

Rethinking Whitehead's influence and rethinking scientific practices

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1. Introduction: Rethinking scientific practices through philosophy

When the Berlin Wall crumbled down and symbolically dragged along with it the fall of socialist ideology, some declared that our civilization had reached the “end of history”, as a result of liberal democracy and positivist techno-oriented science (Fukuyama 1992, 1). Our current times disclose the unsustainability of this idea. The *zeitgeist* of the twenty-first century is impregnated with urgency, because of economic and social inequalities, the current refugee crisis and climate change, along with the many other symptoms deluging the newspapers of our “sick” planet (Parenti et al. 2016, 1).

Bruno Latour (1993, 7–8), an influential thinker of our time that addresses this new state of society, asserts that already in 1989, several conferences warned about the climatic state of our planet, pointing out our vain ambitions to dominate nature. For Latour (2013, 77) to be modern is to belong to a society that controls nature thanks to scientific rationality. The self-image of the modern relies on a clear-cut distinction between society and nature. This vision of modernity is outdated, Latour says, and the concept of the Anthropocene is the most effective alternative to it (de Vries 2016, 115). Made famous by Paul Crutzen (2000, 17), the term Anthropocene does not only designate a new geological era with humans standing as the strongest force against the Earth system, it also annihilates the break between culture and nature (Bonneuil and Fressoz 2016, 42; Chakrabarty 2009, 205). ‘Anthropocene’, I argue, should not be understood as a notion that puts the human subject at the utmost center calling a whole era to himself. It places the human as the central cause of environmental destruction. Humble and guilty, as we enter the Anthropocene we acknowledge the myriads of links that connect our health to the Earth and its beings. The human-nature distinction slowly loses meaning. Such reconnection poses significant challenges to the traditional practice of science, which is essentially reductionist, isolationist and has always presupposed a distance from the scientific objects it studied (Andersen and Hepburn 2019, 1). Traditional science is still human-centered, and begins from a nature/culture divide.

Several contemporary philosophers have been concerned with the meaning of this new human-dominated era and its conceptual consequences within the dominant practice of science. Amongst them are Bruno Latour (2011), Isabelle Stengers (2002, 2011) and Donna Haraway (2008). Environmental concern, however, is not the only characteristic they have in common. They all appear to be echoing an ontological shift that was advanced by Alfred North Whitehead (1861–1947) some ninety years ago. With a remarkable predictive capacity, the English mathematician-philosopher had already challenged the scientific, traditional manner in which nature was understood with his *Process & Reality* (1978) and *Adventures of Ideas* (1967). For Whitehead, nature was not an entity distinct from us, and reality consisted of infinite processual relations.

The figure of Whitehead has been out of fashion in the English-speaking world for a few decades (Latour 2011, 2; Gare 2017, 120). According to both Latour (2011, 3) and Garre (2014, 309), this was the result of a turn from a more speculative philosophical practice in favour of the analytical one, which in turn subsumed philosophy to the will of the reductionist and modern scientific practice (Latour 2011, 3; Gare 2014, 309). Gilles Deleuze (1969, 18–24) began revitalizing Whitehead among the life of

Western philosophers. Stengers (2011) continues Deleuze's attempt, dedicating 576 pages to Whitehead's thought. Nonetheless, nowadays Whitehead is still rarely associated with philosophical environmental discourses concerning men's relationality to nature.

Initially born out of a fascination with the threads of influence that link together Haraway, Latour and Stengers in a conversation with Whitehead, this article intends to invoke a new understanding of science—one that was initiated by Whitehead's thoughts and revitalized through the writings of three contemporary philosophers. That is, the 'new science' is not the fruit of my own thinking. Rather, my contribution is descriptive and synthetic—concretized in the effort of piecing together the disparate reflections the three entertain on the practice of science, plus that of describing how such reflections are a continuation of Whitehead's thoughts. Ideally, this will also pay a small contribution to the endeavor of bringing Whitehead's figure back within current philosophical discourses on the human-nature relationship, such as those brought forward by David Orr (2002), Timothy Morton (2010), Ezio Mazzini (2015), Daniel Wahl (2012), Jason Moore (2016).

