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Dossier

Physics, philosophy and poetics at the end of the Groupe des Dix: Edgar Morin and Michel Serres on the nature of Nature★

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Abstract – This article argues that by the time of the Groupe des Dix's dissolution in 1976, at least some of its members had departed significantly from the intellectual framework inherited from America's Cybernetics Group. Focusing on two key publications of 1977, Edgar Morin's *La méthode, tome 1 : la nature de la nature* and Michel Serres's *La naissance de la physique dans le texte de Lucrèce. Fleuves et turbulences*, I show how the group's two most philosophically oriented thinkers both broke with the "paradigm of the artificial machine" characteristic of cybernetics, developing in its place a new understanding of Nature centred on the figure of the vortex and the concept of self-production. This renewed understanding of Nature in turn entails an attempt to re-think the foundations of the life, human and artificial sciences via an original articulation of physics, philosophy and poetics.

Keywords: technology / environment / *physis* / self-production / cybernetics

Résumé – Physique, philosophie et poétique à la fin du Groupe des Dix : Edgar Morin et Michel Serres sur la nature de la nature. Dans cet article, nous montrons qu'au moment de la dissolution du Groupe des Dix en 1976, certains de ses membres avaient partiellement rompu avec la pensée cybernétique – héritée du Cybernetics Group américain – qui informait ses débuts. Une analyse de deux textes importants datant de 1977, *La méthode, tome 1 : la nature de la nature* d'Edgar Morin et *La naissance de la physique dans le texte de Lucrèce. Fleuves et turbulences* de Michel Serres, montre comment les deux penseurs les plus philosophiques du groupe ont su surmonter ce que Morin appelle « le paradigme de la machine artificielle » propre à la cybernétique pour développer une compréhension de la nature centrée sur la figure du tourbillon et sur le concept d'autoproduction. Chez Morin, cette pensée renouvelée de la nature s'appuie sur la pensée présocratique de la *physis*, et chez Serres sur la pensée lucrétienne de la *natura*. Nous montrons également que l'on peut interpréter les démarches de Morin et de Serres comme une tentative de dépasser la métaphysique, laquelle, de Platon à Norbert Wiener, comprend la nature par analogie avec la technique et donc comme fondée par un acte de la volonté. La compréhension renouvelée de la nature qui émerge dans les textes de Morin et de Serres implique également un nouveau fondement des sciences du vivant, de l'homme et de l'artificiel, qui prendra forme grâce à une articulation originale de la physique, de la philosophie et de la poétique.

Mots clés : technologies / environnement / *physis* / autoproduction / cybernétique

★ Voir dans ce numéro les autres contributions au dossier « Le Groupe des Dix, des précurseurs de l'interdisciplinarité ».

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France's response to America's Cybernetics Group

The Groupe des Dix may be seen as France's response to America's Cybernetics Group. Between 1946 and 1953, such prominent intellectuals as Norbert Wiener, John von Neumann, Gregory Bateson, Warren McCulloch and Claude Shannon gathered together within the framework of the Macy Conferences to discuss the new transdisciplinary science of cybernetics, as well as such related fields as systems theory, game theory and information theory[1]. Likewise, the meetings of the Groupe des Dix over the period 1969 to 1976 provided the occasion for some of France's most original and ambitious thinkers – including Edgar Morin, Henri Atlan, André Leroi-Gourhan, Michel Serres, Henri Laborit, Joël de Rosnay, and René Passet – to meet and discuss these same transdisciplinary sciences. There were, however, a number of important differences between the two groups, the most obvious being the Groupe des Dix's initial aim of applying transdisciplinary science directly to politics (Chamak, 1997; 1999), which in turn explains the participation of career politicians, such as Michel Rocard and Jacques Delors.

There is, however, a second major way in which the Groupe des Dix differed from the Cybernetics Group: its intellectual production. The greatest intellectual achievements of the Cybernetics Group were the transdisciplinary sciences its members founded: Wiener's cybernetics, Shannon's information theory and von Neumann and Morgenstern's game theory. Not only have these theories been hugely influential as regards the emergence and development of such fields as cognitive science and molecular biology, but, particularly in the case of cybernetics and information theory, they have played a central role in the development of key post-war technologies, for they laid much of the theoretical foundations of such fields as computing, telecommunications, robotics, and artificial intelligence. The Groupe des Dix's intellectual accomplishments were quite different. At its outset in 1969, the Groupe des Dix's theoretical reference points were largely the same as those of the Cybernetics Group, and, as already noted, the group's principal aim was to draw on these theories to help apply science to politics. By the time the Groupe des Dix disbanded in 1976, however, this initial political orientation had not only been partially set aside, but, as two major publications of 1977 – Edgar Morin's *La méthode, tome 1 : la nature de la nature* and Michel Serres's *La naissance de la physique dans le texte de Lucrèce. Fleuves et turbulences* – clearly demonstrate, at least some of its members had departed significantly from the theoretical framework of the Cybernetics Group.

