

Science or Fiction? What the Anthropocene Means for EPT

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How should environmental political theorists deal with environmental science? The question has acquired a new urgency with the rise of the Anthropocene, a geological-cum-ecological concept received with skepticism by many political theorists. In part, this is due to the notion that there is an “official” version of the Anthropocene that comes out already linked to a set of normative and policy prescriptions for dealing with climate change and the other manifestations of the new epoch, i.e. a managerial approach that is capitalist-friendly and technologically trigger-happy. However, this in turn reflects deep-seated suspicions about scientific findings and the way in which they are “produced”. This paper will reflect on this topic in the framework provided by the Anthropocene, arguing that a clear demarcation is needed between the scientific and the sociopolitical inquiry, whereupon the former provides the latter with findings to be discussed and processed in a sociopolitical fashion -whereas scientists should refrain from making normative or policy prescriptions or, if any, should make them explicitly. After all, environmental political theory would not exist without environmental sciences. The debate on the beginning of the Anthropocene will help to make this point.

1. Introduction.

Both environmental political theory and environmentalism at large have always maintained an uneasy relationship with science. The sudden irruption of the Anthropocene hypothesis and its rapid spread in the human and social sciences has not helped to allay this tension -on the contrary, the latter is resurfacing in novel ways. This paper is an exploration of the reasons behind such uneasiness, as well as an attempt to leave it behind as far as the Anthropocene is concerned. It thus incorporates a modest proposal for pacifying the relationship between science and environmental political theory.

Historically, the reasons for EPT's reservations about scientific practice are not hard to grasp. Science, as a key part of the modern project, had not just described the world but had contributed to its subjugation: knowledge is power, as Bacon famously stated, and in the hands of modern human beings this power has been also the power to subordinate and destroy the nonhuman world. For all the supposed neutrality of the scientific method, the scientific worldview and its alliance with technology has been presented as being a main drive behind the ecological crisis. The sociology of science would have confirmed this suspicion by showing how social values and norms unavoidably slip into the laboratory and condition the way in which science is made: from the questions that are asked to the solutions that are found. Moreover, as we shall see, scientific detachment would have encouraged social detachment: in describing the nonhuman world as lacking in feelings or subjectivity, science is charged with having normalized mistreatment and exploitation, thus contributing decisively to both environmental unsustainability and moral corruption.

The paradox here, of course, is that environmentalism has always depended on science to make its own case. On the one hand, unsustainability itself could not be measured and signalled without the help of science. And the same goes for phenomena such as climate change. On the other, statements about the moral standing of animals would be harder to make in the absence of scientific descriptions of their sentience and inner life. After all, the whole conversation about the place of humanity in the wider natural world would have never started without the Darwinian revolution. There is certainly another side to environmentalism, namely a romantic one that does not need any scientific insight to vindicate a good life embedded in nature or to make a moral case in favour of natural conservation. Yet, for all the relevance that can be granted to purely moral or aesthetic arguments, they hardly suffice for advancing political arguments on behalf of sustainability and/or conservation in the public sphere of complex, capitalist societies where economic growth is still a priority for most governments and populations.

This somewhat schizophrenic relationship with science has become apparent again since the advent of the Anthropocene hypothesis. For instance, Malm and Hornborg (2014) have warned that the Anthropocene discussion cannot be led by natural scientists, since they tend to overlook questions of power and politics -hence creating the sensation that the current planetary predicament is "natural". Revkin (2014) has also expressed concern for the potential marginalization of social sciences in this debate. At the same time, though, the debate begins only *after* natural scientists have formulated an hypothesis -one that can be grounded either on geology or Earth System Science, or perhaps both. Scientific observation precedes philosophical discussion, it could be argued. Now, this may be seen as an instance of epistemological naivety, since there is no such thing as an unmediated observation of reality. And the same goes for "brute" facts whose existence is denied. That is why a careful demarcation of natural and social science's corresponding jurisdictions seems to be the best way out of this conundrum. An old-fashioned proposition, perhaps, yet a reasonable one.

This paper will be structured as follows. For a start, the troubles with science -in this case the Anthropocene science- will be examined. This entails dealing with two different arguments: on the one hand, the claim that scientific representations are in themselves a way of transforming the world, so that they become a part of the reality they describe. In the case of the Anthropocene, the

emphasis on the geological and the systemic seems to be an invitation to planetary management, while occluding the actual destruction of ecosystems and natural habitats. On the other, the relation between description and prescription becomes troublesome when scientists themselves make normative claims about how to deal with the Anthropocene. In this case, suspicions arise because of the association between scientific statements and the ecomodernist approach to the good Anthropocene. Finally, an attempt to clarify this ambiguous entanglement will be presented, with the aim to pacify the relationship between science and environmental political theory. It will be argued that such goal can only be reached if the competence of science to state facts is respected - facts that do not speak normatively by themselves but must constitute the basic premise of a debate about their social and political implications. This suggests that both scientists and political theorists must come to terms with their respective functions.

