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ARTICLES

Shallow vs. Deep Geoethics: Moving Beyond Anthropocentric Views

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Abstract

At its inception, geoethics was envisioned as a type of professional ethics concerned with the moral implications of geoscientific research, applications, and practices. More recently, however, some scholars have proposed versions of geoethics as public and global ethics. To better understand these developments, this article considers the relationship between geoethics and environmental ethics by exploring different aspects of the human-nature relation (i.e., the moral status and role of humans in relation to the non-human world). We start by noting that the main strains of geoethical thought elaborated so far represent examples of environmental virtue ethics and defend moral weak anthropocentric positions (e.g., "ethical", "responsible" or "enlightened" anthropocentrism). Some scholars propose that such weak anthropocentric geoethics can synthesize the different positions in environmental ethics and move beyond them toward a novel and distinct approach. We compare the meaning and the use of the term "anthropocentrism" in both environmental ethics and geoethics, stressing that although geoethics is inevitably epistemically anthropocentric (i.e., anthropogenic), it does not need to be morally anthropocentric. We consider the compatibility of non-anthropocentric stances with current geoethical theory and argue for the integration of normative non-anthropocentric accounts (e.g., ecocentric) into geoethical debates and geoscience education.

Keywords Geoethics · Environmental ethics · Anthropocentrism · Ecocentrism · Geoscience education

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Introduction

Sitting at the crossroads of geoscience (the discipline that study the Earth and its processes) and ethics (the discipline that studies morality), geoethics has been characterized as "a field of theoretical and applied ethics focused on studies related to human-Earth system nexus […]" (Peppoloni & Di Capua, 2023, p. 18). At its inception about a decade ago, geoethics was envisioned as a professional type of ethics concerned with the impact of geoscientific research, knowledge, methods, communication, applications, and practices on the public sphere and the environment (Mogk, 2018). More recently, however, some of the founding scholars and most prolific contributors such as e.g.Bohle (2021a); Peppoloni and Di Capua (2020, 2021b, 2022b) have claimed that geoethics is "not simply professional ethics" and it is "now able to provide society with a new way of approaching issues relating to the relationship between human beings and the Earth […]" (Peppoloni & Di Capua, 2020, p. 14). In particular, Peppoloni and Di Capua propose a version of geoethics as "an ethics for society" (Peppoloni & Di Capua, 2021b, p. 3), a "global ethics to face grand challenges for humanity", a "global ethics for the new millennium" (Peppoloni & Di Capua, 2020, p. 13), and a "global ethics for a human globalized community of destiny" (Peppoloni & Di Capua, 2021b, p. 9). Similarly, but more cautiously, Bohle (2021a, p. 84) affirms that although it was "initially designed for professional use, geoethics should support any citizen's individual, professional and civic dealings". At least these leading researchers in the geoethics community maintain that geoethics amounts to a much-needed and specific intellectual development. However, as we will show below, claiming that a certain account of geoethics should become a global ethics runs the risk of, for example, perpetrating Eurocentrism or maintaining anthropocentric assumptions. Considering that geoethics is still "deepening its philosophical foundations and strengthening its interactions with other disciplines" (Bohle et al., 2019, p. 165), we believe it is important to examine the ethical assumptions of current geoethical thinking as well as the relation between geoethics and environmental ethics. In what follows, we step back and reflect on whether geoethics can be regarded as a framework, a self-standing field, or as an area of inquiry *within* environmental ethics.

This article has two main objectives. The first aim is to compare the meaning and the use of the term "anthropocentrism" in both environmental ethics and geoethics. The second goal is to ask whether non-anthropocentric ethical positions could be integrated within existing geoethical thinking. Siding with geoethics scholar C. Vasconcelos, we believe it is still worth thinking about "whether it would be possible to […] start having an ecocentric relationship with nature" (Vasconcelos et al., 2022, p. 378). The task of critically scrutinize these issues is non-trivial for three reasons. First, geoethics scholarship developed so far appear largely based on "weak anthropocentric assumptions" (Frigo & Ifanger, 2021). A second and related issue is that some geoethics authors seem to ascribe a specific and unproblematic meaning to the term "anthropocentrism", one that is distinct from that traditionally used in environmental ethics. We explain why this redefinition or misconception is controversial and potentially problematic by drawing from a similar case: Hayward's (1997) article "Anthropocentrism: A Misunderstood Problem" as criticized by Kopnina et al. (2018)

in their article "Anthropocentrism: More than Just a Misunderstood Problem". Third, it is important to clarify more fully geoethics' academic positioning and theoretical foundations in light of their impacts on interdisciplinary academic and public debates as well as their potential to improve geoscience education (Vasconcelos et al., 2023).