Key to this break with the Cybernetics Group was the rejection of cybernetics' founding analogy between cybernetic machines and living beings, developed most notably in Wiener's seminal 1948 publication, *Cybernetics or control and communication in the animal and the machine*. According to Wiener, the cybernetic concepts of teleology, self-regulation, feedback, information, control, communication, and so on, had together given rise to a transdisciplinary science equally applicable to the new generation of artificial machines and to living beings. The feedback mechanisms by which a predator chases its prey, for example, were considered analogous to the way that the anti-aircraft missiles Wiener helped develop during the Second World War bring down enemy aircraft. Moreover, by the time of *The human use of human beings. Cybernetics and society*, first published in 1950, Wiener had further extended the cybernetic framework to such human and social sciences as linguistics, sociology and law. Thus it was that biology, ecology, psychology, linguistics, sociology, economics, politics, robotics, computing and artificial intelligence could all be approached using the same basic cybernetic concepts.

Where Morin and Serres's 1977 publications break with this way of thinking is in their attempt to understand the nature of Nature, rather than the ways Nature is analogous to technology. Drawing on seminal work produced elsewhere in the late 1960s and early 1970s, especially Ilya Prigogine's work on dissipative structures (1968), and in Morin's case also Humberto Maturana and Francisco Varela's theory of autopoiesis (1973), these texts offer a theory of Nature as self-production, a concept most clearly visible, both authors think, in the figure of the vortex[2]. Technology, by contrast, is viewed as essentially different from Nature in that it is produced by something other, namely human beings. It follows, Morin in particular argues, that in reducing Nature to the properties it apparently shares with technology, cybernetics completely obscures the nature of Nature, the

[1] This research originated from a paper presented at a panel on the Groupe des Dix held first at the Society for French Studies Conference at the University of Exeter in July 2012 and then again, with minor modifications, at a conference, "Contemporary French philosophy of science and technology", held at Downing College of the University of Cambridge in September 2013. The original title of both papers was "Physics, Philosophy, and Poetry: Interpreting Edgar Morin and Michel Serres as Heideggerians".

[2] It is interesting to note that Wiener himself (1954, p. 96) at one point remarks: "We are but whirlpools in a river of ever-flowing water. We are not stuff that abides, but patterns that perpetuate themselves". For an extended commentary of this passage, including an analysis of its problematic relation to cybernetics, see Dicks (2013).

result being that "the paradigm of the artificial machine" (Morin, 1977) comes to invade all our attempts to understand Nature: brains and nervous systems become "computing machines" (Wiener, 1948); genes become "programmes" (Jacob, 1970); living organisms become "robot vehicles" (Dawkins, 1976); and the earth itself becomes a "self-regulating cybernetic system" (Lovelock, 1979)[3].

An important consequence of Morin and Serres's theorizations of the nature of Nature is that they lead both authors to focus on a number of disciplines largely overlooked by both the Cybernetics Group and the Groupe des Dix at its outset. Indeed, whereas both groups initially focused primarily on the life sciences, the human sciences and what Herbert Simon (1969) calls "the sciences of the artificial", by 1977 Morin and Serres were focusing instead on a radical re-thinking of three fields largely neglected by the Cybernetics Group: physics, philosophy and poetics.

The birth of a new physics

Physics has traditionally been regarded as a universal science, whose laws apply to the universe as a whole and thus also to every physical entity that exists within it. Newtonian gravity, for example, is universally applicable to all physical entities possessing mass. Likewise, the second principle of thermodynamics, which states that the overall entropy of a closed system will irreversibly increase over time, is likewise assumed to be universally valid. In the new physics described by Serres and Morin, by contrast, the study of self-producing entities whose organizational complexity is maintained or increases as they export entropy to their environment, gives rise to the possibility of studying regularities that hold only locally; hence Morin's extensive discussion of the notion of "endo-causality" (Morin, 1977, p. 257-268) and Serres's claim that the new physics is no longer of the universal, but rather of the local (Serres, 1977, p. 233-237).