In the following sections, I will briefly expose the critique Whitehead moved against the science he referred to as 'modern', to then investigate the form that Whitehead's thoughts take within the work of Stengers, Latour and Haraway. Influenced by Whitehead, these thinkers suggest possible ways to go beyond the traditional concept of science. Afterwards, I will summarize and piece together all the exposed philosophical suggestions, in a creative attempt to propose a new understanding of science. How would scientific practices look if informed by the thoughts of Whitehead, Stengers, Latour, and Haraway? Overall, five main notions capture the essence of the renewed scientific practice these philosophers inspired. This article argues for a science that (1) is against truth, (2) is in opposition to methodological individualism, (3) strives towards peace, (4) overcomes dichotomies, and (5) is done for the world.

2. Whitehead against modern science

This section begins by spelling out Whitehead's ontology and its inherent critique of mainstream modernist science. His attempt to overcome scientific practices will then be explained in terms of two crucial notions: peace and creativity.

2.1 Whitehead's ontology

A solid conceptual departing point to understand Whitehead's critique of modern science goes by the name of the "bifurcation of nature" (1964, 26). Locke's distinction between reality's primary and secondary qualities initiated this bifurcation (Debaise 2017, 2), with primary ones being objective (for example, mass), and secondary ones being subjective (for example, colour). Whitehead employs the term bifurcation to describe the implication that Lockean separation has on the concept of nature (Whitehead 1948, 18). Namely, as on the one side objective nature, and on the other subjective society (Debaise 2017, 15). As a consequence, the distinction originally concerning two complementary aspects of reality, progressively results in the disposal of the latter from the natural domain. Modern science emerged out of this distinction, with its scientists no longer interested in subjective interpretations, but captivated exclusively by nature's objective qualities (Whitehead 1948, 61; Debaise 2017, 18).

Whitehead denies the separation of reality (in other words, brute facts, objective and intrinsic qualities) from appearance (in other words, subjective interpretations), and that between natural and

human entities. In an article titled “Nature Alive,” he observed, “this [traditional] sharp division between mentality and nature has no ground in our fundamental observation” (1938, 156). The ultimate particle of reality is “occasion of experience”, which is characterized by both a physical (objective) pole and a mental (subjective) pole (141). Consequentially, subjectivity is no longer restricted to the human entity. Whitehead rejects the basic assumption on which modern science relies (Debaise, 2017, 10–14).

Whitehead (1967) also demonstrates a certain opposition to the notion of scientific truth, along with the dichotomous methods established to achieve such truth. His words speak clearly: “the Certainties of Science—circumnavigated by myriads of unexplored limitations— are bound to be a delusion” (153). Any “rigid alternative” which travels on top of a true or false binary is “largely irrelevant for the pursuit of knowledge” (1978, 11). Rather, all claims to understanding are provisional and controlled by the “metaphysical concepts of the epoch to which they belong” (1967, 154). Moreover, Whitehead is doubtful with regards to another aspect of traditional scientific methodology: isolationism. This is the practice by which the traditional scientist isolates an object to understand it (for example, a cell from its organ). But for Whitehead, individual entities, being always and necessarily a modification of their environment, cannot be understood in disjunction from it (154). He proposes a cell-theory of actuality, stating that “each ultimate unit of fact is a cell-complex, not analyzable into components with equivalent completeness of actuality” (1978, 256). Facts cannot be analyzed and reduced to a sum of identifiable units. If you wish to reach “completeness of actuality” (256), you must strive to embrace, as much as it is in your power, the totality of the interactions that affect your object of study.

Completeness has to do with the notion of coherence which Whitehead introduces on the very first page of *Process and Reality* (1978, 67), and describes a situation in which “all actual entities are in the solidarity of one world”. In this sense, coherence is ecological (Shaviro 2009, 108). It is given by the way that a living organism necessarily requires a milieu to survive. Reality cannot be atomized into separate entities and then studied. Infinite connections make up reality, and static objects, or static facts are always less interesting than the processes they undergo (Whitehead 1978, 244–246). This is so because for Whitehead nothing really exists as a static object or a fact. The ontological structure of reality is processual, everything is ‘propension’. The problem of course remains: can a scientist ever really take in consideration all of reality? No methodology until now would seem to encourage her to really do so. Whitehead proposes peace.

2.2 Rethinking science: On the notion of peace and creativity

On the one hand there is mainstream science, that, while reaching for truth, leads to war. Truth is war, as John MacArthur would say (2007, 1), because people claiming it will necessarily be engaged in an exercise of exclusion against any contrasting opinion. On the other hand, Whitehead hints at creative science, one that denies truth, striving for inclusion and opportunity for peace.