2. The trouble with (Anthropocene) science.

A first concern with the Anthropocene science reflects a longstanding suspicion about the "objective" quality of the scientific endeavour. Does scientists only "make" science? Or, by doing so, they do something else? If the latter, what do natural scientists *do* when they describe a new geological age or suggest that the Earth is a complex, unified system whose dynamics have been altered by sustained human action? Can we just take these scientific statements at face value?

The main reason for this reservation lies in the absence of a match between language and reality. Ultimately, the concepts that we employ to explore reality condition the way in which we perceive it. Moreover, it is debatable whether we can access an objective nature that is "out there" awaiting for our observations. As Noel Castree has suggested,

"It's important not to confuse knowledges of nature with the 'natural' things those knowledges are about. (...) There is, in short, no unmediated access to the natural world free from frameworks of understanding. These frameworks organise the way that individuals and groups view nature and delimit where the natural ends and the unnatural, non-natural or artificial begins" (Castree 2005, 16; his emphasis).

Furthermore, such frameworks are far from value-neutral: they organise our understanding *in certain ways* that in turn deeply influence how we deal *materially* with the world, i.e. transforming, manipulating, and destroying it. Arne Vetlesen has made a fine work of renewing this critique, arguing that we

"could not have engaged in the activities that now threaten to spell the end of nature (nature as we used to know it) were it not the fact that for at least four centuries we have regarded and treated (nonhuman) nature as dead" (Vetlesen 2015, 129).

To him, this is related to an enhancement of quantity over quality that is characteristic of modern science since Descartes, involving the denial of any inner life or even *telos* to nature. Such is the cultural precondition of human domination of nature, in which technology plays a crucial role as an instrument for "damaging and wiping out entire regions of what used to be wilderness" (Vetlesen 2015, 150). I do not wish to discuss this argument in detail here, although I find it odd that human domination of nature via science and technology is described as a *modern* endeavor and not as a transhistoric process associated to the aggressive adaptation to the environment that defines the human species way of being (see Arias-Maldonado 2015). What interests me here is the denunciation of a direct link between scientific observation and human domination.

If we turn to the Anthropocene, the point has been made that scientific descriptions of the new geological age and/or of the Earth as an integrated system may contribute to "planetary governmentality" (Uhrqvist and Lövbrand 2014, 342). Michel Foucault is invoked here to suggest that scientific descriptions *direct* the way in which we act upon socio-natural reality, without any need to attach explicit normative statements to such supposedly "objective" descriptions. Systems

thinking would thus be a way of framing reality that invites "earth system management" and consequently the ruling of experts. A similar point has been made by Stacey Alaimo in connection with the way in which the Anthropocene is visually represented, satellite-wise, from above:

"The already iconic images of the Anthropocene ask nothing from the human spectator; they make no claim; they neither involve nor implore. The images make risk, harm, and suffering undetectable, as toxic and radioactive regions do not appear, nor do the movements of climate refugees. The geographies of the sixth extinction are not evident " (Alaimo 2017, 92).

Likewise, the value-laden character of scientific framings would also be evident in the *geological* emphasis, a focus that to her eyes may blur the chemical or biological dimensions of human colonization of the planet "by focusing on an externalized and inhuman sense of materiality" (Alaimo 2017, 94). That is also why environmental historian Jason Moore (2015) wishes to "socialize the ecological" and rejects the use of categories such as that of "the human enterprise" that is prominent in Earth System Science literature. Scientific framings, in sum, are reality-forming.

A related critique concerns the distinction between description and prescription. As we have just seen, this separation is already compromised by the value-laden assumptions that underpin scientific categories and observations. Jeremy Baskin (2015) argues that the Anthropocene is "an ideology dressed as paradigm", i.e. a way of understanding the world and a normative guide to action rather than a *simple* set of scientific insights. To him, a perfect proof of this can be found in the debate around the "golden spike" of the Anthropocene, i.e. the search for a stratigraphical marker that is also meant to establish the moment when the new geological age began. The fact that so different moments are discussed suggests, according to Baskin, that geological (thus "scientific") time is less relevant than political, cultural or historical time. Depending on whether the beginning of intensive agriculture, the Columbian exchange, the Industrial Revolution or the nuclear explosions in mid-twentieth century is chosen, the message so conveyed about the *causes* of the Anthropocene differ widely. More on this later.

On the other hand, Baskin and others have lamented that some natural scientists have shown a propensity to accompany their descriptions with explicit prescriptive claims about the way in which human societies should answer the challenge posed by the Anthropocene. Such claims would roughly belong to the ecomodernist dispensation, that is, they unsurprisingly reveal a notable confidence in the possibility of designing scientifically-informed collective solutions to planetary disruption. Technology is seen with confidence and Earth-management guided by experts presented as the most suitable tool for achieving not just a *sustainable* but also a *good* Anthropocene that looks like an improved, nature-friendly version of liberal-capitalist society. The Brethrough Institute is a usual suspect in this regard, while Paul Crutzen (2002, 23) is quoted suggesting that large-scale geo-engineering projects may be necessary in order to optimize climate and Ellis and Haff (2009) asking from Earth-science graduates a more determined engagement with public-decision making. The danger that is perceived in this account is aptly summarized by Baskin himself:

"The emphasis on 'the rule of experts', and the associated endorsement of a technocratic consciousness, depoliticises society and tends to reduce the political to the technical, justifying decisions on technical grounds. (Baskin 2015, 22).

