Time, Infrastructure and Knowledge: Rethinking Temporality in the Anthropocene

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Submitted: November 20, 2024
Accepted: December 31, 2024

Abstract
The contributions included in this Crossing Boundaries section reflect upon infrastructural temporality, chronopolitics and natural history in relation to the Anthropocene and climate change. Vando Borghi examines infrastructure capitalism and regimes of historicity, arguing that infrastructural synchronization dispossesses individuals of agency, producing "uncertizenship". He invites us to delve into "ruins thinking" and an "epistemology of coordination" to inhabit this condition and re-territorialize infrastructures. Luigi Pellizzoni interrogates whether the Anthropocene narrative represents a break from or continuity with late capitalist modernity's politics of time. Addressing the concept of "non-trivial futures", he argues that the Anthropocene aligns with and strengthens capitalism's recursive temporality and secular eschatology, opening space for conservative or reactionary designs. Finally, Paolo Savoia traces a "revival" of natural history in the environmental humanities, enabled by temporal short-circuits between the 16th and 21st centuries. Early modern natural history is revealed as preluding anthropology that blurred nature-culture divides and anticipates a notion of "third nature" which challenges the scalability logic characteristic of modernity.

Keywords
Anthropocene; regime of historicity; politics of time; infrastructural capitalism; uncertizenship; natural history.

1. Guest editor's note

The three contributions in the Crossing Boundaries section follow up a discussion initiated at the workshop "The Faces of Gaia. Climatic regimes, Social orders, and Senses of Ecology", held on June 6 2024 at the Department of Philosophy, University of Bologna. This workshop aimed to critically examine the complex temporalities and worlding practices unfolding in response to Climate Change and the Anthropocene.

The participants to the following dialogue engage with the entangled, non-linear time of ecology in which the pursuit of alternatives to growth-based models has yet to catalyze transformative change. They interrogate the climate exploring their scalar dynamics, un-

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derlying interests, mobilized entities, and political, technological and ecological entanglements, proposing novel approaches.

Rather than framing climate crisis as a punctual emergency confined to the present, the contributions situate it as a process redefining policies and relations of coexistence, social orders, and timescapes. Attention was directed to redefining nature-culture relations, to shifting future-making logics and the ideas and interests shaping climate adaptation and mitigation efforts and their supporting knowledge infrastructures.

The dialogue works at the intersections of critical theory, sociology, political ecology, philosophy, history of science. It reflects upon infrastructural temporality, chronopolitics and natural history in relation to the Anthropocene and Climate Change. Vando Borghi examines infrastructure capitalism and regimes of historicity, positing that infrastructure synchronization dispossesses individuals of agency, producing "uncertizenship". He invites to delve into "ruins thinking" and an "epistemology of coordination" to inhabit this condition and re-territorialize infrastructures. Luigi Pellizzoni interrogates whether the Anthropocene narrative represents a break from or continuity with late capitalist modernity's politics of time. Addressing the concept of "non-trivial futures", he argues that the Anthropocene aligns with and strengthens capitalism's recursive temporality and secular eschatology, opening space for conservative or reactionary designs. Finally, Paolo Savoia traces a revival of natural history in the environmental humanities, enabled by temporal short-circuits between the 16th and 21st centuries. Early modern natural history is revealed as a preluding anthropology that blurred nature-culture divides and anticipates a notion of "third nature" which challenges the scalability logics characteristic of modernity and capitalism.

Across these diverse perspectives, the pieces reveal the complex temporal politics at stake in conceptualizing and responding to contemporary ecological transitions. In doing so, they open possibilities for alternative chronopolitical imaginaries, conceptualizations and inventions.

Uncertizenship: Infrastructure, Ruins and Regimes of Historicity

Vando Borghi

> *More than twenty years have passed since the accident, yet I have been asking myself ever since: what was I bearing witness to, the past or the future? ... I see Chernobyl as the beginning of a new history: it offers not only knowledge but also prescience, because it challenges our old ideas about ourselves and the world... Chernobyl is, above all, a catastrophe of time.*
> Svetlana Alexievich, *Chernobyl prayer. A Chronicle of the Future*, 2016

> *Where imagined future ruins were once the objects of metaphysical fancy or hubristic imperial dreams, the modern ruin is always, to some degree, a palpable, all-too-real remnant of the future.*
> Brian Dillon, *Fragments from a History of Ruin*, 2005

1. Infrastructure capitalism and regimes of historicity

Our present is that of infrastructure capitalism.

> By infrastructural capitalism, we refer to a form of capitalism that is built on the production and expansion of intersecting physical and digital infrastructures, [...] This concept encompasses the concrete infrastructures of roads, cities, high – speed rail, and logistics transportation [...]. At stake in infrastructural capitalism is the material base of all other forms of materiality of capitalism, namely extractive capitalism, monopoly capitalism, and digital or platform capitalism. (Lin and Ngai 2021, 651)

In truth, it is not just about the "material basis of all the other forms of materiality of capitalism", but more broadly about the way in which our experience of our relationship to the world and to other living beings depends in an increasingly decisive and capillary way on the infrastructures on which contemporary forms of life are built (Borghi 2021). Moreover, infrastructure capitalism is not only capitalist but also neoliberal: an unprecedented interpenetration of state and market structures produces what Keller Easterling has called "extrastatecraft" (Easterling 2014), flanking the expansion of market logic with an increasingly intense neoliberal bureaucratisation of the world (Hibou 2012).

It is therefore in infrastructure capitalism that the relationship between past, present and future takes shape, i.e., the "regime of historicity" (Hartog 2003) with which we are concerned. The regime of historicity to which we belong has several aspects of continuity with the past. It is a past in which the relationship with time is highly spatialised, expressing in the concrete expansion inherent in the colonial conquest of lands the idea of a globalising modernisation projected into the future. A temporality characterised by linear and homogeneous evolution, on which the very idea of development was and is based.

Not only development in the socio-economic sense, but a more general "Cosmopolis", to use Stephen Toulmin's expression, in which even knowledge has become increasingly abstract, deterritorialised, detached from specific problems and experiences, as has the temporality with which it is associated (Toulmin and Toulmin 1992). In this space-time combination we can easily see the roots of the project of *scalability* (Tsing 2012) as a specific way of structuring the relationship with the world, a projectuality that banishes all diversity and specificity, imposing itself in an equal and standardised manner in every context. The infrastructures of contemporary capitalism are part of this history.

2. Uncertizenship: Infrastructure Synchronization and the Planet

However, alongside the elements of continuity that infrastructure capitalism represents in relation to the past, there are also elements of discontinuity. In a nutshell, these discontinuities can be summarised in two main themes. The first concerns the unprecedented degree of *synchronisation between infrastructures of things and infrastructures of experience* (Borghi 2021). This has to do with the peculiar ontology of infrastructures, about which I will say more in a moment. The synchronisation of infrastructures has been initiated, on the one hand, by the changes in the organisation of production processes that began in the late 1970s, aimed at introducing just-in-time, and, on the other hand, by the revolution in logistics, which has played an increasingly important role since the invention of the container in the 1950s, to the point of becoming the core of the interpenetration of production and distribution processes. These two drivers then merged with a financial economy capable of producing or consuming wealth in *real time* (that is a sort of gen just-in-time extended to the whole of social life). The synchronisation of infrastructures (of things and experiences) constitutes the completion of a globalisation project of which these transformations are an integral part. A project which, however, the more it is realised, the more it encounters the *planet*, to use Chakrabarty's terminology (Chakrabarty 2021). The "home-world delivery" that Günther Anders (1992; see also Fuchs 2017) spoke of in the 1960s, referring to the world that increasingly enters the everyday lives of individuals through the mass media, now takes on the objectivity of "capitalist realism". Infrastructure capitalism places *connectivity* at the centre of its logics of development, promoting the imaginary institution of a *frictionless* society in which this connectivity functions through and thanks to the (apparent) complete synchronisation between the social life of things and the processes of psychic and collective individuation.