In "Characterizing Current Geoethical Thinking", we characterize the main traits of current geoethical moral theory according to two predominant accounts. In "Unnecessary Disciplinary Boundaries", we critically reflect on disciplinary boundaries and the issue of academic "branding" (Bohle & Marone, 2020). In "Anthropocentrism: More than a Misunderstood Problem (The Sequel)", we compare the meaning and the use of the term "anthropocentrism" in both environmental ethics and geoethics. In "Toward a Deep(er) Geoethics", we argue for the development of non-anthropocentric accounts – which are consistent with existing geoscientific knowledge – in geoethics scholarship and in geoscience education. Borrowing Arne Naess' famous distinction between "shallow" and "deep" ecology,[1] we suggest that a "deep(er) geoethics" would be based on ecocentric grounds.[2] In the last section, we suggest that integrating non-anthropocentric accounts in geoethical debates would also favor geoscientists' critical engagement and ethical reflection about the links between their concrete work and economic and extractivist interests.

Characterizing Current Geoethical Thinking

At first glance, geoethics resembles a type of professional ethics alike engineering ethics, which began with the recognition of the vast impacts of engineering research and practice and evolved into a fully-fledged sub-discipline of applied and professional ethics (Harris et al., 2019). Geller (2015) suggests that geoethics was "inspired by bioethics" while others envision it as a code of conduct or an ethical protocol for guiding geoscientists' professional activities (Mogk, 2018). Brennetot affirms that geoethics has been developed in three main directions – professional, prescriptive and analytical – pointing out that "academic research has so far favoured the first two meanings, neglecting the latter in a detrimental way" (Brennetot, 2021, p. 2). As anticipated above, over the years some accounts of geoethics shifted from developing a professional ethic to envisioning it as a field, a discipline (Bobrowsky et al., 2017), or even a social, public, or global type of ethics (Peppoloni & Di Capua, 2020). In any case, our reading of the literature suggests that current geoethics debates are still quite limited and parochial. Discussions revolve around a few predominant accounts

[1] Naess distinguished two areas of inquiry, that is two different approaches to the complex relationship between humans and ecological systems. Shallow Ecology is a movement that tends to simply promote resource management conservation strategies against pollution and the depletion of resources for the health and affluence of people in high income countries. The Deep Ecology movement promotes a philosophy of ecological harmony or equilibrium, has a holistic vision and a set of principles. It suggests people to embrace an ecocentric view and develop a personal "ecosophy" (ecological wisdom), acknowledging the inherent value of all forms of life (Naess, 1973).

[2] In this paper, "ecocentric/ecocentrism" is used to exemplify a type of non-anthropocentric position that focuses on the Earth systems and its processes. While geocentric might only refer to planet Earth, ecocentric could potentially include also non-terrestrial concerns.

rather than take place in an open area of debate made of different and even contrasting perspectives (such as displayed within environmental philosophy and ethics). The risk is that future geoethical scholarship may become stagnant without any additional philosophical debate.[3]

A few authors have been influential in characterizing current geoethical thinking. Marone and Bohle (2020) propose a geoethics that moves beyond utilitarian and deontological approaches by establishing "geoethical rationale and its six normative preferences": (1) agent-centric; (2) virtue-ethics focused; (3) responsibility focused; (4) knowledge-based; (5) all-agent inclusive; (6) universal-rights based. Recently, Bohle (2021a) reduced these tenets to four (i.e., agent-centricity, virtue-focus, responsibility focus, knowledge-base). Indeed, multiple authors propose that the account of geoethics as an "actor centric virtue ethics" is preferable (see also, Bohle & Di Capua, 2019) because it "has the distinguishing feature that the individual experiences, common sense, education, predispositions, preferences, worldviews, etc., of agents prevail and may lack reference to a common altruistic standard" (Bohle & Marone, 2019, p. 146). In addition, Bohle and Marone (2020, p. 3) clarify that "geoethics uses normative settings of an intermediate level […] without explicitly referring to specific ethical frameworks". In this way, geoethics "exhibits a relativism (that is a pluralism of ethical frameworks) constrained by scientific knowledge" (p. 3). Such "relativism by design" suggests that "sound ethical practice may alter with the ethical framework that is used by the human agent," which is constrained by the two central tenets of geoethics: individual accountability and the scientific knowledge-base, making geoethics an "epistemic-moral hybrid" (Potthast, 2015a) or a "philosophical hybrid of European origin" (Bohle, 2021b).