The worry is that a scientific account of the Anthropocene might lead to a "scientist" response and therefore to a rigidly delineated socioecological regime which manages to evade the hard political questions: who has produced the Anthropocene, who suffer the consequences, who is responsible. Relatedly, the implicit vindication of a managerial approach may breed complacency and delude us into thinking that no extraordinary measures are needed even though the Holocene conditions are gone. As we have get used to talk about environmental risks, we have lost our sensitivity to catastrophes and become "Apocalypse-blind" (Manemann 2014, p. 45).

Finally, it should be noted, the Anthropocene science is also questioned by a number of scientists that are not persuaded of the strength of the evidence presented by its advocates. Geologists Whitney Autin and John Holbrook (2012) have asked, for instance, whether the Anthropocene is an issue of stratigraphy or just "pop culture". His skepticism is encapsulated in the following question: "Does humanity operate on such a grand scale that we drive Earth processes in ways that overshadow tectonic, climatic, and eustatic processes?" (Autin and Holbrook 2012, 61). They, for one, remain unconvinced. And the same goes for fellow geologists Stanley Finney and Lucy Edwards (2016), who, as chair of the International Commission on Stratigraphy and commissioner of the North American Commission on Stratigraphic Nomenclature, respectively, dislike the idea of a geological epoch that, if it were to begin around 1945, would have a duration of one average life span. And, although they await the Anthropocene Working Group proposal in order to see whether there are stratigraphical grounds for recognizing the new epoch, they lament that the drive to officially recognize the Anthropocene may be "political rather than scientific". In a deep time perspective, in other words, the Anthropocene feels too *contemporary* to be true. In James Westcott's words:

"The challenge is to convince geologists accustomed to digging much further back in time that the evidence accumulating now will be significant, stratigraphically speaking, deep into the future. Geologists are being asked to become prophets" (Westcott 2015).

What should environmental political theory make out of all this?

3. Paradoxes of interdisciplinarity.

From the vantage point of the present, past science has mostly suffered from anthropocentrism -up to Copernicus and Darwin, human beings were taken as the measures of all things. This can be forgiven, as it was the human being himself who was observing the world. In this regard, the Anthropocene is a mixed blessing: it speaks of a planet that has been colonized and altered by a sustained and massive human activity, but at the same time it reminds us that geological forces and planetary systems do not care much about human exceptionalism. It helps, in other words, to de-center humankind.

Such news should be welcomed on the part of environmental political theory, since the latter has traditionally laboured to debunk human exceptionalism. As William Connolly has just argued, to challenge "sociocentrism" in this context means "coming to terms with bumpy processes of planetary self-organization that interact with each other and with human cultures" (Connolly 2017, 33). Natural sciences are not enough for this complex task, since they cannot make sense of human impacts on the nonhuman world or can do it too partially -that is, registering the impacts without understanding their causality. His recommendation:

"What is needed, then, is investment in a double process by which we move back and forth between findings in a specific science and attention to the most reflective readings of human cultural experience. (...) The idea is that the earth and cultural sciences need each other" (Connolly 2017, 107).

In other words, he is pointing to the need for interdisciplinarity in the study of the Anthropocene and, more generally, all things socioecological. Of course, he is right. But this epistemological promiscuity must be handled with caution. As we will stress later, cultural inflections have no role to play whatsoever as far as pure descriptions are concerned -no matter how outdated that wording, "pure descriptions", may sound. For instance, Connolly himself comments on the relevance of still recent discoveries such as the workings of plate tectonics and the ocean conveyor belt for an understanding of the planetary system and the relative helplessness of human beings within it. That is pure science: the observation, measurement, description and explanation of natural phenomena in which human influence can be discerned (anthropogenic climate change can affect ocean circulation) or not (plate tectonics seem to be out of human reach). Yet let us see what geologist Jan

Zalasiewicz and his colleagues responded to the charge that the Anthropocene may well just be "pop culture":

"The concept has certainly gone beyond the confines of stratigraphic research. But much of the interest has been among the wider scientific community, because Anthropocene explicitly compares human perturbation of the Earth system (as observed) with ancient natural perturbations (as preserved via proxy evidence in rock strata), and it considers together and integrates diverse forms of environmental change" (Zalasiewicz et al. 2014, 62).