The second element of discontinuity concerns the *dramatic expansion* of the "social-reproductive contradiction" (Fraser 2016), which has gone from being a question limited to social reproduction in the strict sense and its declination in terms of the patriarchal gender division of labour, to a more than human reproductive contradiction. A contradiction that lies at the heart of this encounter between the project of the "globe" and the "planet". This contradiction, to stay with the theme that concerns us – that of "regimes of historicity" – introduces a time horizon that is different from that of the globe. In the time horizon of the globe, referring to the existential, intergenerational, historical dimension, forms of relationship with the world are inscribed that interfere with the time horizon of the planet and the biosphere.

The condition of *uncertizenship*, i.e., "citizenship of uncertainty" (Scoones and Stirling 2020), is therefore that of all of us who inhabit the time of the encounter between the globe and the planet, of the dramatic misalignments between them, of the suffering that this encounter produces on a broad scale that extends from the earth system to the bodies, affective and mental structures of living beings. A state of uncertainty that can no longer be managed by the tools and apparatuses of risk management and that requires a profound change in our design logics. The "design hope" that years ago Tomas Maldonado (2022 [1970]) spoke of is in fact a radical rethinking of the scalability that characterises our design logics. We need to change the way we pay attention to, and therefore our practices of evaluating, what we have around us, in order to subordinate the logic of production to objectives other than human reproduction.

3. Infrastructure As a Process and a Paradox

Let us return to the central theme, the regimes of historicity in the times of infrastructures. To understand this relationship – between infrastructures and the time dimension – it is necessary to consider infrastructure as a *process* rather than an object. This has to do with the peculiar ontology of infrastructures: as a vast literature has now made clear, they are both things and relations between these things. Infrastructure constitutes the material and immaterial architecture through which social life flows and takes shape. In this sense, as suggested by Susan Leigh Star (Star and Ruhleder 1994), the question that guides the understanding of such process concerns "when is an infrastructure" more than what or where. With regard to the temporal dimension in particular, the ontology of infrastructure leads to a paradox. Infrastructure (a verb would be better: infrastructuring) consists of the formulation of a promise of the future and, at the same time, of its ruin. A process of ruination that does not only occur when infrastructures fail or come to a standstill. It is constitutive of the infrastructure itself.

The idea of the future based on the imperative of the progressive expansion of world control is the clearest demonstration of this paradox. The more this concept of controlling (and exploiting) the world has been imposed, the more uncontrollable the world has become. The future, as the space of the *possible* (Borghi 2019) becomes the stake in the confrontation with the constitutive paradox of the infrastructure. Of the possible, as the horizon of our future, it has indeed been affirmed that "there is no alternative", whether it be the conclusion of a very critical diagnosis that absolutizes the present condition; or whether it be, on the contrary, the consideration of those who maintain that the present is the best of all possible worlds and must be preserved as such in the future. But the relationship with the future also consists in a space in which the social-reproductive contradiction is addressed through an infrastructural design centred on care, as a relational logic between living beings and between them and their ecosystems. Thus, the possible exists in any case, in the folds of reality; but far from being the linear temporal evolution bound to the present and the past, it is itself a terrain of conflict: the conflict over the possible and its meaning.

4. Infrastructure, Capacity to Aspire and Proleterianization

The future, Arjun Appadurai has made clear (2013), is a cultural fact. As such, thinking and planning about the future is an asymmetrically distributed capacity in society. It is a *capacity to aspire* (*ibid.*), a capacity to think and navigate in the future, that some are able to elaborate in richer and more sophisticated ways than others because of their social, educational and cultural conditions; a capacity that is denied to some because it is precisely what is lacking in conditions of social, economic and cultural marginalisation. The impoverishment or denial of the capacity to aspire means the inability to imagine that one's future can be different and better than the present into which one has been thrown. Thus, if the relationship to the future is defined as the capacity to aspire, the question to be asked in the present is: in what ways is this capacity reconfigured – expanded or impoverished, enriched or destroyed – by the processes of infrastructuration (and ruining) that characterise our social horizon?

This question needs to be further clarified in relation to the characteristics of the infrastructures we are talking about. Their lifeblood is the large-scale processing of information and knowledge, to which we all contribute our raw materials, and their transformation into data. As already mentioned, connectivity is the functional imperative that characterises their most recent development, beyond their specific socio-technical characteristics, the prerequisite for the synchronisation pursued by infrastructure capitalism. But this connectivity contributes to the further development of a fundamental characteristic of the relationship between human beings, technology and knowledge. I am referring to what Bernard Stiegler calls "proletarianization" (Stiegler 2020). It consists in the loss of control over the knowledge that citizens themselves help to produce, and consequently in the marginalisation to the point of irrelevance of their own experience of the problems of their everyday lives. From the sphere of production, introduced by the so-called "scientific organisation of labour" at the beginning of the last century, it has spread to the sphere of consumption, to the point of penetrating every sphere of infrastructured social life. The knowledge we contribute to produce comes back to us in the form of a multiplicity of situations in which our experience of problems (and the knowledge associated with it) is disempowered.

5. Ruins Thinking: Uncertizenship, Multiple Times and Nonscalability

Reflection on the temporal dimension of infrastructures inevitably leads to the intrinsically political nature of the regime of historicity in which their design is inscribed. That is, the political dimension of the infrastructural process is expressed in the regime of historicity it incorporates and, more specifically, in the interpretation of the field of tension and conflict that is the possible. As Andrew Barry (2020) has noted:

> [T]he development of infrastructures can be *inventive*, opening up new possibilities or *anti-inventive*, reducing the space of future possibility [...]. In short, the development of infrastructures generates an ontological politics of both uncertain and future possibility. (Barry 2020, 98)

The dominant infrastructural design tends to reproduce the settler terraforming regime of historicity. The latter replicates the strategy of abstraction and de-territorialisation (Harrison and Sterling 2020) inherent in scalability as a model for relating to the world and the future. It is the "plantationocene" (Haraway 2015; Haraway et al. 2019) regime of historicity in which the promise of future infrastructure is formulated according to a teleological, linear and homogeneous conception of time. More generally, the promise of modernity is at work in infrastructure as a programme of progressive expansion of human reach and control over the (living and non-living) world (Rosa 2019; 2020).

But, as has been pointed out by many observers, "our stories of time and infrastructure are always stories of multiple times" (Jackson 2017, 172): the time of the different materials assembled, that of their multiple impacts on the environment and, vice versa, of the environment itself on infrastructures, that of the life cycle of people, of their knowledge; the time of wear and maintenance, of change and decay. The condition of uncertizenship demands precisely to openly confront this temporal plurality, with the co-presence in infrastructural planning of the promise of the future and its ruin. In other words, uncertizenship demands the adoption of "ruins thinking" (Wakefield 2018; Quintana 2022; Bennett 2020; Hennion and Monnin 2020). Not the renouncement of the possible, or the expectation of a pedagogical catastrophe, or even the mere aestheticizing contemplation of ruins, but rather the choice of "staying with the trouble" (Haraway 2016), of being in the field of tension of the future, of staying in the field of tension of the "possible" and the conflict that runs through it.

For this to be possible, it is indispensable to counteract the process of proletarianization that infrastructures have intensified; it is necessary to promote practices of re-territorialisation of infrastructures that make them permeable to situated and specific contexts of interaction; it is necessary to open them up to the (social and institutional) learning of regimes of attention that allow for the care of localised contexts of life, of the multiplicity and diversity that characterise them, and thus open them up to a nonscalability conception of the relationship with the world and the future. To inhabit uncertizenship therefore means to overcome the epistemology of crisis and emergency, through which infrastructural solutions are systematically imposed that contribute to the weakening of any "voice" of citizens and to the disempowerment of their experience of problems in the search for specific solutions, and to elaborate instead an "epistemology of coordination" (Whyte 2020), that makes the maintenance and reproduction of interdependencies between living beings and between them and their ecosystems, as well as the temporal plurality associated with them, a fundamental constraint on infrastructural processes.