Two other prolific authors who have often published together are S. Peppoloni and G. Di Capua. Since 2012, they have proposed geoethics as a mix of virtue ethics and ethics of responsibility (Peppoloni & Di Capua, 2012). On this note, Jonas' (1984) and Passmore's (1974) works are often cited as reference points. In two recent publications that are crucial to understanding their theoretical proposal Peppoloni and Di Capua (2020, 2021b) state that geoethics has a theoretical framework made of fundamental characteristics, principles, and a set of values. In particular, principles are separated into fundamental ones (dignity, freedom, and responsibility) and aspirational ones (awareness, justice, and respect). They build on their 2020 article Peppoloni and Di Capua (2020) and offer a list of guiding values of four different "geoethical domains" (i.e., the self, inter-personal, societal, and environmental, see Peppoloni and Di Capua (2021b). According to these authors, individuals who adopt the "poietic process of geoethics" would move from fundamental principles, through the four geoethical domains, then through values and actions towards aspirational principles (see Table 1. in Peppoloni & Di Capua, 2021b, p. 7). Moreover, the "simplified scheme of the theoretical structure of geoethics" presented in the article "Geoethics as global ethics to face grand challenges for humanity" may help understand their

[3] The situation of geoethics could become similar to that of energy justice scholarship where the so-called "three-tenet approach" developed since 2012 has seen a rapid uptake in the direction of being applied to case studies and in combination with its own continuous integration with other framings (Wood, 2023) and "incorporation" of theoretical nuances and additions (Sovacool et al., 2023).

proposed framework (Peppoloni & Di Capua, 2020, pp. 18–19). Overall, we note that these accounts of geoethics are versions of weak anthropocentric environmental virtue ethics which are predominant in environmental virtue ethics scholarship (Cfr. most of the contributions in Sandler, 2004) than novel or distinct developments. In particular, as already noted by others (Frigo & Ifanger, 2021), Peppoloni and Di Capua's account might align with Hargrove's proposal of a weak anthropocentric intrinsic value theory (Hargrove, 1992).[4]

Unnecessary Disciplinary Boundaries

Is geoethics a type of environmental ethics? Is it an exercise in academic "branding for sustainable practices" (Bohle & Marone, 2020)? Does it denote a "school of thought" (Bohle & Marone, 2020)? Unsurprisingly, we are not the only ones wondering about these issues. Potthast (2015b) offered a compromising answer by favoring a certain specificity of geoethics' "major building blocks" while highlighting "strong links to existing approaches of application-oriented ethics" (i.e., risk ethics, social ethics, environmental ethics, and political ethics).[5] The leading authors mentioned in the previous section have to a certain extent addressed these issues too. Bohle (2019) affirmed that there is an inner dilemma between "expanding and focusing" on the subject matter, scope, or ambition of geoethics. Bohle and Di Capua (2019, p. 5) cautiously noted that "there is a tension as to whether geoethics should be anchored within the field of environmental ethics or whether to pursue it as something distinctly different that builds on the foundation of the professional ethics of applied geosciences". In the same year, however, these authors also tried to justify a different status of or role for geoethics as a distinctive academic niche. Bohle et al. (2019, p. 166) wrote that although geoethics can be embedded in already existing fields such as "environmental ethics", "sustainability ethics", and "technological and engineering ethics", it seems nonetheless "distinct because it is situated at the intersection of them". Bohle et al. (2019) affirm that geoethics rests on being "an actor-centric virtue ethic of professional geoscientists" thus representing professional ethics. However, he also claims that geoethics could support "various societal stakeholders and citizens" (Bohle et al., 2019) and even "any citizen's individual, professional and civic dealings" (Bohle, 2021a). Yet, especially when it is compared to the field of environmental ethics, some authors seem keen on defending the originality and distinctiveness of *their* geoethics. For example, after simplistically summarizing decades of environmental ethics scholarship by saying that it "oscillates between extreme positions", (Bobrowsky et al., 2017, p. 178) go on to say that geoethics *surpasses theories in environmental ethics* because geoethics rediscovers, expands, and enhances the

[4] Hargrove proposed the notion of a "weak anthropocentric intrinsic value", defending it as a counterposition to both objective and subjective non-anthropocentric intrinsic value positions (Hargrove, 1992).

[5] Potthast (2015b, p. 54) writes: "(1) professional ethics of scientific and engineering experts (impartiality, incorruptibility, risk awareness, and communication), (2) risk management in a broad sense concerning specific projects, and (3) general considerations relating to environmental justice and the integrity of the earth are the crucial ethical aspects of geoethics, as well as the basis of other ethical assessments of technology".

cultural dimension of geoscience knowledge as a basic element of a holistic vision that goes beyond the dualism between humans and nature. Although Peppoloni and Di Capua (2022b, p. 12) acknowledge that some perspectives in environmental ethics are among geoethics' inspiratory roots (e.g., they mention A. Leopold's Land Ethic), they still claim that "*geoethical thinking goes beyond* the contrasting positions taken by the different existing visions in environmental ethics" (Peppoloni & Di Capua, 2020, p. 25, our italics). These same authors also assert that: "geoethics enriches the human–environment dimension with the *unique perspectives* (understanding the deep time and working with complex systems) that the geosciences bring to the human knowledge and perception of the physical world and that are not fully realized by environmental ethics" (Peppoloni & Di Capua, 2020, p. 25, our italics). More recently, they affirmed that the "philosophy of geosciences provides *distinguishing perspectives* through the lens of geologic time and complex systems to analyse Human-Earth system interactions. It highlights the *original contributions* that Geoethics, grounded on the wealth of geoscience knowledge, could give *with respect to environmental ethics and engineering ethics*" (Peppoloni & Di Capua, 2021a, pp. 18–19, our italics).