An important consequence of this new physics, which has been highlighted in particular detail by Morin, is that its extension to the life and human sciences is no longer "trivial" (Morin, 1977, p. 27), for living beings, ecosystems and even human societies may henceforth be understood not just as physical in the sense of being subject to the universal laws of physics (general relativity, thermodynamics, quantum mechanics, etc.), but as locally negentropic systems possessing their own internal determinisms. So, whereas it typically appears trivial to say that living beings, ecosystems, and human societies are composed ultimately of elemental physical particles and subject to the fundamental physical laws or regularities that govern the behaviour of these particles at different scales, to see them as self-producing systems could potentially provide each of these sciences with a significant new physical foundation.

In broad agreement with Maturana and Varela's theory of autopoiesis, Morin conceives living beings as self-producing systems in which the differentiation between genotype and phenotype is not supposed from the outset, but is instead considered a secondary phenomenon occurring within a fundamentally circular organization, a position later developed with greater scientific rigour by Stuart Kauffman (1995). Likewise, the concept of self-production applied to the science of ecology emphasizes the circling of nutrients within trophic loops as the quintessential ecological phenomenon (Morin, 1980, p. 28), as is also the case in the work of Barry Commoner (1971), though not, it is important to note, in the cybernetic ecology of James Lovelock (1979), which focuses rather on the cybernetic mechanisms through which the earth system is kept stable[4]. Lastly, human societies may also be viewed as self-producing, inasmuch as common cultures, languages, borders, and so on, create various internal determinisms that condition the circulation of people, goods, capital, ideas, and so on[5].

The birth of a new philosophy

In *La naissance de la physique*, Serres remarks that Lucretius had already "accomplished the revolution that the sciences today practice but which philosophy continues to ignore" (Serres, 1977, p. 98). In what follows, I will explore the philosophical dimensions of this revolution through a brief exploration of five key philosophical topics: Being, existence, time, selfhood, and logic.

Morin's theorization of *physis* qua self-production involves a powerful new way of thinking about Being and existence. Whereas he thinks that both cybernetics and systems theory "evacuate being, existence, individuality" (Morin, 1977, p. 214), his own thinking of *physis* allows for a radical new way of thinking about ontology.

[3] See Proulx (1990) for a critique of the cybernetic paradigm inspired by the work of Morin.

[4] For a criticism of Lovelock's failure to theorize self-production, see Dicks (2011; 2014).

[5] Perhaps surprisingly, given that Morin is in the first instance a sociologist, the idea that human societies are self-producing does not receive a detailed theorization in subsequent tomes of *La méthode*. It is, however, discussed at length in *Le paradigme perdu : la nature humaine* (1973), which took four years to write (a period corresponding to the first four years of Morin's involvement in the Groupe des Dix) and at the end of which he announced his intention to develop a "general science of *physis*" in *La méthode*.

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In traditional metaphysics, the Being of an entity is its essence, that is to say, what it is. Its existence, by contrast, is rather the fact that it is. For Morin, however, the Being of an entity is not simply what it is, but rather – at least in the case of beings that have the character of *physis* – the specific way that it produces itself. Being or Nature, it follows, is self-production, with different regions of Being or Nature corresponding to different modes of self-production. Likewise, the existence of a being is not simply the fact that it is, for it must also be understood in a proto-existentialist sense: to exist, in the sense of "standing out" (ek-sisting) with respect to an environment, is also to entertain certain forms of dependence and independence with respect to that environment. Stars, for example, differ from vortices and living beings not only in that they produce themselves through nuclear reactions, rather than through recursive flows (vortices) or bounded autocatalytic reactions (living beings), but also in that the energy on which they depend is stored within them, thus giving rise to an unparalleled independence with respect to their environment. In a similar vein, Morin thinks that living beings differ from vortices in that they possess not just a "self" (*soi*), but also what he calls an "*autos*", understood as a higher level of selfhood, which he thinks involves the computation of information, and which in turn enables living beings to gain much greater independence from their environment than vortices. Indeed, whereas vortices rarely last for any great length of time[6], Morin thinks that the ability of living beings to process and store information allows them to endure over much greater timespans. Nevertheless, living beings remain dependent on their environment for matter, energy, information, sexual reproduction, and so on, hence what Morin sees as their constantly frustrated search for satisfaction and plenitude, a state of affairs that has been analysed with respect to human beings by existentialists under such topics as anxiety, boredom, concern for tomorrow (*le souci du lendemain*), and so on (Morin, 1977, p. 207).