What shows here is that scientists *cannot prevent* their formulations to be appropriated and discussed elsewhere. This includes misinterpretations, sometimes among scientists themselves, as well as paradigmatic conflicts. Without excluding the geological meaning of the Anthropocene, social scientist Clive Hamilton (2017) has insisted that the Anthropocene is not a term coined to describe the continued spread of human impacts on the landscape or further modification of the ecosystems, but a term describing a *rupture* in the functioning of the Earth System as a whole. This means that the young discipline of Earth System Science, rather than geology, is the one to listen to as far as the Anthropocene is concerned. Earth system, not ecosystems, is the scientific object. Political theorists dealing with socionatural relations should take notice. The problem is that "much of the analysis from *scientists* begins from the same misconception" (Connolly 2017, 13). This confusion, if Hamilton is right in denouncing it, owes much to the radical novelty of both this new paradigm.

Yet the Anthropocene Working Group that is lobbying -so to speak- for the official recognition of the new epoch has also stressed, against critics, that adding the Anthropocene to the Geological Time Scale can only be done if conclusive stratigraphic evidence is collected. This entails that "it is essential to disentangle the geological evidence from other ramifications, including societal ones" (Zalasiewicz 2017 et al., 206). What the Anthropocene Working Group currently assembles is thus an stratigraphical case based on the accumulated sedimentary record. As it happens, such observation is made by human beings who have also devised a Geological Time Scale in the first place. But then an important qualification is added:

"It so happens that the bulk of this change is currently human-driven, but if exactly the same changes had been produced not by human action, but for example by actions of some other species, by the effect of extraordinary volcanic eruptions or bolide strikes, or by some other means, then the geological justification would remain unchanged" (Zalasiewicz et al. 2017, 220).

It makes sense: a major alteration, whose stratigraphical traces are being sought, is taken into account -yet the identity of the actor that has produced it remains, *from a geological viewpoint*, relatively unimportant. That is also why the usage of the term "Anthropocene" in the social sciences and the humanities -not to mention public discourse and literary fiction- has nothing to do with its stratigraphic evaluation: either there is a fossil record or there is not.

At the same time, however, a clear-cut demarcation is not easy when a concept deals with the aggregated *social* impact on the planet. As a consequence, the debate about the golden spike of the Anthropocene easily transcends disciplinary barriers and becomes part of a wider conversation about the human presence on Earth. In this regard, even the symbolic and political *appropriatedness* of different starting points have been discussed (see Davies 2016). An early date would focus on the *causes* (the beginning of an intense human intervention on the planet) whereas a late one would emphasize the *consequences* (or the effects of such intervention), whereas choosing industrialization means identifying capitalism as the major driver of the new epoch. But, as Zalasiewicz notes, this is not how science is supposed to work. As the Anthropocene is "captured" by social sciences and the humanities, part of the conversation revolves around meanings and explanations rather than measurements and causation. Once the Anthropocene is understood as a new framework under which socionatural relations are to be approached, a framework that establishes as its premise the longstanding human colonization and alteration of natural systems, the particular problem that

concerns geologists (that of finding a fossil record of the geological change brought about by human beings) is rather left aside.

But again: the *political* Anthropocene must not obstruct the *scientific* Anthropocene. The search for stratigraphical evidence should continue whatever is said in the social sciences -but not vice versa! We will elaborate this crucial point in a moment, but let us add that such geological quest is also independent from other scientific insights. Historically speaking, the Anthropocene does not begin abruptly with an isolated event: unlike past geological epochs, it features a cumulative, asynchronous and prolonged start (see Lewin and Macklin 2014). It cannot be otherwise, since the human impact on the planet is not an *event* but a *process*. What geologists do is looking for an event that can serve as a stratigraphical marker -but the event itself, no matter its symbolic connotations, is relatively unimportant *in itself*. Difficult as it may be, these two aspects of the Anthropocene should not be conflated. As a way of comparison, Earth System Science does not need such event: it registers and measures the alteration of planetary systems as the outcome of human activity, and it can certainly single out particular technologies or practices as having greater impact than others, but it does not need any "poster boy event" for saying what it has to say about the Anthropocene. Then again, it would be unfair to suggest that members of the Anthropocene Working Group have been actively looking for such publicity stunt.

Now, if the natural and the social sciences were separated from each other, these confusions would not take place. Yet we would be worst off without them -they are *creative* confusions. After all, neither the Anthropocene nor climate change are *just* scientific observations, but *also* knowledge-production processes through which human societies learn to deal with the complexity of their ecological entanglements. For Renn and Scherer, the logical conclusion is that

"the Anthropocene shows that the sciences and culture do not belong to a comfort zone wherefrom the world can be observed and described. Rather they are part of the processes by which we operate in it. This means that they also make the world they describe" (Renn and Scherer 2017, 15).