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Reopening Time? On the Chronopolitics of the Anthropocene

Luigi Pellizzoni

1. Introduction

The notion of politics of time, or "chronopolitics", registers that, as the way of relating past, present and future with one another is crucial to the social order, it is also a field of power struggles (Kaiser 2015; Opitz and Tellmann 2015). However, different understandings of the politicization of time are possible. One is exemplified by the concept of "regime of historicity" (Hartog 2003). The idea is that each epoch, each society, is characterised by its own way of articulating past, present and future. This constitutes "the unthought of a culture, the framework that we cannot see, that we cannot decree, but which organises our experience of time" (Bensaude-Vincent 2016, 92). Though a regime of historicity has major political implications, these are not conceived as the (expected or unexpected) outcomes of deliberate actions. Said otherwise, in this framework time exerts a passive political function.

Things look different if one considers time from the vantage point of the notion of dispositive. Foucault (1980) calls dispositive an ensemble of disparate things (materials, technologies, texts, ideas and so on) that performs a governmental function, shaping power relations and channelling conducts. This happens first and foremost by conveying a regime of truth. What are the facts and their relevance; how they are connected; who is entitled to speak and act on the matter – a truth regime entails a narrative, that is, a dramaturgy where an initial and a final state of affairs are linked by deploying a series of implicit and explicit causal factors (actors, forces, events etc.), with related value attributions and moral lessons (Bonneuil 2015). All that takes place over time; it requires and enacts a certain temporality.

Foucault stresses that a dispositive is not the outcome of a deliberate design but rather an effect of the interweaving of its elements. Yet the latter *do* stem from choices and actions. Time, thus, appears in this framework actively politicized. Indeed, for Foucault a dispositive develops in response to "an urgent need" (1980, 195). Urgency evokes the unexpected emergence of a threat to the ruling order. Like an antibody, a dispositive takes shape to address and neutralize it. It is therefore inherently conservative or reactionary.

Responding to the threat of climate change seems today a – perhaps *the* – most urgent need for capitalism, especially if one regards it as not just an economic system but an "institutionalised social order" (Fraser 2014), comprising economic, political, social and cultural conditions, from free labour to private property and free access to non-privately-owned resources, to social reproduction and consumption models. Responses so far basically consist, on one side, in an expansion of markets – especially financial – to previously uncommodified resources and processes (Pellizzoni 2021); on the other, in the co-optation or repression of social mobilizations (Pulver 2023; Forst 2024). What about the narrative that supports such politics? A clue that time is crucial therein is the success enjoyed by the notion of the Anthropocene, which has rapidly moved beyond specialist discussions to involve the social sciences and humanities and the general public. Its advocates claim that the case for the Anthropocene may support an environmental politics more attuned to events that deploy at a geological time scale, that is, more radical and more consistent over time than hitherto. Critics oppose that the awareness of geological times may lead to a sense of futility of any conceivable action. Yet, a preliminary question is: does the narrative of the Anthropocene make any difference compared with the politics of time that characterizes late capitalist modernity?

Addressing this question means first of all making sense of such politics, and then gauging whether and to what extent the time of the Anthropocene aligns or clashes with such politics. Goal of this paper is to outline a tentative answer. I begin by dealing with the modern account of time, as an arrow that connects past, present and future, and its governance implications. I then show how such conception has been challenged by governmental approaches that build on a reiterative temporality and a related eschatology. Third, I reflect on how, with its stress on "deep time", the case for the Anthropocene seems to reaffirm and strengthen the linearity of time. Yet, I argue, Anthropocene time actually aligns with, and strengthens, late capitalism's politics of time. The latter can be challenged only by turning it against itself, as some mobilizations seemingly try to do.

2. The Crisis of Time in Late Modernity

A number of scholars have stressed that modernity breaks with earlier relationships with time (e.g., Luhmann 1976; Koselleck 1985; Hartog 2003; Bensaude-Vincent 2016). Two connected aspects gain salience. First, the account of time that comes to dominate the cultural and organizational aspects of social life is linear and quantitative, rather than cyclical and qualitative as typical of pre and non-modern societies. This means, second, that the future is open. The present derives from the past but is not bound to reproduce it, or more in general to follow a fixed trajectory in its progress. Implied in this view is an account of human agency as powerful enough to affect significantly the course of the events.

Driving the events in a desired direction entails envisaging possibilities and acting in such a way as to restrict or select among them – drawing, in other words, the "future present" as much as possible to the "present future" (Luhmann 1976); what will be to what we can anticipate about it. The future thus "becomes cause and justification for some form of action in the here and now" (Anderson 2010, 778)[1].

For a relatively long period, the relationship between present future and future present has been sufficiently stable. This period begins with the emergence of probabilistic and actuarial sciences in the late eighteenth century (Hacking 1990). Probability "defuturizes the future without identifying it with only one chain of events" (Luhmann 1976, 141). Determining the margins of error about what is going to happen makes the future at once open and controllable. The limits of probabilistic prediction begin to be acknowledged in the 1920s, with Keynes's and Knight's reflections on uncertainty in economic decision and Heisenberg's indeterminacy principle in physics. Yet, the governmental implications of uncertainty and unpredictability begin to gain salience much later, between the 1960s and the 1970s. With the rise of disequilibrium and complexity theories and the gathering of evidence about the systemic character of failures in predicting the impacts of technologies, "incalculable risks" increasingly come to appear the norm rather than the exception. This paradoxically stems not from a lack but from an abundance of knowledge. Indeed, the more the scientific insights and the technological means expand the possibilities of intervention in the world, the more the uncontrolled, uncontrollable and unknown aspects of the world become relevant to the decisions (Wynne 1992).

Over the years, this issue gains growing relevance. The problem of the governance of innovation pointed out some time ago by David Collingridge (1980) concerns technological lock-ins. The more established a technology is, the more we know about its impacts, but the less the freedom we have to change it. More recently, Alfred Nordmann has argued that the anticipation of the future can be "trivial" or "non-trivial". To anticipate the impact of a technology one can sometimes rely on experience or historical precedents. But the more "disruptive", the more a "game-changer", a technology is expected to be, the lesser the past experiences and the present knowledge come to help.

> [The] imagined future is a different world, inhabited not only by different technologies but inhabited by different people, too: by the time the envisioned new technologies have insinuated themselves into the fabric of society, this will be a society of new people in that they will have integrated these new technologies with their system of values. (Nordmann 2014, 89-90)

Collingridge highlights a contradiction between agency and knowledge: the more actionable the future is, the less one knows about what to do, and vice versa. Nordmann stresses that, beyond a certain point, the actionability of the future turns into its opposite. It is not just a question of technological lock-in. The point is that, if there is no way to establish a connection between present future and future present, the latter becomes a mere exercise in speculation. The future is no longer an open but an occluded horizon. The view in front is not just too wide or deep, but immersed in a dense fog. The stronger the beam of our speculation, the more its light is reflected towards us. The increasing role of science fiction in anticipatory exercises (Zaidi 2019) depends on the assumption that, by stretching the imagination beyond the limits of reliable connections between the present and the future, there can be more chances of grasping something behind the curtain of fog. But this is nothing more than a hope.

To some extent the difference between trivial and non-trivial futures is captured by the difference between prevention and precaution. The language of prevention is a language of probabilistic prediction of undesired events and cost/benefit calculations of action or inac-

tion. The language of precaution is of relevant but inconclusive evidence, worst case scenarios and search for proportionality between threat and action (European Commission 2000a). Yet, the timeframe of precaution is linear, just like that of prevention. Indeed, ever more so, since the consequences of the actualization of the threat are deemed irreversible. It is worth noting, however, that the governmental trajectory of precaution has been remarkably short (Pellizzoni 2009). Blossomed between the 1980s and 1990s, precautionary policies were already waning at the beginning of the 2000s. Moreover, support came almost exclusively by the EU and (some) European countries, arguably due to the weight of a social democratic heritage in prompting a response to growing public unease with the socio-ecological impacts of techno-science (European Commission 2000b), and to environmental organizations' pressures. Yet, the harsh controversies over precautionary policies erupted at the core of global capitalism, the WTO, are a clue not only to Europe's relative isolation but also, and above all, to the limits that a linear temporality was raising against capital accumulation, as ever more based on extracting value from the vital dynamics of the biosphere and from ecological turbulences (Cooper 2008; 2010).