To summarize, key authors in geoethics propose that (their) geoethics is supposedly distinct from environmental ethics because it is centered on individual responsibility and offers unique perspectives informed by geoscientific knowledge. However, what these original contributions to ethical theory precisely are remains unclear. We suggest that as soon as these scholars move from proposing geoethics as professional ethics to asserting that it should become a public or global ethics, they force claims of originality and distinctiveness to defend their perspective. This is problematic because, first, the proposal of a universal moral framework for all humans on the planet runs the risk of imposing a partial, Eurocentric view which may collide with current decolonial efforts (Mignolo & Escobar, 2010). Second, claiming originality, distinctiveness, and novelty for the sake of establishing an academic niche may ignore or disregard the work done in other fields. Third, this may introduce unnecessary disciplinary boundaries, unnecessary repetitions, and misconceptions. To exemplify these risks, we will now compare the meaning and the use of the term "anthropocentrism" in both environmental ethics and geoethics.

Anthropocentrism: More than a Misunderstood Problem (The Sequel)

Anthropocentrism in Environmental Ethics

Following Minteer's encyclopedia entry, anthropocentrism can be described as the "view in which nonhuman nature is valued primarily for its satisfaction of human preferences and/or contribution to broader human values and interests" Minteer (2009, p. 59). Several environmental ethicists have contributed to developing a rather sophisticated debate around this notion. For example, among other distinctions, Callicott (2013, p. 9) differentiates between *metaphysical* and *moral* types of anthropocentrism. For him, metaphysical anthropocentrism is "the doctrine that human beings occupy a privileged place in the order of being" and is often the basis

for justifying moral anthropocentrism, or the ethical position that prescribes limiting moral concern to humans. Mylius provides a rich taxonomy of kinds and degrees of anthropocentrism (Mylius, 2018). According to him, geoethics' weak anthropocentrism would be described as *passively normative anthropocentrism*, which is evident "in paradigms that constrain inquiry in a way that somehow privileges *Homo sapiens* or the category of "the human'" (Mylius, 2018, p. 183). Similarly, Brennetot would likely qualify the current geoethical theories discusses above as "prescriptive geoethics" (Brennetot, 2021) that imply normative anthropocentric claims.

It is also important to underscore that, in environmental ethics, anthropocentrism is not just morally problematic but is often believed to constitute one of the primary causes of past and current ecological crises. Indeed, its rejection "has become the hallmark of environmental ethics since the 1980s" (Minteer, 2009, p. 59). In contrast to this established view about the notion of anthropocentrism, however, some geoethics scholars seem to affirm that anthropocentrism is unproblematic. Yet, we suggest that it is worth maintaining a normative description of moral anthropocentrism[6] as "an ideology that roots all [or even most] value in humanity" (Kopnina et al., 2018, p. 7). In sum, there is a well-established meaning of the term anthropocentrism in environmental philosophy and ethics as well as a quite sophisticated discussion about different versions of it (Mylius, 2018) and alternatives. We note that these earlier developments and the theoretical distinction discussed next have both been ignored in geoethics scholarship so far.

A Fundamental Distinction

In the fields of environmental philosophy and ethics, numerous intellectuals and scholars have elaborated and defended different theoretical perspectives about the human-nature relation (i.e., the moral status and role of humans in relation to the non-human world). Through multiple interpretations and analyses about these perspectives (e.g., anthropocentric, pathocentric, biocentric, ecocentric), different strains of scholarships have developed. For example, there have been debates regarding the different values at play when relating to nature. In this context, many scholars assume that there is a fundamental distinction between the origin of moral valuations and the object of valuation (i.e., what is valued) or, in other terms, between what is anthropogenic and what is anthropocentric. As far as we know, humans are likely the only beings capable of valuing things through moral reasoning. To put it in Krebs' words, "teleological valuing (deliberating and choosing, arguing and fighting for certain things)" (Krebs, 1999, p. 121) seems to be a human prerogative. This capacity would correspond to "epistemic moral anthropocentrism" or the "view that we cannot transcend the human moral value perspective" (Krebs, 1999, p. 123). Although humans are capable of moral valuation (which are inevitably anthropogenic), the attribution of value and the kind of moral values attributed do not need to be anthropocentric. To reiterate, if epistemic anthropocentrism is inevitable, moral anthropocentrism is not. More recently, and although they do not cite Krebs' work, Faria and Paez (2014)

[6] Although here we focus on a moral definition of anthropocentrism, it is important to remember that there are many other variants of anthropocentrism (see Mylius, 2018).

