates that more-than-humanness is intrinsic to human culture.

Complex-Adaptive Dynamics of the Human Niche

Different systems with CAD exhibit similar systemic features; see (Bohle, 2020; p. 34-36) for a summary. They do not decompose into parts without losing characteristics such as dynamical properties, counter-intuitive behaviors, hysteresis, and irreversible path-dependent changes. Early studies in planning theory (Briggs, 2007; Head, 2018) call this phenomenon 'wicked'. Complex-adaptive behaviors arise in SES when the dynamics of subsystems or intersections are non-linear and involve feedback. Unevenly distributed and partial knowledge of human agents, diverse values influencing choices, and conflicting interests amplify complex-adaptive behaviors.

The Earth System is an SES with CAD exhibiting features different from the cumulated features of subsystems (e.g. geosphere, biosphere and technosphere). The complex-adaptive Earth System (CAES) blends human systems and practices with natural systems and processes (Dorninger, Menéndez and Caniglia, 2024; Ellis, 2024; Rockström *et al.*, 2024). Hence, the CAES bundles humans and other-than-human beings into one realm.

The human systems and practices encompass the 'built techno/ergosphere', which comprises engineered artefacts, socio-economic institutions, and cultural artefacts shaped by legal, political, and philosophical constructs. The techno/ergosphere is a dynamic intersection of human practices and natural processes².

CAD of natural, societal, and governmental systems is systemic. The human agent is a CAES feature, and the agent's intervention culture is a system attribute. Experience with CAD indicates, for example (Jentoft and Chuenpagdee, 2009; Head and Xiang, 2016; Termeer *et al.*, 2016) that engineering-based blueprints or administrative tactics are less effective compared to participatory governance and shared sensemaking.

Techno/ergosphere

Engineered artefacts intersect the World and Nature. They amplify the complex-adaptiveness of the Earth System because of the specific matter, energy, and information fluxes they shape. Engineered artefacts have twined attributes. They are 'physical artefacts' (e.g., tools, systems, methods) and 'cultural artefacts' (e.g., ideas, insights, concepts) referring to the whats/how/whys of the physical artefacts. Whether the cultural artefacts capture features of CAD determines the human agent's intervention culture.

People's sensemaking of, for example, engineered artefacts or Nature has twined attributes; it is rational and affective. People's rational-affective sensemaking of the Earth System (e.g., of processes,

² For example, regulating mining equipment is a cultural artefact within the global supply chain of resource extraction systems that is part of the techno/ergosphere.

systems, fluxes, practices, artefacts, and dynamics) determines how they design and deploy the engineered artefacts.

Rational-affective sensemaking is a cultural process to internalize the systemic features of people's lives, milieus, and natural environments (Funtowicz and Ravetz, 2003; Rochira and Salvatore, 2021). Rational sensemaking is bound. People are rational within constraints, such as the fundamental need to keep worldviews coherent within the cultural milieu. Whether human sensemaking captures features of CAD is pivotal.

Symbolic Universes

Semiotic Cultural Psychological Theory (SCPT) applies descriptions called Symbolic Universes (SU) to characterize cultural milieus (Salvatore, Avdi, *et al.*, 2019; Salvatore, Fini, *et al.*, 2019). A SU describes the understanding, insights, practices and behavior of groups of people expressing the social experiences of their respective cultural milieu.

The SU approach can appraise how people associate themselves with norms, institutions, or proposed practices (Bohle, 2020; p.36-38). Subsequently, the description by SU can be used to assess whether the affective-rational sensemaking of the given milieu might have the potential to capture a concept of more-than-humanness.

Table 1 Description of the Symbolic Universe - 'Ordered universe' and 'Others' world' – see (Salvatore *et al.*, 2018; Table 7)

*Symbolic Universe 1. **Ordered universe:** Cluster 1 is characterized by two relevant facets -on the one hand, a generalized positive attitude toward the world (institutions and services, the people, the place where one lives, the country, the future), which is considered trustworthy, receptive of the efforts to engage with and to improve it. On the other hand, there is identification with transcendent values and ideals (e.g., justice, morality, solidarity; rejection of opportunism, conformism and power) that foster commitment to making things better -where such commitment is meant as a value in itself: the way of making life meaningful, rather than of pursuing material interests. The combination of these two facets outlines what we interpret as the basic assumption substantiating this symbolic universe: faith in the inherent ethical order of the world. Rightness, morality, and efficacy go together, what is just is also efficacious in rendering things better, because the universe follows its harmonious design. Behaviour has to conform to and reflect such universal order and in so doing one can trust in being on the right side of the history.*

*Symbolic Universe 5. **Others' world:** Cluster 5's profile outlines a fully negative, even desperate vision of the world - generalized untrustworthiness, sense of impotency, lack of agency, anomie. The world belongs to those who have power - the defeated have only the chance to try to survive day-by-day, surrendering to those with the power to lead the game. Morality and values are a luxury one cannot afford when the only possible concern is to limit the damage.*

Extensive fieldwork found five SU for people of European (Western) cultures (Salvatore *et al.*, 2018; Table 7), e.g. Table 1 shows two of them. The SUs called 'Ordered Universe', 'Interpersonal Bond', 'Caring Society', 'Niche of Belongingness', and 'Others' World' categorize milieus, for example, in terms of relation to power and institutions or sources of trust.