3. Another Take on Time

Indeed, with the crucial shove of the "military-industrial complex" (Ritter 2008; Lakoff 2017), capitalism was already turning to something quite different from precaution. New anticipatory approaches have begun to gain salience since the late 1990s. One is "preemption". The idea, become prominent in the American security strategy after 9/11, is to anticipate threats that have not yet manifested themselves, through an incitatory action. The assumption is that, "since the threat is proliferative in any case, your best option is to help make it proliferate more – that is, hopefully, more on your own terms" (Massumi 2007, § 16), seizing the opportunities thus created. By "producing what it is meant to avoid" (Massumi 2015, 196), action generates the reality that proves its own validity. As G. W. Bush once declared, "Some may agree with my decision to remove Saddam Hussein from power, but all of us can agree that the world's terrorists have now made Iraq a central front in the war on terror" (quoted in Massumi 2007, § 17). That is to say: removing Saddam Hussein was the right thing to do because Iraq has become what justified such action. Preemption renders futile any attempt to distinguish between failure and success, wrong and right choices.

Then there is preparedness. Its origins date back to the Cold War, in relation to nuclear attacks, subsequently extending to bioterrorism (Lakoff 2017). Its take-off, however, is roughly contemporaneous to preemption. A major boost came from the WHO (e.g., 2009), which increasingly embraced it in reply to insurgent or resurgent infectious diseases. The Covid-19 crisis brought to public attention that national health systems were supposed to have and apply preparedness plans. Recently preparedness has invested also food security (OECD 2020; Pellizzoni et al. 2024). To be "prepared" here means being ready to react to unforeseen, unpredictable, hidden threats. Rather than eliciting its manifestation the task is catching early signs. To this end, a crucial role is played by vigilance performed by "sentinels" (Lakoff 2017; Keck 2020), such as monitored living beings (e.g., migratory birds, non-vaccinated poultry and human travellers) and detection systems, such as laboratories for early

infectious disease detection. Early detection and rapid response are expected to modulate the expression of the threat, so as to make it manageable.

Preemption and preparedness, therefore, are not the same thing. Yet, they bear strong similarities, especially regarding their take on time. The purpose is not, nor can it be, to prevent the actualisation of the threat but to handle it; not crisis resolution but crisis management. Hence, they both entail a potentially endless reiterative process, whose purported goal – the elimination of the threat – justifies action while ever receding into the horizon as a result of action itself. Also the past is affected – ontologically, not just cognitively. Since it has *become* one, Iraq *must have been* already a cradle of terrorism. And whether Sars-CoV-2 originated from "nature" or "technology" turns out a moot question, not just for the growing difficulty in distinguishing among the two, but above all because its very existence shows it was a possibility bound to actualize sooner or later (Pellizzoni 2025). As these examples suggest, new forms of anticipation disclose governmental opportunities otherwise precluded, or likely to be fiercely contested. With the "war on terror" crimes against civilian people were reclassified as necessary police operations without any actual consequence for its political promoters and supporters. With the Covid-19 crisis a potentially limitless extension of the state of emergency was met with feeble complaints, while largely unnoticed went the fact that policies such as the Italian zoning system blurred anticipation with "chasing" and adapting to the virus, making it impossible to assess their actual effectiveness (Pellizzoni and Sena 2021)[2].

It may be useful to note that the same mechanism is at work, in an inverted way, regarding "disruptive" technological innovation. The receding end point here is not catastrophic but regenerative: food, health and long life for all, cheap and pollution-free energy, and so on (Pellizzoni 2020). This bright future is always presented as within reach – almost. Opposing forces (conspirationists, radical ecologists, anti-scientists, lack of brave investors...) allegedly hamper its actualization. In this way a space opens up, otherwise unavailable or much more contentious, for decisions on innovation increasingly adventurous and subtracted to public discussion. This of course is not limited to technological hype. The "war on terror" has offered lucrative opportunities to security firms and the military industry, while the Covid-19 emergency has significantly enlarged the room for publicly funded research on, and marketization of, vaccines.

In sum, with preemption and preparedness, as well as with the case for technological game-changers, "non-trivial" future is addressed by way of a secular eschatology. If the end point is catastrophic, then the forces that make it recede are "good"; if it is regenerative, these forces are "bad". Forces and counter-forces operate within a sort of messianic temporality where chronological time is replaced by kairological time – the time of the "now"; a suspended, endless present whose decisiveness is ceaselessly claimed yet always deferred, while offering unprecedented possibilities of value extraction and power concentration. This suspended present becomes the past of something yet to come – a "future past" in Luhmann's (1976) terms. Actions are decided by performing what Fredric Jameson (2005) calls "archaeology of the future". Such archaeology can of course build on sufficiently reliable connections between present and future. But when the future becomes "non-trivial" its archaeology authorizes any sort of things, including the craziest and the most violent, unequal and unjust.

4. Anthropocene Time

We can summarize the above in two points. First, the time structure of emergent anticipatory strategies breaks with the modern one. Linearity is replaced by a reiterative structure that departs also from Biblical eschatology. In the Judeo-Christian apocalyptic, catastrophe precedes regeneration and its actualization is postponed by a force (the *katechon*, often identified in the Church or the State) that is at once good and bad (it delays the end of the world, thus also the advent of God's kingdom). Moreover, messianic time is linear (though inscribed in the circle of the eventual reunion of creation and creator, Earth and Heaven). You cannot go back and forth, but just push ahead, opposing the opposing force; or you can surrender to it, arresting your progress towards the apocalyptic moment[3]. What we are faced with, instead, is a Janus-faced, split, eschatology, which moreover blurs and continuously remoulds present, future and past. This kind of temporality can be found at work also on the side of climate mobilizations. While apocalypticism is part of the ecologist narrative since at least the early 1960s, with Rachel Carson's *Silent Spring*, and has expanded after the rise of the climate threat in the 1990s (Northcott 2015; McNeish 2017), "post-apocalyptic" mobilizations have recently gained momentum. For Extinction Rebellion, Last Generation and similar movements collapse is inevitable and indeed already happening, hence the need to accept and cope with it while still mobilizing on the basis of a sort of paradoxical hope (Cassegård and Thorn 2018).

The second point is that this time structure has major governmental implications. The examples provided indicate which sort. Any type of anticipation "justifies measures and interventions in the present without laying claim to having proof that they will effectively avert the threats posed" (Lemke 2024, 7). The acknowledged soundness of the procedure works as an exonerating clause from responsibility "if things turn out differently" (Luhmann 1998, 70). Yet, new anticipatory approaches expand to unprecedented extents the room for manoeuvre, as the eradication of the threat becomes a vanishing point.

However, the case for the Anthropocene seems to run counter to this temporal dispositive. There have been and there are many discussions over the alleged new geological era, which outside specialist debates[4] concern especially its beginnings, for their political implications. Establishing when the Anthropocene begins means defining causal factors and appropriate replies; protagonists and supporting actors, victims and culprits. For example, if the Anthropocene begins with agriculture, then the responsible is the human species. If the Anthropocene begins with the great travels and the colonization of the new world, then the responsible is capitalism. If it begins with Watt's steam engine (1784), then the responsible is industrialization. If it depends on the "great acceleration" begun at the end of World War II, then the issue is late capitalism and globalization (Pellizzoni 2023).