Indeed, Whitehead rejects modernist science through the construction of peace-fabricating propositions, which are a constructive antidote to our fascination with the power of truth because the conceptual matrix on which they rely, claims no authority on its own (Stengers 2002, 246; 2011, 517). Peace is “the barrier against narrowness” and “broadening of feeling” (Whitehead 1967, 285–286). In other words, peace is the intention of inclusion. Taken together, his philosophy employs speculations (constructions) that are explicitly meant to take into account and to save all that exists together, avoiding

exclusion and thus fabricating the possibility of peace (246). I take Whitehead's philosophy as an attempt to propose a methodology following from his intention of saving the totality of reality.

Whitehead's contribution to the achievement of peace does not pass through concrete institutions or organizations (Welker 1987, 324). It is not oriented towards defense nor mere pacification—understood as the fixation of an achieved condition—but calls for dynamic, creative development (325). “It works through insinuation and transformative effects as an infectious lure for new creative contrasts” (Stengers 2002, 240). Whitehead's peaceful scheme manifests itself through its practical effects. Its ‘saving operation’ gives rise to a more interesting world and a more demanding thinking, inspiring surprising syntactic transformations, and finally suggesting possibilities for escaping dramatic either/or dilemmas. “It verifies itself first and foremost through confidence in reality, as if saying, ‘do not be afraid; never will reality give to anyone the power to completely deny and reduce’ ” (245).

Whitehead proposes that it is through creative advance that we can gradually approach peace. Peace is only ‘approached’, meaning it can only be reached asymptotically. To give rise to peace-fabricating propositions, creativity is required. Creativity is the introduction of novelty—the force behind novelty, which in turn is the essence of life (Whitehead 1967, 121). Novelty occurs from the discordance between the physical and mental poles (objective & subjective) (Bell 2011, 77). “When there is no reason to believe that in any important way the mental activities depart from the functionings which are strictly inherent in the objective datum of the [objective] phase, [then] no novelty is introduced” (Whitehead 1967, 211). The discrepancy between the being that perceives (the subject) and the world (the object) is what brings about change. As the subjective mental pole conforms to the objective physical poles, progress withers away (Shaviro 2011, 77). Conformity brings with itself a halt of thinking. The moment you finally believe to have found something (for example, an objective quality through a subjective mind), you stop looking for it. But for Whitehead the process of looking for something, in other words the creative force, is much more interesting than having found it (1967, 258). Moreover, processes have a metaphysical priority over any fixated term.

The ability of the mental pole to keep exploring possibilities that have not yet been defined as facts—or remaining within “the nomadic realm”—is captured in the concept of ‘Adventure of Ideas’ (1967, 258). Adventure is the ability of the mental pole to enter into the nomadic realm, one made of entities that have not yet been defined as facts (Bell 2011, 77), and it is essential to sustain civilization.

To replace a scientific progress populated by true facts regarding objects studied in isolation, Whitehead calls for a scientific creative progress that, in the constant attempt to consider “all that exist together” (Stengers, 2002, 243), strives toward peace on many levels (ontological, epistemological, ethical). A peace-proposing philosophy gives rise to one whole-encompassing ontological zone, extending inclusion rights to all entities.

3. Traces of Whitehead: Stengers, Latour, and Haraway

The section investigates the way in which contemporary philosophers Stengers, Latour, and Haraway have formed some of their ideas on Whitehead, and, at the same time, it describes the way in which these thinkers try to go beyond a traditional concept of science. Evidently, the two things seem to be related. Whitehead's philosophy infuses this intellectual trio, pushing them to reconsider the ontological stances of contemporary scientific research and hinting at new ones.

3.1 Isabelle Stengers: From Whiteheadian peace to cosmopolitical peace fighters

Stengers, a prominent philosopher of science within the European landscape, reveals that Whiteheadian philosophy has helped her in overcoming the fear of scientists—those who claim to “have reality on their side” (2002, 245). I have shown how Whitehead began to open up the scientific “knowledge-game” (250), detaching himself from any sort of scientific authority model and proposing the notion of peace as the methodology to include as much as it is possible all that exists within knowledge practices. Stengers realizes the relevance that Whitehead’s work still has in our time, and decides to bring Whitehead’s endeavor further, utilizing his peace propositions (255) as philosophical tools to actually design “a kind of experimental togetherness” (248), which wants to get rid of the logic of disqualification by requiring that competing practices and interests be taken seriously rather than merely tolerated. She calls this condition ‘cosmopolitics’.