arrived to the same conclusion, thus repeating that anthropocentrism can be considered inevitable only if we avoid to consider the "fatal ambiguity between epistemic and moral anthropocentrism".[7] As we will see below, some geoethics scholars tend to conflate epistemic and moral anthropocentrism, suggesting that anthropocentrism as such is a supposedly inescapable human condition. However, we suggest that these distinctions are crucial. For example, it is actually not possible to overcome moral anthropocentrism without "using" epistemic anthropocentrism. As Krebs writes: "From the fact that all value is value to us, it does not follow that the good of non-humans cannot be of moral intrinsic value to us. 'Value to us' does not equal 'instrumental value to us.' It includes 'intrinsic values (to us),' among others 'moral intrinsic value (to us)'" (Krebs, 1999, p. 123). Finally, even though one does not agree with the above subjective interpretation of intrinsic values, it is still possible to propose a non-anthropocentric account of values that are biologically emerging and objective in the direction proposed by Rolston (1981, 2016). In evolutionary terms, nature carries values within itself. Natural systems are capable of generating values and human beings as evaluators are part of natural systems. In this view, the ultimate philosophical task of environmental ethics is to conceive human beings as part of nature within a non-anthropocentric ethics.

Anthropocentrism in Geoethics

Frigo and Ifanger have already provided some evidence of supposed "(weak) anthropocentric assumptions" in geoethics scholarship (Frigo & Ifanger, 2021). Indeed, some geoethics authors explicitly use expressions such as "ethical anthropocentrism" (Nwankwoala, 2019), "responsible anthropocentrism" (Peppoloni et al., 2019; Peppoloni & Di Capua, 2021b), "enlightened anthropocentrism" (Peppoloni & Di Capua, 2021b), or "weak disenchanted anthropocentrism" (Belardinelli & Pievani, 2023). But what do these scholars mean when they use these expressions? Bobrowsky et al. (2017, p. 6) write that "*to place humans at the center of the discussion on geoethics does not represent a new form of anthropocentrism* but rather stresses that only by accepting their responsibility initially towards themselves, can humans become fully aware of their role as an active 'geological' force" (our italics). Peppoloni and Di Capua describe the supposed inevitability of anthropocentrism, suggesting that "*geoethics grasps the profound meaning of anthropocentric, biocentric, and ecocentric positions and synthesizes them* in a vision that can be defined as 'ecological humanism'" (Peppoloni & Di Capua, 2021b p. 13, our italics). For them, the only way forward is the "adoption of a form of *anthropocentrism illuminated by the principle of responsibility*" since "*there can't be biocentrism, ecocentrism, or geocentrism that does not imply a responsible anthropocentrism* at the basis of a relationship of respect for the human being with other non-human entities" (p. 15, our italics). Moreover, the

[7] In a recent book chapter, Peppoloni and Di Capua (2023) write that their account of anthropocentrism moves "beyond that 'epistemic moral anthropocentrism' described by Krebs (1999) and criticised by Faria and Paez (2014)" (note* it should read "Krebs", not "Krebbs"). However, Peppoloni and Di Capua fail to recognize that Faria and Paez (2014) do neither criticize Krebs nor cite her work. In fact, Faria and Paez's perspective is actually similar to Krebs' as they both stress the difference between epistemic and moral anthropocentrism.

same authors write that the ecocentric point of view "seems completely incompatible with the current economic systems and global social organization" (Peppoloni & Di Capua, 2022a, p. 108). Instead, they affirm that "*the anthropocentric vision places the human being at the centre of reality*, as creator and agent of his/her sensible and rational experience, committed to guaranteeing him/herself survival and material and spiritual well-being. […] In Geoethics, *the anthropocentric vision about human experience is made responsible*. […]" Peppoloni and Di Capua (2021a, p. 23, our italics). Here, by anthropocentric "vision" the authors seem to mean what we called above "anthropogenic" or "epistemic anthropocentrism", that is the obvious recognition of the inevitable human origin of human perceptions, moral evaluations, and judgements. However, these authors also defend weak moral anthropocentrism. We note that the strategy of Peppoloni and Di Capua seems to repeat that of Hayward as highlighted by Kopnina et al. (2018). They explicitly write: "anthropocentrism in geoethics is criticized in its traditional meaning but is reformulated in light of the principle of responsibility, as an ethical criterion for the agency" (Peppoloni & Di Capua, 2021b, p. 11).[8] More recently, Peppoloni and Di Capua tried again to propose the view of geoethics as the synthesizer of all perspectives (Di Capua & Peppoloni, 2022; Peppoloni & Di Capua, 2021c). Since the authors cannot reject the existence of the different positions in environmental ethics (i.e., they were developed before), they recently proposed that the "human being" should "evolve to become relationally biocentric and ecocentric" and also "geocentric in its identity" (Di Capua & Peppoloni, 2022). These claims, we suggest, appear quite confusing and give the impression that (their) geoethics "does everything". In sum, the excerpts above show that these authors' understanding of the term "anthropocentrism" differs from both "the common usage of the term"[9] as well as from "its original connotation in environmental ethics, [that is] the belief that value is human-centered and that all other beings are means to human ends" (Kopnina et al., 2018, pp. 1, 5).

