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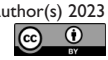

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Michel Serres and the Philosophy of Technology

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Abstract

This article explores the topic of technology in Michel Serres' work. Although a great deal has been said about Serres' treatment of parasitic relations, noise, interdisciplinarity and communication, little has been written about his approach to questions of technology. The author first outlines general trends in the philosophy of technology and indicates how Serres fits within the field. He then suggests a way to read Serres by identifying 'landmarks' in his texts, which are used for explicating his position on technology. Three of these landmarks are explored. The first is Serres' philosophy of world-objects, which moves him to think through the relationship between humans, technology and natural evolution. The second is Serres' notion of technologies 'setting sail' from the body, which allows him to build on Leroi-Gourhan's work, and the third is Serres' description of information technologies and the world of millennials, which leads to his position on pedagogy and technology. From an examination of these three landmarks, a picture emerges of a thinker for whom technology acts as a disturbance around which collectives form, establishing relations and deviations between ourselves and others.

Keywords

exo-Darwinism, philosophy of technology, Michel Serres, technological culture, world-objects

At the beginning of the 21st century and towards the end of his career, Michel Serres saw a world where the old philosophical concepts of subjects, objects, bodies and their limits needed to be radically rethought. Of course, the drive to anticipate the new scenes for knowledge was itself nothing new for Serres. His attempts at the reinvention of philosophical thought, beginning from the ground up, from ritualized practices and from experience in the world, has characterized his entire body of work. His early Hermes work, *The Parasite* (2007) and *Angels* (1955b), offered new ways to conceive of communication, mediation and exchange. And likewise in his Foundations trilogy,

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Serres gave us new ways to talk about the forming of collectives and alternatives to the subject–object dualism. But in his later Humanism period there is a significant shift in approach. Serres' attention is now turned fully to a new 'technologized and culturized' world, which is doing nothing less than transforming the human species, and which in turn requires a new project for philosophy: to describe the human through an understanding of technology. Although a great deal has been said about Serres' treatment of parasitic relations, noise, interdisciplinarity and communication, little has been written about his approach to questions of technology, his exploration of exo-Darwinism and the process of hominization, as loops formed between technology and humans. This article explores the topic of technology in Serres' work, focusing on what he offers to a 21st-century philosophy of technology, including his description of the recent invention of world-objects, his exploration of the manner in which technologies externalize human functions and his anticipatory thinking about technology and pedagogy.

Through the careful study of myths, rituals, fables and historical events, Serres offers a way of thinking about technology 'at ground level', whilst also zooming out to species-level analysis, observing and anticipating the effect of technological change on what it means to be human. This movement between the local and the global represents a relatively new trend in philosophies of technology. Previously in the philosophy of technology a distinction had existed between what used to be considered a 'continental approach', focused on questions of 'capital-T Technology', and an empirical approach, focused on localized specific case studies of technology in the world. The continental approach synonymous with thinkers like Gilbert Simondon, Martin Heidegger and Jacques Ellul, to mention only a few, focused on technology as a general philosophical concept related to the position of subjects and subjectification in the world. On the other side of the divide, the so-called 'empirical turn' in the philosophy of technology, begun mostly in North America, was focused on the design and impact of particular technical objects. Thinkers in this tradition attempted to open previously 'black-boxed' aspects of technology to scrutiny and study the engineering practices that lead to design and production (Achterhuis, 2001: 6). Don Ihde (2001: viii) describes this as the difference between a high-altitude, 'transcendental' perspective and a lower altitude, more pragmatic look at technology, focusing on the local, the concrete, the relational and the contextual. This division, like all divisions, has always been reductive of the ways that technology is both lived with and thought through in the world, and has recently come in for revision by a range of philosophers in addition to Serres, including Ihde (2000), as well as Smith (2018), Michelfelder (2020) and Feenberg (2002), to again mention only a few. These thinkers bring together the two existent approaches and explore the manner in which specific external technological processes offer ways of reinventing philosophical concepts such as being, time, memory, aesthetic experience, communication and creativity. Importantly, in this new brand of philosophy of technology, the empirical is approached using the methods and themes often associated with continental philosophy, including an emphasis on questions of subjectivities, objecthood, transcendence and being in the world.