Interestingly, though, the very scientific enterprise that is denounced as one of the main culprits of environmental degradation and ontological alienation have been able to correct themselves by gradually introducing the epistemological premise that the ecological is also social and thus cannot be confined in the natural sciences narrowly understood. And vice versa: human beings and societies cannot be understood in isolation anymore. Following the pioneering work of anthropology, the social sciences assumed this perspective -in sociology, economy, philosophy. Political theory followed suit, as well as the humanities. The human sciences, in sum, have successfully incorporated the environment and the nonhuman world to their inquiries. Such ascertainment threatens the "anthropic principle" that has been the foundation of human epistemology since -at least- the Enlightenment (see Welsch 2012). In fact, and for all the epistemological arrogance of the social sciences, so often translated into a feeling of superiority over their unsophisticated colleagues in the natural sciences, the weakening of the anthropic principled has been mostly led by the latter: from Copernicus to Darwin. Furthermore, the methodological objection posed by sociologists and philosophers of science -who contest the very possibility of producing an objective account of reality- can be interpreted as a reinforcement of such anthropic principle: not even when looking through the microscope can we get rid of the long human shadow!

Actually, the Anthropocene and climate change constitute the most fruitful examples of a new *cooperation through dialogue* between the social and the natural sciences. In both cases, we face significant changes in natural systems that have been induced by social activity, changes that now in turn condition that same activity -a play of multiple feedbacks in both directions linked to a number of causation chains. Although the social and the natural can still be distinguished, it makes no sense to study them separately. Which is the effect of urbanization on biodiversity? And the impact of climate change on human migration? Which is the dividing line between the natural and the social as far as the decreasing effectiveness of antibiotics is concerned? No matter where we look at, society

is within nature and nature is within society. And yet grand statements, no matter how accurate, do not solve the problem by themselves -how environmental political theory should respond to the Anthropocene science remains to be decide.

4. Getting science right.

How are then environmental political theorists to deal with the Anthropocene science? Hamilton's position is a good starting point, as he demands that "whatever conclusions one might draw as to the ultimate causes and the solutions to the Anthropocene, an understanding of the basic science of it must come first" (Hamilton 2017, 10). Although Hamilton is complaining that the scientific content of the Anthropocene is being misunderstood, conflating planetary change with massive ecosystem disruption, he is essentially right. What interests me here is precisely the other part of his statement -namely, that science comes *first* and the debate about "causes and solutions" *follows*. This means two things: firstly, that scientific *facts* cannot be rejected; secondly, that scientific insights should inform both explanatory accounts and political solutions. At the same time, different scientific claims must be treated differently: an observation or a measurement is not the same as an untested hypothesis or a modellization of how the future -or several possible futures- might look.

To be sure, the second part of his warning is also relevant -yet for reasons other than intended. Hamilton insists that the *real* Anthropocene science is Earth System Science, which in his writings sound as a consolidated discipline instead of a still young body of knowledge awaiting due recognition. The planetary system that it postulates is certainly plausible, as the effects of climate change suggest, but its complexity requires a demanding process of scientific validation that will take its time: verifying knowledge about a hyper-complex open system is not an easy task (see Oldfield and Steffen 2014). The same goes for the geological hypothesis, which, as we have seen, is yet to take the form of an official request to be formally evaluated by the International Commission on Stratigraphy -a process that can take up to 10 years. Noel Castree (2018) has expressed his fear that, if the Anthropocene science does not take its time to develop and to be scrutinized, it may become subject to the sort of politically-led skepticism that so damaged the public reception of climate science in the early 2000s. If political theorists proceed cautiously and await greater scientific consensus, he suggests, they might avoid the accusation of uncritical reliance on scientific expertise -which means that they "scientize" their arguments on behalf of the nonhuman world just to be more persuasive.

This otherwise advisable strategy suffers from two related shortcomings. First, it cannot be fully implemented, as the collective enthusiasm for the new term shows; second, it would compel political theorists to give up on a notion that is proving fruitful despite not having been fully validated yet. Decisively, the way in which the Anthropocene is being useful for scientists in both the natural and the social sciences does not depend on the validation of the geological hypothesis. The Anthropocene works because it recognizes human transformational power and the impact it has have on the natural environment. Anthropogenic climate change suggest, in fact, that at least one important planetary system as been affected -albeit indirectly- as a whole. Therefore, it has become a framework for understanding siconatural relations in a new way, directing the research across the sciences and the humanities. Perhaps this could have waited until proper validation in the involved branches -geology and Earth System- had taken place. But, then again, what does prevent environmental political theorists from making a *careful* usage of science that distinguishes between facts and norms, measurements and hypothesis, descriptions and prescriptions?

These distinctions are of the utmost importance if science is to play, as it must, a beneficial role in environmental political theory. Although scientists cannot isolate themselves from the society they inhabit and thus cannot pretend to stand beyond good and evil, the scientific method guarantees the ability to produce a reasonably objective knowledge about the reality they observe. However dated this claim may seem, measuring the temperatures or making sense of the functioning of the ocean

belt conveyor by observing and describing it are not "social constructions". They are, in a way, representations -language and concepts are needed to produce and express them. But they are not figments of a collective imagination: they relate to an objective reality. Or it doesn't? This is an old philosophical discussion, that usually ends when someone wave about a poker against the skeptics. Science is about facts that can be verified, not a system of beliefs that can be embraced or rejected at will. Those facts must be the starting point for the political conversation about the Anthropocene. But whereas established facts are univocal, their social meanings, as well as "the causes and the solutions" Hamilton talks about, are nothing but. And that is what political theorists should talk about: meanings, causes, solutions.