Like Morin, Serres has also analysed the ontological implications of seeing Nature as self-production. Indeed, as he explains in *La naissance de la physique*, seeing Nature in this light makes possible a radical rethinking of the fundamental question of philosophy: the relation between Being and becoming. Ever since Plato, Serres notes, we have typically understood Parmenides' understanding of Being as "remaining the same" in opposition to Heraclitus's understanding of Being as ceaseless change, flux and becoming. Moreover, one could further add that from Plato onwards metaphysics has consistently identified Being with remaining the same, and that even such nineteenth-century philosophers as Marx and Nietzsche simply reversed the terms of the opposition, arguing against Plato and traditional metaphysics that change and becoming are more fundamental than Being qua remaining the same. Serres's theory of Nature marks a radical break with the opposition of Being and becoming characteristic of Western metaphysics. In contrast to Heraclitus's claim that "you cannot step twice into the same stream", Serres notes that if you plunge into a vortex you can be pretty much certain to bathe again in the same waters (Serres, 1977, p. 189). In looping back on themselves, the currents of a vortex are constantly moving and changing, while at the same time allowing an entity to remain the same in the sense that they form a being whose identity and integrity remain constant. Remaining the same, it follows, is not here identified with unchanging eternal essences or ideas, as is the case in Plato, but rather with maintaining one's integrity and identity via continual processes of flowing, changing, and becoming.

Just as the recursive organization of the vortex makes possible a new understanding of Being, the same is also true of time. The Newtonian time characteristic of classical physics was fully reversible, with linear causal chains being equally valid in both temporal directions. Then, with the advent of thermodynamics in the nineteenth century, the concept of time became irreversible, flowing only from past to future and never the reverse. In the new physics and philosophy of self-production, the conception of time changes yet again. In a vortex, Serres observes, causes produce effects which in turn produce the same causes that produced them, thus giving rise to a form of local reversibility in a context of global irreversibility (Serres, 1977, p. 188). This reversibility – different from that of Newton in its local and circular character – is what allows the being in question to produce and maintain itself (*se maintenir*), a process which Serres thinks constitutes the physical basis of the "now" (*le maintenant*). So, whereas in classical physics and equilibrium thermodynamics, there exist moments in a temporal series that may be classed as past or future relative to each other, there is no physical basis in these sciences for any "now" and thus for any classification of the past and future relative to the present. By contrast, with the new conception of time described by Serres, any "self" exists in a global context in which time moves irreversibly forward from past to future, and yet the existence of the self also provides the ontological basis for the "now", for without selves there could be no experience of things in the present, including remembrance of things past and anticipation, willing, or imaginative projection of things to come.

The concept of self-production also makes possible a new way of thinking about selfhood. The key concept of cybernetics is self-regulation; cybernetic systems are systems that regulate themselves. But, as Morin (1977)

[6] Vortices can endure for extensive periods of time, but only if their environmental context remains sufficiently stable.

argues, without some sort of goal, the concept of self-regulation is meaningless; and yet where the goals come from is not explicitly addressed by cybernetics. The fact that these goals must ultimately belong to or derive from some sort of "self" is overlooked, or at least unaccounted for. A similar criticism may also be made of information theory and game theory. Information theory, as theorized by Shannon, concerns only the transmission of "bits". The meaning behind the bits – what the emitter "wants to say" (*veut dire*) – is thus presupposed without being explained (Morin, 1977, p. 303). As for game theory, a field which attracted relatively little attention from the Groupe des Dix, the players are assumed to have goals and these goals are in turn assumed to consist in the realization of a goal or the maximization of some sort of interest (financial, military, reproductive, etc.), but where the players and their goals and interests come from is not in itself something that the theory directly addresses. Morin's understanding of *physis* as "self-production" provides a powerful response to this lacuna. Production, he claims, means "bringing into Being and/or existence" (Morin, 1977, p. 157). So, just as cars come into existence via "car production", selves come into existence via "self-production". And without "selves", there could be no goals, no intended meanings and no players of games.