Against this background, a unique French position that Serres' work also resonates with has started to emerge. This approach focuses on the *processes* carried out by

technical objects and the *conditions* that these processes have established. As Loeve et al. (2018: 7) write, what differentiates the French approach from other philosophies of technology is a rejection of the functionalist view of technology:

> Tools, objects, machines, operations, and gestures, are scrutinized for their own sake rather than as means for external ends or for the purpose of the moral evaluation of these ends. However, the concept of the technological object is promoted as a necessary mediation *to understand the human*. (emphasis in original)

In this article I put Serres' work within both the project of French philosophy of technology as well as the broader terrain of the changing continental–empirical approach. It has to be said that Serres would probably not have liked my attempt to categorize him (famously, he never liked the idea of belonging to groups or trends). But contextualizing his work in such a motivated fashion allows me to tease out specific aspects of his work, particularly concerning his historical approach to questions of technology and the externalization of human functions.

Most often Serres is thought of as a philosopher of science. But importantly he is a philosopher of science for whom technology plays a key role. For Serres, like Simondon and Heidegger, technology is at once an outcome of scientific discovery and a force that produces the conditions for that discovery. When Serres and technology are discussed, it is usually through applications of his work to theories of media and communications or through applications of his formulation of noise and disorder in sound studies (see, for instance, Barker, 2015; Crocker, 2021; Johansen, 2020). Refocusing on the aspects of technology and humanity in his work offers new ways to understand both his own project and the way a French philosophy of technology has emerged around the paleoanthropological work of André Leroi-Gourhan in particular. We can see how Leroi-Gourhan allows Serres to develop an understanding of technology and evolution that he then uses to create a novel description of the technological object and what he calls 'loops of hominescence'. If Heidegger's (1977) 'Questions Concerning Technology' – at the centre of so much philosophy of technology that would follow – suggested that technology 'enframes' human activities and obscures other potential ways of being that are not defined as 'useful', Serres is representative of a different approach. Rather than the question of 'essences', Serres' focus is on the way technologies figure in everyday life and he argues that the loops formed between humans and technologies on a day-to-day, lived basis *produce* temporal niches. They produce their own small time zones within which life becomes possible in the first place. Most famously, this idea has been extended by Latour (1993), who argues that the loops between objects and humans constitute a becoming-collective, with the mediation of technology impacting the programs for action within a society. For a collective to form, according to both Serres and Latour, there must first be an object that circulates within it and that mediates – in the sense that it makes possible – the action of its members. In both the contemporary and archaic world, this object is often manufactured via technological means, whether a stone blade or an atomic bomb. And because of this, for Serres as well as for Latour, being human itself involves being *in relation* with technological processes as a primary condition, as the starting point for *the human*.

Of course, the relation of technology and humanity has been something of a trope in philosophies of technology. As Carl Mitcham (2014: 523) points out, almost all serious thought about technology arrives at the question of which side of the exchange is dominant in technology's relationship to humanity. This chicken and egg question is usually framed as who/what determines who/what. As Mitcham argues, one side is seen as dominant, or else the discussion tends to descend into clichés of a generalized mutuality. Serres offers philosophers of technology something different. As he often does, Serres reframes the question in terms that are not so easily teased apart. For Serres, it is not a question of humans on one side and technology on the other, but rather a question of humans living amongst *disturbances* that are mediated by an array of technical objects, which in turn start to remake the human in a process of hominization. To use one of Serres' often repeated phrases, technology is both 'quasi-object' and 'quasi-us'. This relation, as he puts it, prompts 'us' to change in a process where external technological practices take over functions that are usually reserved for the human, such as manual labour, the cultivation of the land or the preservation of memory. But, for Serres, it is not all loss on the side of the human. Because of the disappearances caused by these disturbances, new traits that come to characterize the human are able to emerge.