The categorization of cultural milieus by SU corroborates with the Kohlberg hierarchy of the level of societal coordination (Kohlberg, 1981), which associates public norms and the worldviews of individuals and groups [Table 4].

Geo-philosophical frameworks

Several geo-philosophical concepts, such as geoethics, recently appeared in Earth Sciences, such as geology (Bohle and Marone, 2021). Given the notions of this essay, these concepts are cultural artefacts of the techno/ergosphere. Initially, they capture a specific relation of a non-human entity (e.g., the geosphere) with the human (e.g., professional practices of geoscientists). Although geo-philosophical frameworks like geoethics (Peppoloni and Di Capua, 2022) do not explicitly apply notions like other-than-human, they express a culture of more-than-humanness.

Table 2. Tenets of the Cape Town Statement on Geoethics (CTG)

Label	Description
1. agent-centricity	To apply a normative framework that invests (empowers) an individual professional geoscientist to act to their best understanding in the face of circumstances given, opportunities and purposes;
2. virtue-focus	A corpus of personal traits (honesty, integrity, transparency, reliability, or spirit of sharing, cooperation, reciprocity) of an individual professional geoscientist that furthers the individual's operational (handling of things) and social (handling of people) capabilities;
3. responsibility focus	The outcome of a normative call (internal, external) upon an individual professional geoscientist to frame decisions/acts in terms of accountability, as well for the intended effects as for unintended consequences;
4. knowledgebase	Knowledge acquired by scientific methods instead of allusion to faith (primarily geosciences / Earth system knowledge).

The Cape Town Statement on Geoethics (CTG) is the most accessible resource on geoethics (Di Capua, Peppoloni and Bobrowsky, 2017). The CTG bundles various concepts in a Kantian/Aristotelian virtue ethics framework (Table 2). The CTG expresses a holistic Earth System perspective without using concepts like SES with CAD, techno/ergosphere, or cultural artefacts.

To investigate how the CTG is appraised in different cultural milieus, the initial SU description (Table 1) can be reformulated (Table 3) to fit the description of CTG (table 2).

Table 3. Descriptions of the five Symbolic Universe (SU) using a language that fits the description of CTG (Table 2); reproduced from (Bohle, 2020; Table 2).

<i>Symbolic Universe 1:</i> Ordered Universe:	<i>To be:</i> trustworthy, receptive, harmoniously designed, and ethically ordered world (institutions, people, commons, place and future) to engage with (behavior reflects universal order, rightness, morality, efficaciously bettering things); <i>To ought:</i> identification with values and ideals (justice, morality, solidarity; rejection of opportunism, conformism, and power; right side of the history) <i>To do:</i> commitment to making things better, a value and a way of a meaningful life;
<i>Symbolic Universe 2:</i> Interpersonal Bond	<i>To be:</i> a positive, optimistic vision of the world (institutions, people, commons, place, and future); <i>To ought:</i> a vital world of interpersonal, emotional bonds that are meaningful and fulfilling; <i>To do:</i> agency needs adaptability and conformism to find individual safety and fulfilment;
<i>Symbolic Universe 3:</i> Caring Society	<i>To be:</i> society is a trustworthy provider of commons, receptive to demands and needs; <i>To ought:</i> generalized confidence in the rules to be supportive (life, future, and agency); <i>To do:</i> undertake trustworthy efforts together with the care-takers;
<i>Symbolic Universe 4:</i> Niche of Belongingness	<i>To be:</i> an identity, in-group network within an untrustworthy world; <i>To ought:</i> the network provides shelter from a threatening outside; <i>To do:</i> power in alliance with the more potent, breaking the rules to help loved ones;
<i>Symbolic Universe 5:</i> Others' World	<i>To be:</i> an untrustworthy world that belongs to the powerful; <i>To ought:</i> morality and values are a luxury; <i>To do:</i> impotency, attempts to limit damage;

Discussion

Connecting Frameworks

The CAES ties world views, human practices, and societal and natural systems. Therefore, human norms (accepted or rejected) are an intrinsic feature of the Earth System.

A given pattern of societal norms shapes society's engineered artefacts, which shape the material intersections of human and other-than-human realms, finally altering the World and Nature. Iteratively, human rational-affective sensemaking of the altered World and Nature feeds (back) into worldviews, practices and associated societal norms (Bohle, 2020; Fig.1).