The prefix ‘cosmo’ is important. It moves beyond the idea that the prefix ‘common’ is restricted to our fellow humans—as politics since the time of Plato has implied—and invites us to grapple with the often-problematic togetherness of the heterogeneous forms composing our reality (250). Such ‘cosmopolitical space’ is inhabited by ‘peace-fighters’, who are lined up against the war of scientific truths and facts and their disqualifying power. It stands as an alternative to both absolutism and tolerance; it reintegrates the natural and the social, the modern and the archaic, the scientific and the creative.

In the attempt of divulging and modernizing his philosophy, Stengers gives us an example of a Whiteheadian peace-proposition (253). It is an example that applies Whitehead’s thinking to a contemporary issue, striving to “Think With Whitehead” (2011) about our times. Out of her own academic experience with the world of chemistry and her work with chemist Nobel laureate Ilya Prigogine, Stengers (2011, 254) feels entitled to claim that modern, rational, Western pharmacology relies on a non-peaceful proposition. It considers itself as proof that the only way to understand the living body is through experiments, by revelation of the various molecular interactions. It follows that everything that may rationally intervene within such intercommunication must be a molecule (256). Thus, devising new molecules is the only rational, objective way to cure people. A molecule is then tested against a placebo effect, and either it succeeds and becomes a known scientific curing molecule or it cradles back to anonymity (256–257).

This scenario is non-peaceful because it does not strive to include—to save all that exists—omitting a crucial aspect. Stengers explains that the clinical test is mostly presented as if it were to verify that the cure is given by the encounter between molecule X and a sick body (2002, 254). However, those curing molecules are found against placebo and do not objectively testify to an actual encounter. They only statistically suggest that, in some way, the winning molecule has contributed more than a placebo in inducing healing (255). The efficacy of Stengers’ argument skyrockets if we acknowledge that eighty percent of the drugs currently used and sold (resulting from such current pharmacology approach) seem not to work (Shih, Zhang, and Aronov 2018, 24). Winning molecules, drugs that ‘work’ according to specifically designed laboratory tests, are sold to users’ bodies onto which they end up having no effect.

In this regard, a Whiteheadian peace-fabricating description of the whole situation would, yes, rejoice about a drug passing a relatively severe test to be called successful. However, it would also emphasize the importance of realizing that a test is trying to bridge the sterile experimental environment with the complex environment of a suffering body—and its relation with a physician (Stengers 2002, 254). Indeed, as placebo itself proves, a healing process cannot be abstracted from that environment. The placebo

effect shows us that we can feel better only from thinking we have ingested something that should supposedly make us feel so. The cure may very well result from non-molecular means—which cannot be tested according to the terms required by experimentation. The experimentation equipment excludes innumerate possibilities from the picture. Finally, Stengers (2002, 255–256) writes, a Whiteheadian and cosmopolitical fact must emphasize that what we call ‘disease’ and ‘cure’ are also social processes and do not generally satisfy the true experimental demands, which authorize the reduction of the sick body to some molecular assembly.

Importantly, a cosmopolitics insists on the fact that concepts shall be created for the world, one that extends much further than academic walls (241, 255). Aware of the impossibility of expecting ‘togetherness’ in places devastated by other priorities, Stengers’ proposition demands that at least among the educated—where scientists practice science—we do not forget to take into account precisely those places and people that are generally excluded from the equation. Referring back to Gilles Deleuze’s very own conception of thinking, Stengers writes that we are only actually thinking when we think with the excluded, with the “analphabets, or dying rats, or alcoholics” (255). If peace is, as Whitehead said, the ability to consider all that exists together, then Deleuze’s formulation of thinking is crucial to achieving such peace. Whitehead, Deleuze and Stengers together force upon us a question: who do we create concepts for? Or better yet, who do we do science for? Such matters have clear implications within the new understanding of science this essay wants to provide.

Logically, Stengers’ cosmopolitical enterprise cannot converge into a conclusion (255). It is as open-ended as the ‘adventure of thinking’ that Whitehead calls for. What needs to be created is the possibility of producing facts that are scientific, but also include what they generally deny (251). That is, facts should be propositions that respect the value scientists require we recognize in what they call ‘objectivity’, but that also demands from scientists that they enjoy scientific achievements “as selective, inventive, social events, and not as a monotonous assaulting wave of objective rationality against human opinion” (252). These will finally be cosmological grasps, and could produce the possibility of a “demanding peace”(252).