How Might One Read Serres?

Before beginning to unpack Serres' thought on technology, a word is needed on my approach to his work. Rather ironically, a lot has been written about how difficult it is to write about Serres (see, for instance, Brown, 2002; Morris, 2022; Paulson, 2005; Tucker, 2021). To help with this, Serres scholars have proposed a variety of different ways to unpack his writing. For example, Watkin (2020) approaches Serres through his 'figures of thought', as the repeated intellectual moves that run throughout his body of work and that allow him to move from local examples to generalized global intuitions. Niran Abbas (2005: 1–2) proposes the metaphor of 'mapping' as a way to read Serres as a mapmaker, collecting and combining historical stories, rituals and myths that unfold previously unimagined realities. My attempt in what follows is to offer a way of reading Serres using my own metaphor of 'landmarks', as elements of his text that when viewed together can be used to establish a position within a given territory. In this case, the specific territory is a 21st-century philosophy of technology and the landmarks that help us locate ourselves within this territory are: technology as 'world-objects'; technology as a departure from the body; and 21st-century information technologies and pedagogy.[1]

Using this approach, Serres' ideas are put into more manageable compartments than would be found in his original texts. But the separation of Serres' thought on technology into a set of 'key ideas' to be read in isolation is not what I intend. These themes are meant to be read as opportunities for connections – as way-finding devices with which to approach and mediate Serres' sprawling and highly interconnected philosophical system. It has to be said that in Serres' work we can often feel 'at sea', in more ways than one, given the stories and myths of seafaring that populate his work (famously, Serres served in the Navy and often brings into his discussion topics related to the sea and navigation). One can also feel at sea due to his turbulent writing style that often sees the mixing of ideas from one discipline to another and one time period to another, like waves, rolling

together and colliding. To find a position from which to read these texts, one then needs to find landmarks, which are repeated and developed throughout his body of work. And, like landmarks, the key ideas that I outline in what follows need to be read together. After all, one landmark only has relevance in relation to others. When I was a boy and fishing off the coast with my father, rising and falling on the swell, we would locate on the shore a large white house. We knew we were in our favourite spot when the white house lined up with a tree growing on an outcrop on the cliff edge. This article works in a similar way. I try to disentangle some of the complex landmarks that make up the territory of Serres' thought. The landmarks, as will be seen, are interconnected – one is understood in relation to the others, and directs our understanding of the others – and, because of this, they provide reference points as we think through his philosophical project. Once we have gone through all three, we will be better positioned to understand what Serres offers us in terms of a philosophy of technology. The first landmark is what he calls 'the world-object'.

Landmark #1: The World-Object

Like many philosophers of his era, Serres' thinking on technology was largely a by-product of his experience of conflict, not least the Second World War and the atomic bombs dropped on Hiroshima and Nagasaki. He tells Latour:

> Here is the vital environment of those who were born, like me, around 1930: at age six, the war of 1936 in Spain; at age nine, the blitzkrieg of 1939, defeat and debacle; at age twelve, the split between the Resistance and the collaborators, the tragedy of the concentration camps and deportations; at age fourteen, Liberation and the settling of scores it brought with it in France; at age fifteen, Hiroshima. In short, from age nine to seventeen, when the body and sensitivity are being formed, it was the reign of hunger and rationing, death and bombings, a thousand crimes . . . around me, for me – for us, around us – there was nothing but battles. War, always war. (Serres and Latour, 1995: 2)

Born in 1930, Serres was a teenager during the Second World War, just coming of age and forming memories that permeated through his entire life and that fed into his philosophical project. His staunch pacifism and objection to any kind of conflict was mirrored in his philosophical writing, eschewing the dialectic or any form of critique that would draw him into arenas of conflict in which he had no interest. Serres (1995a: 131) states:

> I am attempting to extricate myself from the hell of dualisms . . . To think in terms of pairs of separated elements is to make ready some dangerous weapons, arrows, darts, dovetails, whereby to hold space and kill. To think by negation is not to think.