Another field that is radically modified by the notion of self-production is logic and reasoning. Traditional logic is linear, its overall strategy being to begin with true premises, and, from these premises, to arrive at indubitable conclusions. Logic thus conceived is isomorphic with respect to the linear chains of cause and effect observed by classical physicists. In both cases, moreover, circularity is prohibited. It is prohibited by logic on the grounds that it amounts to a vicious circle or tautology, and it is prohibited in physics on the grounds that it would amount to a perpetual motion machine. The logic and reasoning of Morin and Serres, by contrast, is radically different. Particularly in the case of Morin, thought is considered to be fundamentally circular in nature, though this circularity is not vicious, for it is capable over time of giving rise to ever greater complexity, weeding out elements that are inappropriate, but also integrating or inventing new ones as required. It follows that rather than trying to establish some sort of single, absolute certainty on which a belief system may be built, such as the word of God, the Cartesian *cogito*, or the "self-evident" axioms of logic, thinking must henceforth be seen as possessing the same basic form as the underlying, circularly organized physical systems in which it participates. Thinking, in other words, is inseparable from and structurally isomorphic with respect to the self-production of the being or system in which it occurs. Morin concludes that thinking may thus be said to be "encyclopaedic", not in the sense that it may produce an exhaustive, alphabetic description of various fields of knowledge, but rather in the original Greek sense of learning and articulating different fields of knowledge in an active cyclical manner (Morin, 1977, p. 19).

The birth of a new poetics

One of the key concepts of *La méthode* is production, which, as we have already seen, Morin understands as "bringing into Being and/or existence". This concept is in turn divided into two further notions: creation (or *poiesis*) and reproduction. A star, for example, produces itself without any template or blueprint and in that sense constitutes a particularly pure example of production qua *poiesis*. The same is also true of self-producing ecosystems, which bring themselves into existence in the form of trophic loops and in the absence of any blueprint. A photocopied document, by contrast, does not create anything, but instead reproduces an initial template. In between these two extremes, living beings combine both *poiesis* and reproduction in a variety of complex manners. A further important aspect of Morin's theory of production is that, in producing themselves, beings also produce all sorts of elements not present in their initial composition. Stars, for example, generate all the heavier atomic elements, in the first instance out of helium and hydrogen. Living beings generate all sorts of specifically organic compounds. Ecosystems generate both new species and new habitats (soils, rivers, etc.). And human societies generate new technologies, institutions, discourses, and so on.

According to Morin, cybernetics completely conceals the phenomenon of *poiesis*, for, as we have already seen, it presupposes the existence of the systems it studies without paying attention to the way they are produced. The closest equivalent within cybernetics for *poiesis* is thus energy, for both living beings and machines require energy if they are to keep functioning. This failure of cybernetics to theorize *poiesis*, Morin claims, entails the "exile" of *poiesis* into the realm of poetry (Morin, 1977, p. 366), which in turn comes to be seen as a leisure activity or form of entertainment (Morin, 1997, p. 43) and thus as essentially different from genuine work (*ergon*).

But, if it is possible to reintroduce *poiesis* into Nature by theorizing Nature as *physis*, could it not also be possible to see poetry otherwise than as a leisure activity? *Poiesis* may be distinguished from poetry in that, whereas the former produces or brings forth things (cells, organs, buildings, machines, etc.), the latter produces or brings forth the world. Homer's *Iliad*, for example, may be said to have produced or brought forth the world of the ancient Greeks, and the Bible may likewise be said to have brought forth the world of medieval Christianity.

What such world-forming poems have in common is that they tell a grand narrative of the world, capable of giving meaning to human existence. To a certain extent, the same is also true of Morin and Serres's 1977 publications, both of which, I will now argue, may be seen to tell – or at the very least imply – a world-forming poem or grand narrative.

Having joined the Groupe des Dix in 1972, Serres's 1975 publication, *Feux et signaux de brume*, spelled out some of the key elements of his understanding of history. Drawing on his doctoral dissertation, *Le système de Leibniz et ses modèles mathématiques* (1968), this text argues that whereas the science of Leibniz's time centred around the notion of the "fixed point", from the nineteenth century onwards it was turned towards the thermodynamic notion that energy or work is generated through the cancelling out of differences (*e.g.*, between hot and cold), a process that may be subject to regulation in such a way that a desired output is ensured. In this respect, Serres's understanding of history is very similar to the one put forward by Wiener in the opening chapter of *Cybernetics*, which likewise charts the transition from the classical mechanics of Leibniz and Newton to the equilibrium thermodynamics of Carnot and Boltzmann[7]. At this point, however, the two thinkers diverge in a number of important ways.