3.2 Bruno Latour: For a Science Down to Earth

Bruno Latour is chiefly known for his bold book-title statement *We have never been modern* (1993). According to the French philosopher (1993, 11), the self-image of the modern man relies precisely on the distinction between the sphere of values involving society and culture, and the sphere of brute facts concerning nature. This reminds us quite explicitly of Whitehead’s bifurcation, although the bibliography of his book does not include him. In truth, many of his concepts can be related back to Whitehead’s philosophy and his work certainly is influenced by his figure.

Most importantly, Latour starts from Whitehead’s same call to action: we shall overcome the bifurcation between nature and society, because the distinction between society and nature that characterizes the “Modern” self-image only exists artificially (1993, 11). The modern believes herself separate from nature, while in her everyday practice she is constantly creating hybrids between the two. Consider a scientist: rather than merely observing and understanding nature while remaining outside of it, she constructs technical instruments to isolate and gain access to it, bringing it from the outer world into a lab. While doing so, she is continuously creating objects that are hybrids of humans and non-humans. This Latour calls the work of translation. Take a petri dish: partly natural (for example, cell tissue), but also non-natural (for example, plastic container, growth medium, and so on). Cell tissue from a living organism

is translated into the laboratory, creating a network that brings together scientists, patients and their tissues, plastic companies, ethicists and so on.

To hide the hybrid nature of reality and to remain consistent with his self-image, the modern man engages in the work of purification, the constant attempt to bifurcate reality into two distinct ontological zones: one pertaining to humans, and one to non-humans (Latour 1993, 10–12). As soon as we become aware of the work of translation and we realize the difficulty of discerning what is social and what is natural within the chain of hybrids that surround us, our self-image no longer holds (11). The image of modernity has been constructed on an entirely artificial separation. Latour expands Whitehead's bifurcation, describing it in practice, for example, the laboratory scientist—and attributing to it a specific reason: we bifurcate to remain consistent with our self-image.

Expanding Whitehead's attempt of discrediting the subjective-human/objective-nonhuman dichotomy, Latour claims that nature is not made of beings that thrive independently of human intention (Latour 1993, 11). This is why we need to reconsider the epistemological stance derived from the modern constitution according to which research allows us to “discover the essence of nature” (Mathews 2011, 1–2). A new ontological perspective in which non-humans' existence changes through scientific proceedings, and vice-versa, shall replace the previous one (de Vries 2016, 132–133). Humans and nonhumans maintain relationships in which they collaborate to reveal themselves to each other (Latour 1988, 130–134). He advocates for a relationist ontology, emphasizing the importance that processes of translations have in the making of reality (135). Such relationist processual ontology necessarily recalls the ontology initially proposed by Whitehead, according to which every being is in propension, never static, both objective and subjective.

From his understanding of modernity, Latour moves to his critique of what he calls the “Science-done from Sirius” (2018, 118). The author's disapproval of doing science from outer space runs as a thread line throughout his last book *Down to Earth* (2018), which the title tellingly contrasts with such ‘outerness’. The metaphor of a science that studies nature from the universe hints at a wrong attitude of the modern scientist, who attempts “to tear himself away from the primordial soil and set out for the Great Outside” (2018, 124). Scientists developed a new motto: ‘*to know is to know from outside*'.

This is when the notion of critical zone (CZ) becomes a useful tool. CZ is a field of research which has recently caught Latour's attention. Defined as the Earth's permeable near-surface layer, the CZ expands from the top of vegetation down to whatever depth groundwater is circulating (Brantley et al., 2017, 842). It can be interpreted as a spatial window from which to make key observations about the complex interactions that regulate the natural habitat and determine the availability of life-sustaining resources (Arènes, Latour, and Gaillardet, 2018, 123). The word critical refers to the fact that it is crucial to all types of life, considering the majority of Earth's ecosystems lives within it (Latour, 2014, 4).