Here, Serres first explains his style of thinking, his eschewal of the clean, purified logic of rationality in place of synthesis and creativity, mixtures instead of dualisms. This style of thinking leads to his quite remarkable reimagining of the relationship between objects and their role within the collective that produced them.

In terms of his position on technology, he argued that the technology that led to the dropping of the bombs brought the potential for mass human extinction into clear and

immediate relief. The atomic bomb not only brought about death, but it also caused death to enter into culture in new ways, bringing with it the realization, the first of its type in human history, that civilization, and more than that, humankind in general, was at risk of dying out.

According to Serres, the human collective always involves a confrontation with the object that signifies death. In *Statues* (2015c), Serres writes that the human corpse was the first object that bound together the pre-historical collective. The object, the dead body lying in front of the living, represented a problem and an obstacle. The corpse was an object that, unlike other objects, had no functional use within the community. Unlike wood or stone objects, the dead body could not be owned or used within the community. More than a means to an end, the dead body causes the collective to become aware of itself *as a collective.* This object, this thing separated from its function, now gives the collective something to define itself in distinction to. Over time, the human sacrifice stands in for the corpse, which is substituted by animal sacrifices and later by mortuary objects, by tombstones, by pyramids and by statues. The death that came with the atomic bomb, however, was a new death, one not seen before.

For Serres, the dropping of the bombs was not simply an event that happened in one place and time, but instead an object extended over space and time. As he writes in *Genesis*, another book where this 'landmark' of the world-object appears, 'Hiroshima: the bomb ripped up the vanquished and, since then, has been getting displayed' (Serres, 1995a: 88–89). Weapons, after all, are not just 'used' but also designed to be displayed as objects and markers of the power of the collective that wields them. The bomb becomes an object to be displayed on a global scale, around which human lives are organized. The global object brings with it a global question: What can we hope for in the face of potential extinction (Serres, 2019: 37)? The collective wields the object, but the object ends up determining the conditions for the collective.

We can think of world-objects as an extension of what Serres once called 'quasi-objects', objects like the corpse that draw together the collective and, by this function, become a 'quasi-object' and a 'quasi-us'.[2] In *The Parasite* (Serres, 2007) the quasi-object is introduced to think through social relations. In *Genesis* (Serres, 1995a) the quasi-object is further developed to approach the question of the differentiation of the human. It is the figure of thought that allows Serres to talk about collectives forming out of the chaos of constantly changing relations:

> The only assignable difference between animal societies and our own resides . . . in the emergence of the object. Our relationships, social bonds, would be airy as clouds were there only contracts between subjects. In fact, the object, specific to the Hominidae, stabilizes our relationship, it slows down the time of our revolutions. For an unstable band of baboons, social changes are flaring up every minute. One could characterize their history as unbound, insanely so. The object, for us, makes our history slow. (p. 87)

What, then, does Serres mean by this very general term 'object' and how does it slow down our revolutions, making our history slow? First, the object is a thing around which relations form. It is the object with which Serres approaches the question of the collective and it is through this term that his argument offers us a new way to think about

technology and the politics of living together, which thinkers such as Latour will later pick up and expand. Traditionally, in philosophical language the 'object' is opposed to the 'subject': the subject observes an object – it is there for the subject to use. In this convention, the medieval notion of object continues, the *ob-jectus*, as that which lies before the body and its strength (Serres, 2019: 140). However, for Serres, this distinction is far too dialectic, far too violent. Instead, the subject–object distinction is replaced by a mixture. The collective produces the object, which ends up characterizing the conditions for the collective. The objects in the world – in as much as they take on the role of the quasi-object – have an active role in *stabilizing* social relations, slowing down the radical change of relations. As is well known, Serres gives a number of examples of the functioning of the quasi-object in games, including the button in a child's game of button, button, who's got the button and the ball in American football, rugby and soccer, which dictates the relation between players (Serres, 1995a: 87–95, 2007: 224–234).[3] Serres also tells us that quasi-objects can be those objects formed by religion, by warriors or by exchange. The sacred revolves around sacred objects, the war around weapons and exchange around the value of objects. The appearance of world-objects in Serres' later work ramps this up to species-level.