Highlighting the Problem

Authors Peppoloni and Di Capua (2021b, p. 14) assume that we need to maintain an anthropocentric perspective because issues arise when we shift problems outside humans' responsibilities. For example, they write: "It is therefore not the anthropocentric human perception that produces the mechanism of exploitation and deterioration of the environment, but rather the general process of deresponsibilisation of individuals implemented by bad policies or by the exercise of a prevaricating power of the lobbies". They propose to "responsibilize" human conduct through their specific version of weak anthropocentrism but without modifying the morally anthropocentric worldview and its destructive socio-economic paradigms. Drawing from Kopnina et al. (2018) we consider such re-shaping of the notion of anthropocentrism controversial and problematic. Specifically, it "confuses a formal description of valuation theory with one legitimate aspect of that theory" (Kopnina et al., 2018).

[8] Identical text has been published in (Peppoloni & Di Capua, 2022a, p. 109).

[9] For example, the Oxford English Dictionary defines anthropocentrism as: "Regarding humankind as the central or most important element of existence".

It muddles "anthropocentric" and "anthropogenic", or the rather obvious fact that human conduct depends on human action or that responsibility is a human affair (see "A Fundamental Distinction" above). Moreover, creating a new meaning for a term that is well established in a fellow-discipline (i.e., reformulate a notion that is already part of the traditional linguistic apparatus of environmental ethics, see "Anthropocentrism in Environmental Ethics") runs the risk of creating unnecessary misconceptions and repetitions. Establishing a geoethics on anthropocentric grounds, despite "responsible" or "enlightened" variants, and despite the fact that anthropocentrism is not necessarily only a Western construct, runs the risk of imposing a specific view, a "philosophical hybrid of European origin" as Bohle admitted (Bohle, 2021b). The geographic limitations of such geoethics' basis would jeopardize its global extension and purported commitments diversity and value pluralism.

Nevertheless, some geoethics scholars have gone so far as to explicitly deny the viability of non-anthropocentric approaches. Pievani (2015, p. 65) asserts that passing "from an anthropocentric approach to an ecocentric approach" is "psychologically impossible". Menegat and Fontana (2018, p. 90) warn about subscribing to a "new ideology" following "the false polemic triggered by the eco-ideology that often underpins the environmental issues". Whether there are attempts to reformulate the notion of anthropocentrism or explicit claims that non-anthropocentric thinking is impossible, ideological, or moralistic, these additional examples show the presence of fundamental misunderstandings about or disregard for alternatives to anthropocentrism within geoethics scholarship.

To call attention to these issues and reactions, we recall Naess' famous discussion of the "shallow ecology movement" and "deep ecology movement" (Naess, 1973). We declare the current, predominant versions of geoethics "shallow" as a conscious provocation based on two lines of reasoning. First, current accounts primarily maintain and defend morally weak anthropocentric positions through their reshaped or reformed versions of "responsible" or "enlightened" anthropocentrism. Second, current geoethical scholarship lacks a systematic critique of extractivist and capitalist interests connected to geoscientific research and practices. Therefore, we agree with Kopnina et al. (2018) and "propose that anthropocentrism (applied to humanity as a whole [but particularly as a cultural trait, a mentality]) should remain as the term that describes a human-centered valuation theory, aspects of which are a powerful explanation for society's current environmental unsustainability and unethical treatment of nonhumans" (Kopnina et al., 2018, p. 7). We maintain that recognizing human agents as the key responsible actors is compatible with embracing non-anthropocentric moral positions. In the following section, we advocate for the proliferation of geoethical accounts that explicitly embrace and defend normative ecocentric ethical positions. By "ecocentric", we mean an ethical approach that focuses on the Earth and its processes, including living beings (animals and plants) within ecosystems. Whilst the term "geocentric" might only refer to planet Earth, "ecocentric" can potentially include non-terrestrial concerns too.