However, such distinction may not be so neat. Bruno Latour has recently argued that description is always accompanied by a constraining set of injunctions. They are, in short, prescriptions as well. Drawing on Nietzsche, he notes that

"the pure, brute existence of incontestable facts enter abruptly into the discussion to bring it to an end, thus fully playing the normative role that these facts were not supposed to have" (Latour 2017, 23).

That is precisely why, Latour elaborates, climate deniers make so strenuous efforts in discrediting climatic facts -if they were accepted, their "simple" description would carry normative effects. The reason lies in that to describe "is always not only to inform but also to alarm, to move, to set in motion, to call to action" (Latour 2017, 26). Facts prescribe because they are stubborn -once they are "discovered" they cannot be removed nor should they be ignored. For this reason, the new climatic regime has created an unbearable tension between description and prescription and has made every constative statement a performative one. The same can be said of the Anthropocene, understood as a set of factual claims about the antropogenic disruption of planetary systems. Yet Latour provides a key nuance:

"What doubtless explains in part the old idea that description entails no prescription is that these warnings obviously do not spell *in detail* what has to be done. They are merely ways of putting collective action *under tension*" (Latour 2017, 48-49).

This can also be formulated by saying that *is* entails *ought*, but leaves open the content of the corresponding prescription. *Something* must be done, yet *nothing* in particular should be done. Again, that is partly what the political conversation is about: finding out what is exactly to be done. Following this logic, the distinction between description and prescription can be preserved, albeit not in a pure form: descriptions prescribe, but make no explicit indications. In turn, this allows to maintain the separation between the *scientific* and the *political* Anthropocene, even though the latter will forcefully refer to the former and sometimes scientists will be tempted to make political recommendations. That said, these are two different set of claims, political and scientific, no matter who -the scientist or the political theorists- is making them.

Usually, the science is invoked in order to legitimize the politics. But let us keep in mind the ambivalences at play. On the one hand, the political discussion takes place *because* there is not just one political path towards sustainability -or, to put it more widely, there is not just one political response to the facts communicated by scientists. At the same time, though, normative statements on the part of political theorists cannot *ignore* scientific claims: they are compelled to incorporate the scientific viewpoint lest they present groundless or delusional arguments. Scientific observations and measurements are not dependent on social contexts or cultural biases -although *what* is to be observed and measured certainly can. Science will thus provide a view of the socionatural relation as it stands, as well as a number of certainties about natural systems, the degree of human presence in them, etc. Unavoidably, there will be misunderstandings between scientists and political theorists, but the benefits provided by their mutual engagement far exceed its shortcomings. How possibly could complexity be approached in a simple manner?

As for scientists, they should refrain from making normative claims about how to organize socionatural relations or to pursue sustainability -that is not their *function* in the public debate. Nevertheless, this restriction is probably too harsh and, above all, unrealistic. Natural scientists feel concerned about the preservation of the nonhuman world and wish to speak out in its favour. Often, too, they are *asked* about the solutions they would choose. And, of course, they must be *consulted* on the technical viability of political proposals. What can be asked for, in this context, is that they make their political or normative statements *explicit* and clearly separated from their scientific investigations.

5. Getting politics right.

Different kind of statements about socionatural relations in the Anthropocene can be discerned. On the one hand, there are *factual statements* which derive from observations, measurements, comparisons and the like. Then there are scientific *theories* about the functioning of natural systems and their interaction with social systems -in turn, they can be *untested hypothesis* that await verification or become *falsified theories* already accepted by the scientific community. If the disciplinary boundary is crossed, there are *explanations* about the state of socionatural relations, past and present, that can make use of scientific insights (for instance, appealing to evolutionary theory). Then there is the debate about the *meanings* of scientific concepts and scientifically described socionatural events. And, finally, although the list is not exhaustive, there are *normative claims* about that what should be done about human-nature relations. Needless to say, the degree of certainty of these statements differ widely: the more factual, the less uncertain, and vice versa.

To make sense of this taxonomy, and suggesting a way of organising the relationship between Anthropocene science and environmental political theory, Hannah Arendt's view of truth can be useful. In *Truth and Politics*, Arendt (2006) implicitly refutes Nietzsche's famous *dictum* against positivism, according to which "there are no facts, only interpretations" (see Kaufmann 1994, 458). Nietzsche himself was refuting an equally radical claim, namely, that there are *only* facts. Actually, there are facts *and* interpretations, the value of Arendt's account being the recognition of such circumstance. She is not talking exactly about scientific statements, rather of the opposition between *factual* truth and *political* truth. And she does so concerned by the mass politics that led to totalitarian regimes in Europe, regimes which made efforts to manipulate history and hide the most unbecoming aspects of their socioeconomic reality. Still, her account can be recruited for ascertaining the role of Anthropocene science within environmental political theory, for reasons that will be evident below.