The first of these concerns Wiener's claim that cybernetics spells the coming of a "new age". Central to this view is his belief that "[t]he thought of every age is reflected in its technique" (Wiener, 1948, p. 38), a claim which he justifies with reference to three different ages: i) the age of classical physics, spanning approximately from Descartes to Leibniz and Newton, the thought of which was reflected in the clock; ii) the age of thermodynamics, spanning from Carnot to Bergson, whose thought was reflected in the motor; and iii) the age of cybernetics, inaugurated by Wiener and his colleagues, the thought of which is reflected in the servomechanism. But, if there are three basic ages and each age has a way of thinking that characterises it, why does Wiener only distinguish between two different notions of time, the reversible time of Newton and the irreversible time of Gibbs and Bergson, in which he also locates cybernetics? Likewise, given that the fundamental technology of the age of thermodynamics was James Watt's steam engine and that this technology already made use of a "governor" capable of automatically regulating the engine's output, can cybernetics really be said to have made a radical break with the technology of that age or is it rather the case that it simply added a new property – information-processing – to the motorized technologies of the nineteenth century, such that factories came to be equipped with automated systems and robots, motorized vehicles with auto-pilots, and, on a more theoretical level, power engineering was supplemented with communication engineering? In light of Morin and Serres's 1977 publications, the new age Wiener claims began with cybernetics would ultimately appear to be just a "digital upgrade" of the thought – and corresponding technologies – of the nineteenth century. By contrast, Morin and Serres's attempt to re-think the nature of Nature, and thus also to develop a new physics and a new philosophy, would appear to mark a genuine revolution in thinking.

A second point of divergence concerns Wiener's apparent limitation of the thought of an age to its science (*e.g.*, Newtonian physics) and technology (*e.g.*, clocks). For Serres, by contrast, the thought of an age extends to all fields of knowledge, from physics and biology to economics, law and even art and literature. As Vincent Descombes (1979) notes, Serres views all the different fields of knowledge of a given age as "isomorphic" or structurally homologous, hence his famous argument that the basic principles of nineteenth century thermodynamics and evolutionary biology are present in Zola's novel *Le docteur Pascal* just as much as they are in the texts of Carnot and Darwin. In a similar vein, *La naissance de la physique* shows that Lucretius's first-century poem, *De rerum natura*, exhibits a clear isomorphism between science and literature in the sense that "the poem as a whole [...] loops back onto itself without closing itself, like a vortex" (Serres, 1977, p. 146). Nevertheless, there is of course a significant difference here between the way these two ages articulate what we today see as separate "disciplines": whereas Lucretius happily accepts the view that the various ways of knowing of his time are all isomorphic, we moderns typically try to separate out the various ways of knowing into separate "disciplines" with their own radically different methodologies and objects of study. Likewise, whereas for Lucretius poetry assumes the role of the overarching discursive framework wherein other ways of knowing may be gathered together, we moderns consider that poetry has little or nothing to do with the serious work of scientists and engineers and is fit only for leisure time and entertainment.

A third point of divergence concerns the point of origin of the grand narratives in question. Wiener explicitly derives the word "cybernetics" from Plato's analysis of the steersman (*kybernetes*) in the *Gorgias*, for modern servomechanisms may be considered technological analogues to the work carried out by a steersman. For the steersman to navigate his ship, some sort of destination must have been willed, whether by the steersman himself or by his superior in a chain of

[7] This transition within physics clearly parallels the philosophical transition from the thinking of Being as fixity, immobility and remaining to the foregrounding of change, motion and becoming characteristic of the so-called "reversal of metaphysics" found in Marx and Nietzsche.

command. The same goes for a modern autopilot, which must likewise have been programmed to arrive at a chosen destination. And a living organism, viewed as a cybernetic robot, must also carry out the "will" of the selfish genes that programme it to do their bidding. Fundamental to all of these examples is the idea that at the very foundation of things there lies some sort of "will", an idea that received one of its first major philosophical statements in the *Timaeus*, in which Plato argues that physical reality may be regarded as the technological production of a demiurge, and which then received modified formulations in the philosophy of Aristotle, who held that all natural beings possess a kind of inner *telos*, in the Christian view that the world proceeded from the will of God, and more recently in Wiener's technological conception of Nature as analogous to a collection of servomechanisms.