Toward a Deep(er) Geoethics

Underexplored Core Issues

In its current formation, geoethics scholarship appears to lack a critical reflection about the linkages between "applied" areas of geoscientific work and specific economic forces (e.g., governments, lobbies, corporations). Extractivist practices, for example, have primarily taken place within an ethical framework characterized by anthropocentric positions and instrumental views of nature (i.e., extraction that advances anthropocentric interests is generally considered ethical). Moreover, such extractivist practices are increasingly linked with economic (neo)capitalist and neoliberal interests which assume the "privatisation of public goods and services", the "deregulation of business (including trade) and lower corporate taxation (paid for with cuts to public spending)" as "'common sense'" (see Castree's review in Finn et al., 2015, p. 87). Moreover, consider the problematic fact that extraction-based businesses often (co-)sponsor geoscientific academic events.[10] Finally, reflect on the employment trajectories of graduates in geosciences. According to the Employment Survey of the Annual Report 2020 of the European Federation of Geologists,[11] the majority of the 768 respondents work in privately-owned enterprises connected to business, followed by employment in the public sector and a similar number in the commercial/corporative sector. The survey mentions that it received "twice as many replies from the private sector as the public, which may reflect employment patterns." This suggests that the majority of geologists with higher degree education end up working in for-profit businesses, which may add even more relevance to the previously raised points. In other terms, there exist not only theoretical but also practical linkages between the geosciences and the socio-technical, economic, and political apparatus of the Capitalocene (Moore, 2016). Of course, the effects of certain extractivist practices are particularly dramatic in the so-called Global South, especially when connected to (neo)colonial economic and political agendas. As Washington et al. affirm, it is rather unsurprising that "anthropocentrism is the prevalent ideology in most societies around the world, and it also permeates academia and domestic and international governance" (Washington et al., 2017, p. 38). Further ethical reflections are therefore demanded by the fact that extractivist practices are often rooted in anthropocentric thinking and affect both human and non-human lives and well-being. Of course, we are aware that civilizations require resources, yet the means and ends of extraction lend themselves to raise significant ethical concerns. Therefore, we advocate for more systematic and ambitious geoethical reflections of the status quo that critically address the historical and current entanglements between geoscientific knowledge, practices, economic extractivist interests, and environmental and climate issues.

[10] See the list of generous supporters of the 35th International Geological Congress 2016 held in Cape Town, South Africa: http://www.35igc.org/Verso/45/Supporters.

[11] https://storymaps.arcgis.com/stories/9518f950c7f6487ebc172722a90c2966.

Towards a Non-Anthropocentric Geoethics? Geo-scientific Knowledge Supporting Non-Anthropocentric Thinking

Drawing from examples of non-anthropocentric environmental ethics perspectives such as Callicott's planetary "Earth Ethic" (Callicott, 2013, 2021) and Rolston III's proposal about intrinsic values in nature (Rolston, 2012), it is possible and valuable to develop a "deeper (ecocentric) environmental ethic [that] recognizes the welfare of all nonhuman forms" (Kopnina et al., 2018, p. 5). What can this mean for geoethics? It could mean recognizing geoethics as part of environmental ethics. Creating non-anthropocentric versions of geoethics. Or integrating non-anthropocentric aspects and reasoning in existing geoethical accounts. At the same time, we reject Norton's (1984) "convergence hypothesis", which states that, provided certain constraints, people supporting anthropocentrism and non-anthropocentrism could still agree on common environmental policy goals. Instead, we suggest that professional practices and even public policies that are based on a non-anthropocentric geoethics would be different (i.e., more radical and proactive about protecting the non-human world from human economic and extractivist interests) from those based on current main version of weak anthropocentric geoethic. Supporting a similarly non-anthropocentric stance, Washington et al. (2017) suggest that adopting ecocentrism is important for ethical, evolutionary, and spiritual reasons as well as in terms of ecological conservation and governance.

Although proposing a specific version of non-anthropocentric geoethics goes beyond the scope of this article, we recommend scholars interested in developing geoethics to explore more radical and ambitious theoretical options by integrating, for example, ecocentric moral positions. Considering that the geoscientific objects of study are primarily non-human entities and processes, ecocentrism appears as a consistent theoretical basis for geoethics. Given that geoethics is often described as an ethics of responsibility towards the Earth system, it makes sense to put the Earth system (and not only "responsible humans") at the center of moral valuation as an encompassing moral object with possible different scopes (e.g., ecosystem, ecoregion, watershed). Existing geoscientific knowledge related to the Earth system and its complex processes may also be inspirational for the adoption, at the ethical level, of non-anthropocentric positions. For example, the notion of "geologic" or "deep" time, which has been considered alike a Copernican revolution regarding how humanity perceives itself in the universe (Cervato & Frodeman, 2012; Mogk et al., 2017) – may be inspirational to decenter human beings morally too. Moreover, the epistemological choice of systemic thinking – conceiving Earth's processes within complex adaptive systems where countless abiotic and biotic components interact with fluxes of materials and energy – is compatible with ecocentric thinking. The enormous scales and scopes of geological and astronomical phenomena and processes – mass extinctions, earthquakes and volcanic activities, tsunamis, tornados – may also provide cautionary tales, suggesting that thinking in non-anthropocentric terms might also be a sign of much needed humility, in contrast to the arrogance of controlling nature illustrated by, for example, many geoengineering proposals. Finally, ecocentric moral positions would not only be consistent with the above geoscientific notions, but also with several "hard lessons" derived from natural hazards, disasters, and calamities