At the moment, understanding this zone requires researchers drawn from many traditional disciplines (for example, geology, hydrology, soil science, etc.) to work in collaboration (Arènes et al., 2018, 125). Having a large number of disciplines involved in monitoring specific chunks of land, allows us to dismiss believing that we are engaging with a ‘unified system’ (Latour, 2014, 3). A geologist alone can understand less than he could do with an interdisciplinary team. The point is not summing together the various fields of enquiries; rather, the discussion emerging out of the creative contrast among them should elevate the exploration beyond it.

CZ science is the field in which the typically modern disinterested distant gaze on nature is finally abandoned. Instead of an agent, 'The Human', acting 'On Nature', we recover from these studies multiple tracers of various agencies mixed together in wildly different combinations, making it imperative for many different disciplines to collaborate (4–6). The critical zone becomes an exemplification of what it means to see the earth from the inside, all the while coming "down to Earth". Descending from the pedestal of Sirius, scientists are finally able to recognize that there are many other forms of movements and relations that had become harder and harder to take into account under the previous paradigm (Latour 2018, 119).

3.3 Donna Haraway: beyond humans & individuality

Donna Haraway, a biologist, a philosopher, a media and literature scholar dedicated her last book *Staying with the trouble* (2013) to the concerns brought about by environmental change. If Latour maintains that we have never been moderns, Haraway states that we have never been humans either (1). This statement converges within the recent scientific findings that revealed that the human body is made of more bacterial cells than human ones, re-defining our beings as living symbiotically with a myriad of different species that contribute to our health and functioning (Gilbert, Sapp, and Tauber 2012, 325). We are not humans; we are holobionts—assemblages of several species, and each of us forms a distinct ecological unit (Haraway 2013, 60). Separating humans and nature to different ontological zones makes even less sense now.

Reality is composed of dynamic, complex, responsive and interspecies systems (58). If we genuinely wish to understand such systems, we need to learn to forget individuality, and start using "poly-temporal, poly-spatial knottings" (60) that make up a reality of "worldings" (12). Haraway writes that the figure of Whitehead along with his ontological turn "infuses her worldings" (12), which are intertwined systems in which natures, cultures, subjects and objects co-exist. We understand why: a philosophy of co-existence owes its development to Whitehead's 'cell theory of actuality', by which he strives to reach 'completeness of actuality'. Through the concept of worlding, Haraway re-situates humans within nature and saws back the bifurcation, emphasizing relationality and the necessity to be genuinely present. As we understand this notion, we recognize ourselves as creatures embedded in myriads of configurations of places, matters and meanings in which we need to act (Parenti et al. 2016, 4; Haraway 2013, 3–4).

Expanding onto Whitehead's predicament (1967, 154) stating that knowledge always arises from a particular context, a particular environment and a particular body (for example, a scientist or an institution), Haraway speaks of situated knowledge. The practice of situating knowledge is crucial to counter what she calls the "God Trick of Modern Science" which relies on the supposition of a possibility of all-encompassing knowledge, independent from both history and context (1988, 578).

To fully understand reality as a mesh of worldings, we also require new tools for thinking. Haraway calls these tools 'SFs' (2013, 2–3). SF stands for science fiction, speculative fabulation, science fact, string figures and much more. Once again, it is Whitehead's (1967) *Adventures of Ideas* that inspires Haraway's system of SF. SFs are "full of such [Whiteheadian] adventures", she writes (12). Haraway's SF tries to extract an epistemological consequence out of Whitehead's ontology: reality is always both physical / objective and mental/subjective. Consequently, situated knowledge cannot be only factual; it must be as sensible as it is rational. Thinking is an ever-changing adventure in which various forms of "SFs need each other" (3). The philosophy of SF is a way of saying that we need each other—with the other being an "all-encompassing other and not restricted to the human other", in unexpected collaborations and

combinations, in “hot compost piles” (4)...

Throughout her writing, Haraway proposes several images that embody the weaving of fact and fiction together. Such figures are performative tools that intend to alter our thinking, pushing it towards a more relational, non-anthropocentric way of thinking and doing. The figure of the Lichens is one amongst the many. Borrowing the image from Scott Frederick Gilbert (2012, 1), a biologist who once stated that “we are all lichens”, Haraway uses it to speak of the impossibility of being individuals. The lichens are organisms hard to fit within a specific kingdom, precisely because they have properties of fungi, algae and yeast. A lichen is situated across different kingdoms and it is more than just the sum of those three organisms. It creates an ecological microcosm while reworking the boundaries between species (Haraway 2012, 30–32).