In the grand narratives of Serres and Morin, by contrast, the point of origin is not the birth of metaphysics in Plato, but rather the birth of physics in Lucretius and the Pre-Socratics. Just as Serres returns to Lucretius's *natura*, so Morin returns to the *physis* of the Pre-Socratics. Moreover, when one further considers that Lucretius himself drew on the Pre-Socratic thinker, Democritus, who, like other Pre-Socratics, such as Anaxagoras and Empedocles, saw vortices as the fundamental agent of physical creation, it would appear that there is ultimately a common Pre-Socratic origin to the work of both thinkers. In keeping, however, with Serres and Morin's view that the vortex does not form a closed circle and that its dynamic circularity is generative of complexity, this return – or looping back – to the very beginning of Western thinking about Nature is not destined identically to repeat that of the ancient Greek and Roman arkhe-physicists any more than the age of cybernetics has identically repeated the inception of metaphysics that took place in the work of Plato. In line with the concept of self-production as dynamic looping back on itself, the emerging "age of *physis*" will not simply repeat the thought of the very first thinkers of the West, but will instead allow Western civilization to renew and maintain itself – by looping back to the most basic question of all, the question of Being or Nature.

Conclusion: the problematic reception of Morin and Serres's 1977 texts

My principal aim has thus far been largely expository; it has been to show, if only in broad outline, how Morin and Serres's discovery of a "new physics" led them to develop a way of thinking about Being or Nature that involved a radical transformation of both philosophy and poetics. In this concluding section, I would like to discuss briefly the reception of Morin and Serres's thought and in particular their 1977 texts.

If, as I have argued, Morin and Serres developed a radical new way of thinking about Being or Nature, then why has their work commanded so little attention? Why has it had so little influence on others? Other members of the Groupe des Dix certainly paid attention and no doubt contributed indirectly to the development of Morin and Serres's thought. Henri Atlan's criticisms of genetic determinism (Atlan, 1999), for example, clearly share much in common with Morin and Serres's understanding of Nature as possessing a dynamic circular organization. Similarly, René Passet's (2010) vast study of the history of economics, in which he argues that the basic structure of economics in any given age is isomorphic to that of physics, is clearly commensurate not only with Serres's view that all the various forms of knowledge of an age have the same fundamental structure, but also with the specific content of these historically situated structures, for, like Serres, Passet traces the passage from the mechanical age of clocks to the thermodynamic age of motors and finally on to the emerging age of the "creative vortex" (*tourbillon créateur*). Further, a case can also be made for a reciprocal influence between the work of Serres and Morin and certain attempts to develop a renewed thinking about Nature outside the Groupe des Dix. Prigogine and Stengers (1986), for example, evoke Michel Serres at the end of *La Nouvelle alliance* in the context of what, in keeping with Morin, they see as the contemporary re-discovery of Nature as *physis*. As a general rule, however, it can hardly be said that the new thinking of Being or Nature proposed by Morin and Serres – each in their own slightly different ways – has been particularly influential, particularly when one compares it with the thought of such figures as Foucault, Derrida, or Deleuze.

The principal reason for this lack of influence, I believe, relates to the philosophical orthodoxy of the time. There is, it seems to me, something distinctly Heideggerian about Morin and Serres's thinking of *physis* and *natura*. Not only did it arise from a critical reception of cybernetics, which Heidegger (1976, p. 457-458) had recently argued – in a 1969 seminar in Le Thor – had come to act as a replacement for philosophy and poetry [8], but it also led to a radical renewal of these latter two modes of thought, which, in keeping with Heidegger's idea of "another beginning", sought to "resuscitate", as Morin (1977, p. 27) puts it, the initial thinking of Being or Nature characteristic of the ancient arkhe-physicists. This is not to deny the existence of significant differences with Heidegger, the most obvious of which is the latter's focus not just on Being and becoming, but also on the phenomenological question of appearing, and in particular

[8] For a brief discussion of the relation between Heidegger's critique of cybernetics and Morin's view that cybernetics lacks an ontological ground, see Coutlée (1990, p. 204).

the idea that beings appear or come to presence in the clearing – a concept totally absent from Morin and Serres. But even without going into a detailed exercise of "comparing and contrasting", there can be little doubt that the common project of Morin and Serres's 1977 texts of returning to the origins of Western thought in order to develop a renewed thinking of Being or Nature has a distinctly Heideggerian dimension. In the philosophical climate of the late 1960s and early 1970s, however, such influential thinkers as Levinas, Derrida, and Lyotard were occupied in large part with distancing themselves from the Heideggerian project of thinking Being anew by means of a return to the origins of Western thought. Whereas Heideggerian deconstruction sought to uncover the original understanding of Being as *physis*, the deconstruction of Western ontology carried out by Derrida and others was grounded rather in the conviction that there was no origin, no fundamental conception of Being or Nature to uncover, in which case the attempt to ground a new physics, philosophy, and poetry in the concept of self-production could only be but another phase, itself in need of deconstruction, in the interminable saga of Western metaphysics.