What these accounts share is the claim that geological time has intruded in the time of human societies. Though by no means a new topic[5], the relationship between natural history and human history has gained unprecedented saliency. Dipesh Chakrabarty, a leading scholar of postcolonial theory and subaltern studies, has especially focused on the issue. For him, climate change corresponds to a "form of [epochal] consciousness that does not deny, decry, or denounce the divisions of political life while seeking to position itself as something that comes before politics or thinking politically" (Chakrabarty 2015, 142). This consciousness

regards the compresence of two temporal regimes: on one side that of geological history and of humans as a species; on the other that of human history, of culture and politics (Chakrabarty 2018). Human history has always been nested in natural history, but the latter was conceived as a backdrop of the former, while today the mutual intertwinement of the two regimes appears ever more evident. The attempt to disentangle human history from natural history[6] has produced its opposite, leading humans to interfere with long-term geological and biological processes which they are unable to manage. Yet, and crucially, these "conjoined histories" (Chakrabarty 2021) entail different "modes of thinking, [...] kinds of knowledge and [...] ways of comporting" (Chakrabarty 2019, 24). This conjunction and simultaneous disjunction poses unprecedented problems of governance.

Bruno Latour provides a comparable account, to the extent that he also stresses the intertwinement of different temporalities. Yet, their disconnection or disharmony is portrayed differently. His reference metaphor is not the Anthropocene but Gaia. The Greek goddess had been brought to the fore of ecological discussions by James Lovelock and Lynn Margulis (1974), to claim that the living and non-living parts of the planet compose an interacting system, the biosphere, endowed with self-regulating capacities. For Latour, however, this interacting system should not be interpreted holistically, as the idea of a "living planet" suggests, but as a network of autotrophic processes, i.e., forms of regeneration from elements in the system, in which the exchange of material and information by microbial actors plays a crucial role, and which unfold on diversified temporal and spatial scales, in the absence of an overall order (Lenton and Latour 2018). Gaia, therefore, expresses "no other order, and certainly no superior order, than those intertwined agents have been producing through their entanglement" (Latour and Lenton 2019, 6). In this framework one has to consider not only the different temporalities of natural and human history, the contrast between "deep" and "shallow" time they entail, but the internal fractures of the former. Compared with Chakrabarty's account, the challenge for climate politics seems here even greater.

Indeed, the notion of deep time has gained growing traction, not only in regard to climate change but also to technologies such as nuclear waste management (Ialenti 2020) and cryopreservation (Lemke 2024). Like that of natural history, the notion of deep time is not new. It also dates back to the late eighteenth century (Northcott 2015). However, its association with the Anthropocene gives it a dramatic tone it originally did not possess. On one side, the onset of the Anthropocene depends on the connection between the distant past of long-term geological processes and the near past (whatever the exact beginning) of humans' acquired capacity to interfere with these processes. On the other, human action – or inaction – is assumed to have long-term effects. The deep future is as relevant as the deep past[7]. Moreover, the Anthropocene narrative takes an apocalyptic perspective[8]. For Northcott such narrative represents a "portentous reversal of the Christian apocalyptic" (2015, 107). Yet, it actually deploys only the catastrophic part of it. Catastrophe is pending, and regeneration after its actualization seems hardly meaningful or imaginable, but some social and/or technological *katechon* might push it away. With post-apocalyptic activists such *katechon* arguably lies within their mind, as a drive to accept and live with (or survive in) the catastrophe while mobilizing against it (Cassegård 2024). This introduces in the narrative a sense of urgency that concentrates all the stakes in the now, appearing for this reason at odds with the deep time of planetary dynamics, though remaining faithful to a linear

conception of time. Whatever the future, it lies ahead. Yet, is that really the case?

According to Jeremy Davies, the Anthropocene is geologically defined by "all those changes to the earth that might be discernible in the distant future" (2016, 77). Julia Nordblad notes that this account uses the future perfect tense:

> It places the past and the future in the same category, because from the point of view of the future geologist they are both equally past. This predictive determinism – she continues – is profoundly unfortunate as a political temporality because it blurs the line between past events and events that are still avoidable. (Nordblad 2021, 335)

This does not help to address a situation that is "both open and decisive", occluding the space "for imagining, planning, critically discussing, or deliberating the future" (*ibid.*, 336). In this sense, Nordblad argues, the notion of Anthropocene contrasts with that of climate change, which the IPCC reports articulate in terms of alternative scenarios. The Anthropocene conveys a notion of the future as "a closed temporality that proceeds as unfolding"; climate change of "an open temporality that harbors alternatives and possibilities", which is "a condition for politics, especially democratic politics" (*ibid.*, 341-342). Thus, the Anthropocene framework is depoliticizing, while the climate change one opens a window for political action. More precisely, the IPCC reports present future as a finite resource, corresponding to the remaining carbon budget before climate change processes become unstoppable. The precise amount of this resource is a contentious point, as calculations are fraught with uncertainties related to the complexity of climate dynamics. Yet, Nordblad stresses, the calculation of this quantity is an eminently empirical question. Likewise empirical is therefore the "precise mechanics" by which "the very long term is entangled with our political present" (*ibid.*, 347) – hence the actual decisiveness of the now.

However, it is by no means sure that privileging the notion of climate change over that of the Anthropocene one is beneficial for democratic politics, let alone an effective one. In the light of the discussion above, the problem is not the opposition between closed and open future, but the relation that is established between the two, with a characteristic blurring of, or movement back and forth between, present, future and past. For a start, thinking of the present as a future past, as happens with the notion of Anthropocene, is not per se foreclosing action. Many AI experts describe the present as the past of a future where the "singularity" (e.g., Kurzweil 2005) – the moment when a technological superintelligence starts to self-develop at an uncontrollable pace – has already happened, and yet, or precisely in view of this, they work to make it happen. Second, as Nordblad also notices, some scenarios take into account "negative emissions", that is the removal of carbon dioxide from the atmosphere thanks to technologies yet to be developed, which effectively correspond to "a kind of carbon debt to be paid back later" (Geden 2016, 793). This is not one problem among many, but a clue to the contradictory implications of the way these scenarios are constructed. They aim to keep and explore an open future, but the greater their reliance on negative emissions, the lesser their capacity to obtain such result. Said otherwise, scenarios based on negative emissions follow a preemptive rationale, producing what they are meant to avoid, that is, the continuation or intensification of present emissions as premised on the development of such technologies. Technologies, more-

over, that are fraught with implications hardly ever democratically discussed, such as accident hazards of CO_2 capture and storage plants and the impacts on biodiversity of forestry and farming aimed at maximising carbon dioxide absorption, which make them "an unjust and high-stakes gamble" (Anderson and Peters 2016, 183). Actually, a preemptive rationale underlies not only technological expectations but any expectation concerning the driving factors of emissions (population size, land use patterns, lifestyles...), as specific assumptions about the future society – again, hardly ever democratically debated and moreover included in allegedly value-neutral assessments – lead to equally specific policy indications (Beck and Mahony 2017).

Furthermore, the empirical character of the carbon budget does not prevent it from performing a major governmental effect. The problematic estimation of the proximity of a threshold or irreversibility of climate processes determines a particular relation between the near past of rapidly rising emissions, the near future of urgent decisions and the distant past and future of geological time. Namely, a sort of syncopated rhythm of time compression and dilation develops. The unspecified decisiveness of the now entails a compression of time, yet the effects of any decision rest to an equally unspecified extent on the deep geological past and future. This rhythm is consistent with the reiterative temporality discussed above, which indeed shows a similar dynamic – the vigilant wait for the enemy; the sorties for eliciting it; the rapid responses to its manifestations; the return to a vigilant wait. The governmental outcome of this rhythm is the one already discussed, which ultimately consists in a growing uneven distribution of agency between, on one side, corporate, financial, media, technocratic and political elites, and on the other the rest of the population. In the case of climate politics this outcome becomes especially evident in the psychologically disturbing and politically disempowering effects of being incessantly exposed to claims about the decisiveness of adopting sustainable lifestyles in a context where such adoption appears ever more difficult or illusory (Blühdorn 2017). The unenviable situation in which post-apocalyptic activists find themselves, caught between police repression, public irritation and a likely eventual irrelevance, between feeling of futility and paradoxical hope, is perhaps the most evident clue to the governmental outcomes of this temporal rhythm and, more broadly, to the conservative or reactionary performance of a dispositive that the Anthropocene and cognate concepts and narratives hardly counter, but rather strengthen.