4. The science we need: What would scientific practices look like if they were informed by Whitehead's, Stengers', Latour's, and Haraway's philosophies?

Striving to piece together the thoughts of the various philosophers mentioned so far, this last section culminates with the proposition of a new understanding of science. What would scientific practices look like were they informed by Whitehead, Stengers, Latour and Haraway's thoughts? I will go through the five main notions that capture the essence of such renewed scientific practice one by one.

One of the main threads has to do with the problem of truth. I have shown how Whitehead's philosophy begins debunking the idea of an established true fact. Truth is no longer telling, and beyond this, practices concerned with certainties engage in a non-peaceful exercise of exclusion. Stengers extends Whitehead's thoughts, proposing to replace scientific facts with scientific events that disclose the social, selective, inventive and creative features of scientific achievements. Such events make up Stengers' cosmopolitics, a space within which opposing dogmas do not result in one prevailing onto another, but rather can make up an ecology of competing practices that take each other seriously. Haraway adds another element to the story, insisting on the importance of situating such scientific events. Situated knowledge necessarily opposes the ‘God Trick’ that Modern science likes to master. That is: we need a science that, instead of imposing truths, skillfully moves itself through partial situated solutions (one). Letting go of truths will also allow our new science to strive toward peace (two). Dismissing the word ‘fact’—“the thing known to be true or proved” (Oxford 2019, 1)—*tout court* may be an effective and symbolic move to sensitize the public in front of the issue behind the word itself.

The problem of truth is traced back to the initially accepted/rejected attitude science has in front of its hypotheses, which represents another difficult milestone science has to overcome. This is an issue brought up by dichotomies, binaries and bifurcations. The Lockean separation between primary and secondary qualities sparks in Whitehead the urge to overcome dualities. The bifurcation between primary—objective—intrinsic attributes and secondary—subjective—extrinsic ones slowly begins to imply a separation between objective nature and subjective society. This is the division that Latour takes as the starting point of his understanding of modernity. He shows us that the very modern practice of purification constantly traces reality back to two distinct ontological zones—one pertaining to nature, and one pertaining to society. Latour significantly adds onto Whitehead's endeavor of overcoming such a distinction, disclosing the endless continuity that links the two zones. For both thinkers, the ontological area is one, and it is relational. Stengers' cosmological grasps, or scientific events, represent the types of

knowledge capable of both understanding and creating new links connecting humans and non-humans. Haraway's SFs are yet another tool envisioned to fight the battle Whitehead initiated and begin to grasp such 'problematic togetherness'. Their thoughts compel us to envision a science that sits comfortably with such lack of dichotomous demarcation, one practiced by scientists that embrace the relational and processual ontology through which they are intrinsically linked with their environment.

The moment the distinction between the two ontological zones is broken apart, and one comprehensive reality of infinite interconnections is disclosed, it is clear that methodological individualism no longer holds. Science was defined as the practice of isolating objects to study them individually. Whitehead rejects such individualism, on the basis that it is blind in front of the actual relational character of reality. Haraway expands on Whitehead: individuality does not even make biological sense. To her, reality is a matter of knottings and worldings. Latour gives us the example of a scientific practice that requires many disciplines together and forces scientists to let go of the idea of a unified system. Science needs to overcome methodological individualism (five).

Resistance to truth, dualism and methodological individualism might be a few of the ways to ensure that knowledge is not made to exclude whatever is produced according to a different rule or concerns a different group of people. By not excluding, not looking down upon, we could succeed producing knowledge for the world. It was Whitehead's notion of peace which demonstrated the first intention to "save all that exists" within theory of knowledge. Stengers and Haraway update his philosophy, explicitly writing that we need to think, produce and create for everybody, never only for a restricted section of academics populating prestigious universities. This is an issue that is relevant nowadays. Which knowledge will be the one 'for the world', meaning concerned with the world's biggest problem—the climate crisis—and devoted to producing information that will help us in such "catastrophic times", as Stengers (2015, 1) would put it? Unwilling to find a definite answer to this question, philosophy starts by posing it. It provides us with some tools to start re-imagining the practice of science. As we engage in this thinking activity, we realize Whitehead's texts and thoughts are intrinsically tied to such discourses, both as the initial promoter and as an actual constant inspirer. Whitehead opens up a debate formulating the conceptual knots which infuse Latour, Stengers and Haraway to further reconsider the ontological stances of scientific practices and propose new ones.

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