In keeping with this, it is also significant that what has typically been emphasized and retained in the thought of Morin and Serres is not the "Heideggerian" dimension highlighted in my exposition of their 1977 texts, but those aspects of their thought that fit more easily with late-twentieth century philosophical orthodoxy. Morin, for example, is now celebrated above all as a thinker of complexity – a concept which fits much more easily with the poststructuralist celebration of difference, diversity, alterity, plurality, and so on, than does his attempt, in volume one of *La méthode*, to develop a new theory of Being or Nature[9].

Something similar is also true of Michel Serres. Consider, to take a key example, Bruno Latour's reading of Michel Serres's *La naissance de la physique* (Latour, 1988). Now, it is well-known that Latour was strongly influenced by Serres and he certainly offers a spirited defence of Serres's 1977 text. But what interests Latour about *La naissance de la physique* is not the content of the philosophy that Serres derives from the physics of Prigogine and Lucretius, but rather what he takes to be the implications of Serres's work for our understanding of science. When science is thought in terms of "power struggles" (*épreuves de force*) taking place within an actor-network, as is the case in Latour's own work (2001), not only can its apparent truths never be definitively verified, but, *contra* Popper, they cannot be definitively falsified either. Lucretius, Latour notes, was long considered as being at best wrong and at worst unscientific; and yet, as Serres has shown, his writings on turbulence, the *clinamen*, vortices, and so on all chime perfectly with the very latest discoveries and theories of hydrodynamics. What matters for Latour, then, is not the fact that Serres had resurrected an ancient understanding of Nature which makes possible a new understanding and articulation of physics, philosophy, and poetry, but simply the idea that, even in science, there are no definitive winners or losers, that "[t]he past of science [...] is still active" (Latour, 1988, p. 88). Further, it is also significant that Latour does not only ignore the fact that *La naissance de la Physique* is in the first instance an attempt to re-think the concept of Nature (and not a critique of scientific progress), but also, in his later writings, undertakes a philosophical crusade against the very concept of Nature. In *Politiques de la nature*, for example, one reads: "When the most frenetic of ecologists cry out in fear: 'nature is going to die', they are unaware how right they are. Thank God, nature is going to die. Yes, the great Pan is dead! After the death of God and of Man, nature too must come to an end" (Latour, 1999, p. 42).

But if Nature is seen as it is in the new physics of Prigogine and others, then would the death of Nature be such a good thing? That would, after all, mean the complete breakdown of all processes of self-production, whether in stars, living beings, ecosystems, or human societies.

If Morin and Serres's 1977 texts have been largely overlooked, or at least interpreted other than as fundamental contributions to a "resuscitation" of the original physics, philosophy and poetics of the ancients, then what consequences might follow from a more sustained attention to their work? With this question in mind, it is interesting to note that Morin often refers approvingly both to Heidegger's doctrine of a "new beginning" (Morin, 2007; 2011) and to the famous dictum of Hölderlin that Heidegger famously placed at the heart of his critique of technology: "Where danger is, grows / The saving power also" (Morin, 2004; 2007). For Morin, a renewed thinking of Being or Nature is necessary if our now planetary civilization is to undergo the radical metamorphosis required to avoid global collapse and instead to commence a new "ecological

[9] This is not to say, of course, that Morin's thinking of Being or *physis* is opposed to his writings on complexity. Self-production, Morin thinks, is a necessary precondition for complexity to arise both within self-producing beings and through their relations to other beings, to their environment, and to what are sometimes called "higher-order" self-producing beings (*e.g.*, self-producing societies composed of self-producing individuals). Nevertheless, it is also true that it is quite possible – and indeed very common nowadays – to evoke the concept of complexity without evoking that of self-production, let alone such quintessentially philosophical concepts as Being and existence.

era". If he is right about this, then an important conclusion follows: we must break with the contemporary philosophical orthodoxy, according to which we must either maintain a modern conception of Nature or abandon completely the concept of Nature. What is required instead is rather develop a new, but at the same time also very ancient, conception of Nature – one that is not reductive, but, on the contrary, is capable of helping generate and sustain complexity.

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