5. Conclusion: Towards Another Time

This conclusion is supported by looking at the political implications Chakrabarty and Latour draw from their take on the Anthropocene and Gaia – more belated in the case of Chakrabarty; more explicit in Latour's. Chakrabarty (2021) hints of the possibility of a global governance of climate, centred on a technocratic evolution of the United Nations, whose remit would be technologically challenging but politically modest: maintaining or bringing human societies, despite and beyond existing unbalances in power and access to resources and well-being[9], within the boundaries that ensure the reproduction of fundamental planetary processes. Latour outlines a kind of networked technocracy that interacts with terrestrial dynamics in a more creative way, though the preservation of the social and political status quo is out of ques-

tion[10]. He talks of a "Gaia 2.0", where the "scientific establishment" leads a "deliberate self-regulation, from personal action to global geoengineering schemes" (Lenton and Latour 2018, 1066). Gaia 2.0, he points out, does not correspond to a traditional technocratic model, where the best solution is known in advance. It rather builds on improving the "quality of the sensors – both instruments and people – that detect shortcomings and the speed with which we rectify the course" (Lenton and Latour 2018, 1068). Thus, if Gaia, as Latour (2017) stresses, is not "a God of totality", it turns out to be a God of preparedness. Gaia, more precisely, is the God of a time that is neither apocalyptic, as some scholar claims (Northcott 2015), nor post-apocalyptic, as Extinction Rebellion and Last Generation activists see it, but reiterative; the God of a liminal state between the end and its aftermath, between catastrophe and regeneration.

One may ask, at this point, whether the dispositive can be challenged, and how. The answer to the first question should be a yes, at least if one sticks to a Foucauldian perspective. For Foucault, there is no power without resistance; no watertight dominative structures. As for the second question, Foucault suggests that a challenge for domination occurs when its modalities are turned against themselves, which sooner or later happens as power and resistance are moulded on each other. This means that, to be effective, oppositional forces should not focus on the vindication of linear time, but rather elaborate a different eschatology, a different interpretation of kairological time.

This possibility is, in some sense, at the centre of Walter Benjamin's *Theses on the Philosphy of History*, to the extent that they contain a reflection on the dominative implications of a progressive conception of history based on a linear conception of time, and the claim that only a qualitative reappraisal of the relation that connects present, past and future can challenge the winners' legitimisation, to which everything and everyone is bent – not only the living, but, as he writes in the Sixth Thesis, even the dead. Regarding our question, especially telling is the Eight Thesis, where Benjamin contrasts a state of emergency that has become rule to the "real" state of emergency that the tradition of the oppressed indicates as a task. And the Second Thesis, where he talks of the past as bound up with the idea of redemption, and of a "secret agreement between past generations and the present one" as "endowed with a weak messianic power to which the past has a claim" (Benjamin 1969, 254).

Another way to make a case for the possibility of another time, neither linear nor locked in a self-fulfilling circularity, is to consider how, faced with the climate threat, the turn of social agency to a conservative or reactionary direction builds on portraying the relationship between geological and historical time in terms of irreconcilable contrast and tactical adaptation. In this regard, Theodor W. Adorno's (2006[1932]) reflections on the idea of natural history may be valuable. His claim is that natural history is to be conceived dialectically, comprehending things and events as natural precisely where they appear most historical, and vice versa[11]. Neither necessary clash between the two times, therefore, nor rapid detection and adaptive response to the planet's swerves, but rather an effort to understand how these temporalities, as qualitatively and not just quantitatively interconnected, can be brought to a consistent beat. Consistent does not mean single. Following Adorno's aversion to any reduction of plurality and diversity to unity and identity, this beat is to be conceived as composed of a multiplicity of beats – "the multiple times immanent to every being in the world" (Bensaude-Vincent 2016, 98). Consistent, moreover, does not mean that nature and history can shift "one magically

into the other", but rather that "they are dialectically mediated in each other" (Hullot-Kentor 2006, 250). Thinking in terms of mediation, instead of contrast or tactical adaptation, may lead to a reopening of time on a very different basis from the endless value extraction with which the modern idea of progress has come to coincide. Said otherwise, time can be reopened only by aiming precisely at the opposite of the current increasingly dominative, or tactically yielding, designs on nature, namely towards what Adorno calls reconciliation.

Do we find concrete traces of these theoretical suggestions? There is no space to elaborate on that. Yet, one can at least mention post-apocalyptic activists' paradoxical persistence in enacting civil disobedience, in spite of increasingly harsh repression and public disapproval. And, of course, one can mention prefigurative activism, that is, that which seeks to enact and embody in the here and now the future it aims for (Monticelli 2022). This often involves reconfiguring not just social relations but also the relationship with places and things (Schlosberg and Coles 2016). Can this social effervescence be regarded as an expression of the "weak messianic power" Benjamin speaks of? Prefigurative mobilizations, just like post-apocalyptic ones, are often tagged as backward-looking, aiming at, announcing or practicing the return to premodern ways of living. On the other hand, an environmentalism is gaining momentum that draws inspiration from far-right imagery of naturalism and organicism, whose practices are often not easily distinguishable from those of emancipatory prefiguration (Dannemann 2023; Bryant and Farrell 2024). This indicates that prefigurative and post-apocalyptic mobilizations need a thorough elaboration of their relationship with the (oppressed) past[12]. Nonetheless, they are for the moment the only serious challenge to the governmental dispositive that rules this historical juncture.

Notes

[1] To this purpose one can also consider "past futures" – how the present was imagined in the past, compared with its actual state. Such an exercise is especially intriguing with regard to technologies (e.g., Bijker 1997).

[2] This system was introduced to modulate circulation restrictions at regional level, according to a risk classification based on the trend of Covid-19 cases registered weekly.

[3] Agamben (2005) notes that in St. Paul's influential account messianic time corresponds to a gathering together, a summary recapitulation of all things: a sort of convergence of the past in the now. Such movement, again, is linear: you cannot go from convergence to a renewed divergence.

[4] After much wavering, the Anthropocene Working Group of the International Commission of Stratigraphy decided in March 2024 not to grant the Anthropocene the status of a geological era for the time being. Of course, the decision is revisable in the light of new evidence, and certainly did not put an end to the diatribe.

[5] Discussions date back at least to Buffon's 1778 essay *Epochs of Nature*. For a discussion see Herringman (2015).

[6] For a recent reiteration of the case for their disentanglement see Asafu-Adjaye et al. (2015).

[7] This happens also with nuclear waste management or cryopreservation. Deep past concerns respectively the geological stability of the sites for repositories and biological evolution; deep future concerns the endurance of waste containment structures and of a suspended, liminal state between life and death.

[8] Again this can be seen also in nuclear and cryopreservation narratives, apocalypticism being implied in liminality (life/death; radioactivity containment/decay). I have not the space to elaborate on this.

[9] Chakrabarty has repeatedly insisted that, although responsibilities and impacts of climate change are unevenly distributed, climate politics has to think in terms of the human species.

[10] In all of Latour's writings on the climate crisis capitalism is hardly ever mentioned as the main, or at least a major, cause, let alone as a possible obstacle to effective responses.

[11] This is hardly an empty philosophical idea. Think, for example, of environmental migrations on the one hand; of the claimed equivalence of "natural" and genetically engineered organisms on the other.

[12] The very notion of prefiguration, for how it is mainly accounted for, focuses on the present and its relation with the future. The past, such as the anarchist and socialist traditions, is usually regarded as an inspirational source or a benchmark (Raekstad 2022), rather than something awaiting redemption. As for post-apocalypticism, the past appears a destiny more than something actionable in the present.