Table 4: Correspondence between a) SU, b) Kohlberg's hierarchy of societal coordination and c) the CTG

		Symbolic Universes				
Kohlberg Stages (forms of societal coordination)		1 Ordered Universe	2 Interpersonal Bound	3 Caring Society	4 Niche of Belongingness	5 'Other's World
1	Obedience and punishment; blind egoism					Min
2	Self-interest orientation; Individualism, Instrumental egoism				Low	
3	Interpersonal accord and conformity; Others' approval, social relationships			Moderate		
4	Law and order; blind compliance, social systems		High			
5	Social contract orientation; Agrees on common regulations	Max				
6	Universal ethical principles, principled self-conscience, mutual respect					

Cultural milieus shape the worldviews and practices of persons and groups, including the norms that guide them. SUs are an approach to characterize these worldviews and practices. Comparing SUs and geo-philosophical frameworks indicates mutual correspondence or divergence, e.g., how geoethics might be received in cultural milieus characterized by a specific SU.

Using CTG as an example (Table 4): (i) Likely, the CTG resonates most positively with people of the cultural milieu *'Ordered Universe'* (highest Kohlberg level). (ii) In other milieus, the reception of CTG likely will be 'around moderate'. (iii) The reception of CTG will likely be adverse to the milieu *'Others' World'* (lowest Kohlberg level). Given that geoethics implies considering more-than-humanness, it can be assumed that more-than-humanness will be a 'long-haul' for many cultural milieus, but the *'Ordered Universe'*.

Describing a specific SES with CAD is a substantial analysis, as the following example (mining at the seabed) illustrates.

Case: Deep-Sea Mining

Mining activities at the bottom of the sea, i.e., deep-sea mining, exhibit attributes that illustrate how to apply the conceptual frameworks outlined above because deep-sea mining can be described as a specific SES exhibiting CAD, an intrinsic part of the CAES.

Mining the bottom of the sea raises many concerns (Werle *et al.*, 2018; Heffernan, 2019; Blanchard *et al.*, 2023; Jaeckel *et al.*, 2023; Wilde *et al.*, 2023). It is an emerging industrial activity within global supply chains. It is characterized by remotely operated technology, sensitive and hard-to-monitor ecosystems, actors with conflicting interests, convoluted societal, technical, and environmental challenges, and public governance through the International Seabed Authority.

Compared to other industrial operations at sea, e.g., shipping, fishing, or hydrocarbon exploitation, these nascent mining activities are (still) researching the operational conditions and technological solutions. Also, the related legal, regulatory, and commercial frameworks are under construction, involving various stakeholders like international authorities, national regulators, private entities, and civil society groups. The idea of 'freedom of the seas' is a prime feature of marine culture (Vidas, 2011; Boyd *et al.*, 2018) that, combined with the open sea's remoteness, gives factual autonomy to risk questionable practices.

The natural dynamics of oceans and seas are non-linear with multiple feedback; hence, these natural systems are prone to CAD. The cultural-environmental conditions at sea present significant challenges for operations, safety, and monitoring, enhancing the likelihood that marine SES exhibits CAD. Hence, human agents' [geo]ethical framework is a vital system feature, including whether it addresses the more-than-humanness of the oceanic environment.

Among marine SESs, the specific SES 'mining at the seabed' is uniquely characterized by partial knowledge, conflicting interests, diverse values, non-linear dynamics, and multiple feedback processes. Hence, it is particularly prone to CAD, which ties natural and human-made structures (techno/ergosphere), including culture being an intrinsic feature of the latter.

Those human agents with a geoethical practice, because it fits their SU, will likely refrain from mining at the seabed because they perceive (among other aspects) a risk of damaging other-than-human beings. Those who reject geoethical practices because of their SU likely take a different perspective on mining at the seabed.

Winding Up

This essay describes 'human cultures' as components of the CAES, i.e., the planetary human eco-techno niche in which people dwell.

Any human culture involves more-than-humanness because of the tied material realms of human and other-than-human beings. Ideas about distinct realms of human and other-than-human beings seem a transhumanist oversimplification. Nonetheless, how a person perceives more-than-humanness will depend on the specific cultural milieu of the individual.

Consciously practicing a more-than-human culture characterizes a specific adaptation to the human niche. This adaptation might be implicit, as likely for people applying geo-philosophical practices, i.e. geoethics, that acknowledge CAES as a combination of natural, technological, and cultural processes tightly knotted into one comprehensive system.

Geoethics recognize the combination of natural, technological, and cultural processes, although it lacks reference to the complex-adaptiveness of the CAES. Complex-adaptiveness, however, is essential because it enforces a strong material tie between human and other-than-human realms.

Reflecting on operations for mining at the seabed illustrates how human and other-than-human realms couple in an SES with CAD. Other illustrative examples could be found. However, the example 'mining at the seabed' has a terrestrial analogue: running an open-pit cobalt mine from a helicopter up in the clouds. That sounds quite unimaginable, likely in any culture.

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