Arendt observes that a common strategy to discredit factual truths is to treat them as opinions, i.e. to render them a matter of belief or choice. The ensuing problem is that of factual reality itself, which in her view is "a political problem of the first order" (Arendt 2006, 232). Facts feature an "unyielding, blatant, unpersuasive stubbornness" (2006, 233); a way of depicting them close to that of Latour. Therefore, facts are not opinions, despite facts informing opinions. Opinions, on their part, can vary and they will be legitimate as long as they respect factual truth. Hence:

"Freedom of opinion is a farce unless factual information is guaranteed and the facts themselves are not in dispute" (Arendt 2006, 234).

This is also the case of the Anthropocene science and the factual truths that it carries, which must be the foundation of the political discussion about their meanings, consequences, and normative implications. Such facts cannot be just denied or rejected as a "narrative", a representation made up of social assumptions and dominant values: facts are facts. That is why, Arendt also notes, truth "carries with itself an element of coercion" insofar as

"once perceived as true and pronounced to be so, they have in common that they are beyond agreement, dispute, opinion, or consent" (Arendt 2006, 234).

Such character does fit well into the political realm, which is organized around debate: facts claims to be acknowledged and preclude debate itself, thus possessing "a despotic character". They are beyond agreement and consent and talking about them "will contribute nothing to their establishment" (2006, 236). Surely, they can be rejected, as climate change comes to show. But the fact itself, the *reality* they embody, does not disappear as a result -that is, again, its *stubbornness*.

Yet an interesting difference between factual truths of the kind Arendt is discussing and those communicated by science concerns their *contingency*. She suggests that facts "have no conclusive reason whatever for being what they are" in the sense that "they could always have been otherwise, and this annoying contingency is literally unlimited" (2006, 238). The contrast is interesting because natural laws *cannot be otherwise* and that amounts to a particularly strong stubbornness. What could have been different, however, is the way in which socionatural relations unfolded -different because human beings and societies introduce an element of contingency that can and should be incorporated into the discussion. Even though, as I think, human aggressive adaptation to nature is not exactly a contingency -but again, that is something to discuss, not a "fact" in the manner of an increase in global average temperatures in a given year. It follows therefrom that *scientific* facts are even more compelling than *historical* ones, insofar as they are less contingent or, in any event, they respond to natural laws that can certainly be used advantageously but not changed nor ignored.

The relationship between Anthropocene science and political theory is thus directly affected by the conclusion to which Arendt, at the end of her essay, arrives. Namely, that the whole sphere of political life is limited:

"It is limited by those things which men cannot change at will. And it is only by respecting its own borders that this realm, where we are free to act and to change, can remain intact, preserving its integrity and keeping its promises" (Arendt 2006, 259).

Truth, she concludes, is that what we cannot change, and her words amply resonate in our conversation. The political concerns that what human beings *can* change at will -although we could add those who have been changed *unintentionally*, as climate change and other aspects of the Anthropocene can arguably be described. This is important, most of all, to prevent two kind of attitudes that stand at opposite sides in the socionatural debate: the one that denies scientific facts or treat them as opinions (as with climate deniers) and that which expresses itself in unrealistic assumptions about sustainability (be them cornucopian or promoters of de-growth strategies). However, these distinctions are harder to keep as we depart from scientific facts and start discussing what is and what is not *feasible* regarding socionatural relations. What can we actually *change at will*? What socionatural configurations can be pursued and which ones are, contrariwise, unfeasible and perhaps dangerous?

To answer such questions, we need a political conversation in which two dangers are paramount. Firstly, science can be ignored and socionatural relations treated as endlessly plastic; secondly, science can be used in order to de-legitimize plausible alternatives. How to avoid them? We can ask those who engage in the conversation not to do either of this, but it would be naive to think they will do as told. Therefore, it must be accepted that the very definition of the boundaries of the political vis-à-vis the scientific will be part of the discussion. In other words: the possible and the impossible are to be *politically* discerned, but those who advance arguments in this context cannot ignore the science, which will then work as a limit to the political. The obligation to respect firmly established scientific facts becomes, then, a guiding principle in such deliberation -a rule to be applied when the validity of different claims is weighed. As noted earlier, not all scientific statements are the same - they vary in type and degree of certainty.

When facing the Anthropocene, then, environmental political theorists cannot ignore the science nor ignore the fact that the science is not yet firm, as both the geological case and the Earth System one

are not sufficiently established. This uncertainty should be registered by political theorists, especially since it does not prevent them from taking the science that is certain, i.e. the overwhelming amount of data about human influence on natural systems and the planet at large. Science, as it stands, must be integrated into political theorization and accepted as a departing point for critical discussion. Yet political theorists have the right, or maybe the duty, to check the kind of claims that scientist make. Not in order to discuss their results or question the methodology, but to make sure that they do not reach hurried conclusions of any kind when none is warranted.