at local and global levels (e.g., global climate change, dam collapses, biodiversity loss, ocean acidification). Admittedly, this knowledge is already about the "eco" and the "geo", so what is lacking are equally ecocentric (or at least geocentric) moral reflections within geoethical thinking. On this note, Bohle and Preiser recognize that "modern societies require different narratives to traditional societies to promote Earth-centric behaviour. Nowadays, people can base their Earth-centric behaviour on a substantial knowledge base" (Bohle & Preiser, 2019, p. 110). In conclusion, we also "maintain that a transformation towards an ecocentric worldview, and corresponding value systems, is a necessary path towards the flourishing of life on Earth, including that of our own species" (Washington et al., 2017, p. 40).

Against Homogeneity: Different Voices within Geoethics

We are not the only ones suggesting such non-anthropocentric re-orientation in geoethical scholarship and thinking. For example, Herrmann-Pillath advocates for a "geocentric turn" in economics that may affect also geoscientific practices and geoethics (Herrmann-Pillath, 2021). Stefanovic (2015, p. 20) highlights the opportunity to recognize non-anthropocentric interests by suggesting a type of geoethics that expands "to include a broader 'ecocentric' awareness of the Earth and its nonhuman inhabitants". A non-anthropocentric geoethics would also promote more critical reflection about the links between geoscientific knowledge, capitalist pressures, and extractivist interests. In the context of Brazilian mining of ferruginous deposits, Dos Santos Pinheiro (2018, p. 53) imagines "a plural, trans-specific, and anti-utilitarian geoethic […one that…] denies the instrumental appropriation related to market pressures". Sharp et al. (2022) use the expression "more-than-human" in their call, within physical geography, for a geoethical approach that "decenters the human" and contrasts the "academic binary framings of the world". These excerpts attest that there is already an ongoing effort within the geoethics community to envision alternative and less homogenous approaches to weak anthropocentrism. As Kopnina et al. (2018, p. 15) put it, "ecocentrism will foster a new human identity—not short-sighted and insatiable but grateful, caring, and in awe of life and part of greater planetary existence".

Outlook: Integrating Non-Anthropocentric Views in Geoethical Education

But how can non-anthropocentric perspectives enter geoethics scholarship and geoscience education? A first step could be the development and integration of non-anthropocentric ethical accounts into geosciences curricula, as it is already the case in other fields (Kopnina, 2020). This would increase diversity of views and would be compatible with improving the ethical literacy of geoscientists (Bralower et al., 2008). Yet, the main pedagogical tools developed by geoethicists so far (Mogk, 2019; Mogk & Geissman, 2014; Vasconcelos et al., 2020) as well as attempts[12] to recruit more geosciences students tend to be based on the anthropocentric approaches men-

[12] See: https://www.yearofplanetearth.org/.

tioned above. We suggest that adding non-anthropocentric perspectives to geoethical education would improve academic debates and the overall preparation and work of future geoscientists, besides potentially having wider public implications beyond education. As Noel Castree suggests in her reading (Castree, 2017) of Klein's (2014) *This Changes Everything*, geoscientific knowledge may have a "proto-revolutionary character". There are indeed ways in which "geoscientists can act as fifth columnists calling the capitalist way of life into question". This corresponds to the "conviction that international geoscience might not only inspire, but actually be part of, a root-and-branch assault on the capitalist way of life". Here, we are similarly "highlighting the radical potentials of geoscience today [making the case] for forms of Interdisciplinarity that might render geoscience more political" (Castree, 2017, p. 52). Similarly, Vasconcelos et al. affirm that "integrating geoethics into science curricula [… would increase] "the societal relevance of earth sciences, including geosciences" (Vasconcelos et al., 2023, p. 10).

At this point, some questions can be posed for further investigation: What would practically change in a specific case if geoscientists (but potentially also other practitioners and stakeholders) embraced a non-anthropocentric moral stance? Or, what would be the differences in terms of ethical analysis, evaluation, and implementation of a specific geoengineering project, such as Stratospheric Aerosol Injection (SAI), Carbon Capture and Storage (CCS), or ocean fertilization? To answer these and similar questions, more research about the concrete implications of non-anthropocentric approaches is needed. But these discussions and engagements could happen only if non-anthropocentric approaches – those already developed in environmental ethics as well as new ones – would become part of geoethical debates. Along with a broader adoption of geoethical education worldwide within (geo)scientific and Earth-science curricula, geoethics needs philosophical pluralism. Two choices may represent a good starting point and perhaps a springboard for further developments. First, we may simply recognize that geoethics is a type of environmental ethics and does not need its academic niche. Second, educational programs in geoscience that include geoethics can fully integrate and discuss non-anthropocentric perspectives to enrich the debates and pluralize geoscientific education.

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