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◆

A Revival of Natural History? Temporal Short-circuits between the 16th and the 21st centuries

Paolo Savoia

1. The Art of Observation

In her masterful book on the matsutake mushroom and its multiple stories, Anna Tsing spoke about a "third nature", which is the subject of her past and present research on assemblages of human and non-human nature, tracked down through what she calls an "art of noticing" and

the gathering of "polyphonic" stories (Tsing 2015, 23). These arts of observation and of listening to stories she sometimes calls "natural history", a complex research practice that must resolutely recognize the fact that traditional progress narratives have become meaningless, or, worse, blinding to possibilities of life in, and resistance to, 21st century capitalism. Let us hear her:

> Imagine "first nature" to mean ecological relations (including humans) and "second nature" to refer to capitalist transformations of the environment [...]. My book then offers "third nature," that is, what manages to live despite capitalism. To even notice third nature, we must evade assumptions that the future is that singular direction ahead. Like virtual particles in a quantum field, multiple futures pop in and out of possibility; third nature emerges within such temporal polyphony. Yet progress stories have blinded us. (Tsing 2015, *viii*).

Tsing shares the criticism that many historians and social scientists – such as, and in very different ways, have directed to the idea of the anthropocene (Malm and Hornborg 2014; Bonneuil and Fressoz 2016; Haraway 2016; Barca 2021; Moore 2017). While earth system sciences are necessary to understand current threats to life on planet earth, they argue, the reference this undifferentiated *antrhopos* as the agent of such catastrophic alterations of nature is at best too vague, and at worse depoliticizing and authoritarian. Many have embraced the term Capitalocene as an alternative, underlining that it is not *homo sapiens* that brought about planetary destruction, but Western capitalism since the early modern globalization. In other words, historians say that history matters, and that we must look at the close threads of the historical record if we want to build narratives of the Anthropocene which are both historically specific and accurate, and politically leaning towards the demands of climate justice.

Tsing shares this view, but with a caveat. She writes that:

> [I]magining the human since the rise of capitalism entangles us with ideas of progress and with the spread of techniques of alienation that turn both humans and other beings into resources. Such techniques have segregated humans and policed identities, obscuring collaborative survival [...] The modern human conceit won't let a description be anything more than a decorative footnote. This "anthropo-" blocks attention to patchy landscapes, multiple temporalities, and shifting assemblages of humans and nonhumans: the very stuff of collaborative survival. (Tsing 2015, 19)

In other words, according to her, the arts of observation, of description and of curiosity are threatened by historical narratives based on the rise of capitalism that are still too monolithic, not enough attuned to the stories that humanists might gather, stories that would reveal the possibility of imagining and practicing other forms of life – human and non-human, together. To this effect, she proposes a method which combines history, ethnography and "natural history". Looking for alliances with biologists describing multi-species cooperation and symbiosis, Tsing calls for "[n]atural history description, rather than mathematical modeling" as "the necessary first step" of a new humanistic enterprise (Tsing 2015, 144).

In a 2018 paper on life among industrial ruins, Tsing, Gan and Sullivan took this evocation of natural history one step further. They wrote that "anthropologists join a related movement

in ecology to restore the professional status of natural history, which has fallen out of regard in the last century", and they describe their method, based on three steps: gathering human and more-than-human stories from local sources; observation of plants and fungi on the ground; consulting with biologists "to verify field-derived species identities" (Tsing et al. 2018, 39).

2. Natural History

According to standard narratives of the history of western science, natural history – a quintessential early modern scientific enterprise – has fallen out of grace since the 19th century, giving way to specialization and the emergence of scientific disciplines as we know them: biology, geology, chemistry, ecology, and so on (Foucault 1966). In fact, this is mostly true, despite the fact that the term "natural history" has followed a different path in Europe and in the US, where it survived to this day indicating, on the one hand, a sort of amateur art of para-scientific observation, perhaps best represented by birdwatching as a hobby; and, on the other hand, the observational fieldwork necessary for botanical classification (Anderson 2013). To be fair, natural history is also present in 20th century literature. For example Italian writers Mario Rigoni Stern and Primo Levi both used the label natural history to title or subtitle some of their works: Levi for his science fiction short stories of the 1960s, and Rigoni Stern for his late 1990s collection of short stories on plants, mountains, and trees. Albeit in very different ways, both Levi and Rigoni Stern choose to refer to such a tradition for their works that claim to blur the distinctions between humans and non-humans (Levi 1966; Rigoni Stern 2008).

As a historian of science, I am very interested in this "revival", if I might call it such, with explicit political overtones, of natural history. Current historiography of early modern natural history is fresh and exciting, mostly focusing on its global and colonial dimensions, and on the exchange, translation (and exploitation) between European natural philosophy and native knowledge across the Atlantic (Curry and Secord 2018). Early modern natural history was itself a revival of ancient natural history, but very different from it at the same time. Pliny the Elder's 1st century *Naturalis historia*, while putting together the histories of humans, plants, and animals, was permeated by a Stoic vision of nature as beneficial to humans, whose meaning was that of serving human's ingenuity, of course guaranteed by the political order of the Roman empire. The nature of ancient natural history was in a way anthropocentric and finalistic, but on the other hand it was also porous and entirely crossed by historical human action. From the late 16th century on, this revival was made possible by the "Columbian exchange", by the new needs of managing objects and information that were not present in the classical Greek, Latin and Arabic sources, and by the new collective empiricism that characterized early modern natural philosophy, well symbolized by the foundations of botanical garden across European universities (Crosby 1972).

But early modern natural history was also based on a cultivation of, sometimes obsessive, curiosity and thirst for information and possession of natural specimens, that had to be collected in museums. The field trip, both local and trans-atlantic, became a staple of the new identity of the early modern naturalist, together with the gathering of stories from European peasants and American natives. Moreover, in works like Ulisse Aldrovandi's, facts carefully

gathered through correspondence and observation were placed side by side with folk-tales and mythology (Findlen 1994). For example, when natural historians described apple trees, they carefully gave an empirical description of the plant together with notes on the analogy on human and tree anatomy, and all the pagan and Christian mythological tales about apples. When Conrad Gessner, perhaps the most important naturalist of the 16th century, described animals he included in the description their names in different languages, cooking methods and medicinal uses by humans, poetic considerations, and so on (Olmi 1992). Early modern natural history has rightly been described as "the art of description", but, in current parlance, surely it was a more-than-human nature being described (Ogilvie 2006).

On the other hand, early modern natural history cannot be separated from the rise of colonial violence and knowledge appropriation, global commerce, and capitalism. In fact, besides the contact with a radically new human and non-human nature, historians have argued that the habit of closely, empirically describing natural things has been modeled upon to commercial practices of describing items to be sold in the global markets. Indeed, colonial and proto-capitalist ways of living shaped cultural attitudes and how material resources were used creatively in a variety of realms (from entertainment to science). The fact that the "scientific revolution" took place in the first age of global commerce should be taken seriously. The emergence of a certain kind of economy has consequences for science. The Renaissance culture of exchange had enormous consequences not only for businesspeople but also for people engaged in understanding nature. In many ways the economic transformations of this age of global commerce placed a high value on descriptive information about objects; in turn, such values shaped priorities for knowing about nature. "Matters of fact" in the realms of medicine and natural history were gathered and exchanged within the sphere of a wide commercial economy. Harold Cooks argued that the objectivity of the new philosophy, derived from commercial exchange and natural history, also provided the intellectual foundations for philosophical materialism, which deeply threatened the political and philosophical establishment (Cook 2007, 1-41).

However, natural history cannot entirely be reduced to the colonial enterprise and to the rise capitalism, even if it obviously was made possible by these broad historical phenomena. There is an ethical and political dilemma in discussing natural history today, well summarized in a recent article by Taylor M. Moore: "Can emancipatory, decolonial histories be coaxed from objects made visible to history through the violence of the colonial archive?" – his answer is not clear-cut, but he proposes the label "(un)natural history" to take into the account this duality (Moore 2023, 473).

3. Early Modern "Third Nature"

Let me just make one example taken for the 16th century of natural history as a mode of reasoning that goes past the dichotomy between nature and culture. One of the most significant examples of the 16th century literature on the lands, gardens, and country lifestyle under the umbrella of natural history is *La villa*, published in 1559 by the Milanese humanist lawyer Bartolomeo Taegio. The author, a devotee of agriculture and the science of stars, sets the context as a series of dialogues taking place at a dinner party in the country villa of the

Milanese gentleman Camillo Porro, where the "gardener" told many "secrets" to the guests. Among the many things discussed in the book with scientific rigor, Taegio recalled the habit of playfully shaping fruits, mainly citrons and pumpkins.