At the same time, political theorists are among those who -together with philosophers- try to elucidate which is the moral and political meaning of scientific statements, i.e. established scientific facts about the current state and past trajectory of socio-natural relations. What news does the Anthropocene bring? Are human beings now in command of the planet, or the irruption of the geological diminishes their role? Is naming a geological epoch after us an exercise in realism or an act of megalomania? Who is exactly the *anthropos* that the term conjures? What about the language we use or the images we choose in talking about the Anthropocene? What do they convey and what do they exclude? If we talk about transformation and hybridization, aren't we hiding the destructive side of human agency? But again, is it the talk of a Sixth Extinction justified, or scientists are not exactly saying that we are already going through it?

Politics, then, is also about science. But not about accepting or rejecting what science has to say, rather about what is the meaning, the relevance, and the implications of that which science tells us. This is not exactly to *politicize* science, but to engage *politically* with it. A good example of the virtues (and perils) of this approach is, as noted above, the debate about the beginning of the Anthropocene -political theorists have been somewhat unscrupulous when discussing this matter, as they have often thought only in symbolic and political terms leaving aside the geological requirements for setting a proper date. But maybe geologists themselves have misled them! Another, perhaps better example of this method is provided by the alternatives to the term "Anthropocene": from Capitalocene (see Moore 2014) to Technocene (see Sloterdijk 2017) and even Chthulucene (Haraway 2016). Without giving it a name, ecofeminist thinkers have also presented an alternative understanding of the Anthropocene as a typically male-driven historical process (see Grusin 2017). It is a creative way of advancing different interpretations of the Anthropocene hypothesis: not questioning *what* can be measured but reinterpreting *why* we have reached this point -as something that must be found out before we can decide *how* to deal with it. Yet the latter is a question that cannot be answered as if factual constraints would not exist.

The intended picture is that of politics as an activity limited by "that what we cannot change", namely factual truths, but not suppressed by them: Arendt, I hope, would have approved.

6. Conclusion.

Throughout this paper, I have explored the uneasy relationship between environmental political theory and environmentally-related science, more particularly the emerging Anthropocene science. By the latter I mean both the geological hypothesis that a new epoch in the Earth cronology has started and the Earth System science claim that planetary systems, understood as an interconnected totality that regulate the Earth, have been anthropogenically disrupted. Several critiques have been made by environmental political theorists, most of them a variation of old arguments about the role of science in the domination of nature: science is everything but neutral, its frames and concepts determine the way in which we see the natural world, the supposedly "objective" scientific method is plagued by social assumptions, descriptions of the Anthropocene are filled with prescriptions about how to respond to it, the science itself is not well established yet. Some scientists even suggest that the Anthropocene is more pop culture than geology, while there is also the view that it is not geology but Earth System science what must count as "the science of the Anthropocene".

Be that as it may, I have tried to show that a reasonably clear-cut distinction between science and politics can be maintained, despite the partial validity of the abovementioned reservations. English writer J. G. Ballard (2014, 456) wrote that "science continually dismantles the world and feels utterly free of any emotional entanglements that cloud reality". And this is true, for good *and* worse: it allows us to better understand the material and nonhuman worlds -as well as the human interactions with them- and at the same time it creates a "way of seeing" them that so often has contributed to their exploitation or mistreatment. However, science has also corrected himself and changed dramatically the framing through which we approach the (natural) world. Admittedly, it has done so with the help of the human sciences, and as a result the distinction between the so-called "two cultures" is now weakened. In view of this interdisciplinary promiscuity, to demand "objective purity" from science is not fitting. Yet science can provide it. That is, it can provide enough "objective" statements about reality for a distinction between scientific and political claims to make sense. Naturally, not all scientific claims are the same, nor can all be affirmed with equal certainty: a measurement is not the same as an hypothesis, feedback mechanisms as they can be presently observed differ from an estimation of their future occurrence.

In this context, environmental political theory cannot ignore science nor treat it as a mere "narrative", i.e. some sort of fiction inspired by the social contamination of the laboratory. Science works -again, for good *and* worse. This means that political theorists should treat science as Arendt treats factual truths: as something that cannot be changed and must be incorporated as such in the political realm, which actually is *limited* by them. It would be shocking that, while environmental political theory has always attempted to turn natural limits into a political factor, it is to reject scientific statements just because they are not the "right" ones. What political theorists should do is to discuss the moral and political meaning of the news that science conveys, as well as its normative implications. Needless to say, such division of work is not without its grey zones: there are scientific hypothesis not yet tested that, however, produce effects in the public imagination; there are scientists making normative claims; and, crucially, there are natural limits that can be tweaked and expanded by human ingenuity. This last point shows how much easier it is to *explain* past socionatural relations than it is to *predict* their future or to *design* them. That is just one reason among many why environmental political science must be scientifically informed -lest its claims become a *flatus vocis* disentangled from socionatural reality and its stubborn (im)possibilities.

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