> I am telling you that if you wish to see in pumpkins, in cedars (if you have them) new and strange faces, you should have someone make a crystal jar of the shape you like, and then place them [the fruits] inside these jars when they are still very young, and you will see that the pumpkin will grow up similar to the jar, and the thing should work. (Taegio 1559, 157)

The discussion went on and focused on grafting, in a tone that alternated between technical language and the language of wonder:

> [O]n this pear tree and on this red blackberry bush you can graft oranges, whose sourness you can sweeten by making a hole in the middle of the trunk, thus channeling out the bad humor, to the point that the fruits are well formed, and then you must dress their wound with lotus; from all this you will see a wondrous effect. (Taegio 1559, 157-58)

Taegio was fully aware of the fact that nature changed under the repeated, patient, gradual work of men, because in the most beautiful gardens "one clearly sees that nature gives way to industry, and that it changes its way after a patient work" (Taegio 1559, 55). While describing the marvelous garden at the country villa of a Senator of Milan, Taegio included a passage on the creation of a "third nature" through grafting.

> Here are without end the ingenious grafts that show with great wonder to the world the industry of a wise gardener, who by incorporating art with nature brings forth from both a third nature, which causes the fruits to be more flavorful here than elsewhere. (Taegio 1559, 58)

Taegio was not the only one who brought up the theme of a third nature in the sixteenth century, which bears a striking resemblance to Tsing's 21st century third nature. Indeed, there was a widespread conception of grafting and horticulture as an incorporation of art and nature that was productive, which brought about something new in the world by challenging the traditional natural/artificial distinction (Beck 2002). These writers drew upon Ovidian themes that were ubiquitous in their culture, shaping iconographic programs of "grotesque" hybridizations of the human and the natural.

4. Scalability

Tsing calls her art of recounting natural stories intertwined with cultural stories a method, even a science – a science of contaminated diversity, an analysis of indeterminate encounters. The main issue at the heart of the matter is one of scale: multi-species and more-than-human stories unfold on vastly different spatial and temporal scales, far apart from each other, with broken and interrupted geographies and timeframes. The problem in making space for this

natural-historical way of reasoning is that modern sciences are precisely based on the possibility of infinite expansion of the same research framework – research questions must be applicable on increasingly larger scales while remaining unchanged – and they don't allow for interruptions; in fact, they consider the art of observation and natural history "archaic" precisely because they cannot "scale up" (Tsing 2015, 37-38).

This *scalability* is a trademark not just of modern sciences; in fact, it is typical of the idea of progress itself: expanding projects without changing assumptions, changing scale without altering one's structure. The scalability Tsing talks about requires that the elements of the project – may it be an economic theory or a scientific research program – remain impermeable to encounter and the indeterminacy it brings: only in this way is expansion possible. The effects of scalability have been so powerful that its projects have taken center stage, and whatever resists scalability has become invisible, useless, or an obstacle that needed to be overcome.

The European early modern colonial plantation is the perfect example of scalability, as it consists in a pattern involving: a) isolating the plant (monoculture); and b) exploiting slave labor (naming the labor of slaves isolated and without relationships in the "New World"), abstract workforce considered as autonomous and interchangeable units. Tsing also argued that the model of the 17th century colonial plantation shaped some of the ideas and practices that became central features of narratives of progress, modernity, science and technology that at the core of the idea that human civilization meant emancipating their needs from nature by dominating nature. The early modern period, the period of the triumph of natural history, is still at the center of multiple histories, including those written by earth system scientists Lewis and Maislin, who famously proposed to date the Anthropocene back to the early 17th century (Lewis and Maislin 2018). Tsing writes of the plantation:

> Interchangeability in relation to the project frame [plantation], for both human work and plant commodities, emerged in these historical experiments. It was a success: Great profits were made in Europe, and most Europeans were too far away to see the effects. The project was, for the first time, scalable – or, more accurately, seemingly scalable. Sugarcane plantations expanded and spread across the warm regions of the world. Their contingent components – cloned planting stock, coerced labor, conquered and thus open land – showed how alienation, interchangeability, and expansion could lead to unprecedented profits. This formula shaped the dreams we have come to call progress and modernity. (Tsing 2015, 39-40)

5. Nature and History

In any case, by the early 17th century the word *historia* could mean several things. *Historia* was employed in several disciplines, such as jurisprudence, medicine, and literature, always with reference to individual, singles cases, or stories – or case *histories*. For the physicians, *historiae* were specific descriptions of single organs to highlight their structure and function; for someone like Francis Bacon, they were collections of empirical information on single phenomena; for Ulisse Aldrovandi they were collections of information to be looked for within the whole literature on plants and animals. But what is important here to keep in mind is that

these "stories" were about what we would call nature and culture at the same time, namely they referred to a continuum between nature and culture, they were placed before – or better away from – the separation between nature and culture (Pomata and Siraisi 2005). This legacy is still very clear in the XIX century, when both Charles Darwin and Karl Marx use "natural history" to describe, respectively, the historicity of nature – and nature as technology as well as technology as nature – and to emphasize the features both historical and natural of political economy.In the preface to the first edition of *Capital* Marx wrote: "My standpoint from which the development of the economic formation of society is viewed as a process of natural history" (Marx 1976, 92). And Darwin before him:

> [W]hen we regard every production of nature as one which has had a long history; when we contemplate every complex structure and instinct as the summing up of many contrievances, each useful to the possessor, in the same way as any great mechanical invention is the summing up of the labour, the experience, the reason, and even the blunders of numerous workmen; when we thus view each organic being, how far more interesting – and I speak from experience, – does the study of natural history become! (Darwin 1872, 426).

Moreover, the historical links between 17th and 18th century natural history as a prehistory of anthropology have been explored, but mostly as focusing on humans as a separate field of inquiry with respect to nature (Campbell 1999). The first man to occupy a chair of anthropology in Italy (1869), Paolo Mantegazza, defined his discipline "the natural history of man" (Puccini 2011, 547).

6. Conclusion

The revival of natural history in environmental humanities reflects similar patterns. As I recalled earlier on in this essay, there are two meaning of the label natural history that can be historically specified, and that both enrich the ways in which natural history is being used in the environmental humanities: on the one hand, the combined history of a historical nature and of a history dependent on the materiality of nature; on the other hand, the Anglo-Saxon contemporary meaning of field work or field observation.

Natural history is being used again to underline the interdependence between history and nature, humans and non-humans, or more-than-human history – of course, without the colonial overtones of 19th century anthropology. I would say the natural history is a mode of reasoning that has a long history of cutting through the nature vs history divide, at least since the 16th century. There are in the history of western approaches to nature ways of thinking about nature and history as completely intertwined. Perhaps, the new environmental humanities and social sciences sometime lose sight of such traditions and tend to think that they have a duty to put into question a distinction – that between nature and history, or nature and culture – that is in fact not so old and not so entrenched within a supposedly monolithic Western way of reasoning. I argue that a more fruitful approach consists in looking for temporal short-circuits between the 21st century and early modernity, as they are enabled by inquiring on the tradition of natural history as an epistemic genre.

Capitalocene is a better word than Anthropocene, and I am convinced that we need narratives about the rise of "world-economies" and "world-ecologies" that span large portions of the world. Yet, we also need stories, both for the sake of painting better historical pictures, and for the sake of listening to the little things emerging out of capitalist devastation. And such stories are to be gathered by forming local and specific alliances between the sciences, humanists, lay knowledge, and more-than-human nature. Capitalism – or Capitalocene – is the frame for new natural histories, but it does not determine such histories in advance. Perhaps it is an old problem, older than modernity itself: how to link the individual to the general? In current terms: how to link case histories with Capitalocene?

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