World-objects are objects that are global in at least one of their dimensions. It is easiest to think of them as objects like atomic bombs, or satellites or the internet. These are very large objects that extend over the globe: the energy and destruction of the bomb; the speed of satellites; the space of the internet. But Serres also argues that technologies that work on very small scales also appear as world-objects. Specifically, he argues that the biotechnologies that are slowly decoding the various genomes and make possible genetic engineering have emerged as another world-object, with the capacity to affect all life, in a way that counters the bomb and its potential for extinction. He writes:

> much as the thermonuclear bomb could be taken as a final world-object, terrifying for its destructive power, we can consider the set of these algorithms [of biotechnology] to be an initial world-object, that of creation. Soon we shall hold in our hands the birth of the individual, of his fellow human and of his others, of species as well perhaps and therefore the production of ourselves and of our own race. We will cause ourselves to be born, here and now. (Serres, 2019: 37)

The set of genetic mapping technologies and the discoveries that they promise represent another world-object, one that stands exterior to the global collective and has the potential to allow humans to both map, and eventually have at their disposal, the means of creation and evolution. With these two world-objects, Serres sees creation and extinction, life and death, entering into culture in new ways. Because humans begin to now master both genetics and the bomb, we have seized the two poles of our destiny, our birth and our death, and this, according to Serres, changes our status as humans.

Landmark #2: Appareil/Appareillage/Setting Sail

Another 'landmark' that can be used to find our place in Serres' philosophy of technology is the notion of 'setting sail'. The French for 'machine', for 'instrument' and for

'device' shares the common term *appareil.* For Serres it is no coincidence that this term can also refer to an aircraft and, what is more, is etymologically related to the word *appareiller* or *appareillage*, the French for 'to set sail'. From this, Serres takes it as etymologically suggested that a machine or an instrument invents a system that sets sail from the body. Technology, for Serres, signifies not just an extension of the body but a departure from it, in as much as it signifies a departure from the time of natural evolution, as stressed by the landmark of the world object and the disturbance to life and death that it signifies. He writes:

> This stone serves as a hammer in place of the fist, more fragile but serving as a model, and this lever externalizes the forearm . . . Thus a sort of *appareillage* [setting sail] took place and always takes place, in every sense that can be given to this word which evokes at the same time the devices [*appareils*], their like [*pareille*] resemblance to the body functions and the putting at a distance of these functions, their externalization, that loss of parts of our body into fabricated objects tossed at random into the world. (Serres, 2019: 40)

Serres' description of *appareillage* here is key to what he calls exo-Darwinism and the associated process of hominization. In order to develop this description and the notion of technology as an externalization of the human, Serres draws on the work of Leroi-Gourhan, who first introduced the manner in which humans exteriorize the functions of their organs.

In *Gesture and Speech* (1993), Leroi-Gourhan revised quite radically the supposed limits of the human and the myth of homo–*singe* through his account of evolution and technology. The event of upright posture, when the vertebrate body plan no longer walked on all fours, for Leroi-Gourhan signalled a moment when the hands became free to take on other tasks, like carrying and fashioning objects. The face also changed proportions, no longer needing large teeth to grasp and carry objects as it had previously. And this, for Leroi-Gourhan, is the moment when the human begins to emerge:

> freedom of the hand almost necessarily implies a technical activity different from that of apes, and a hand that is free during locomotion, together with a short face and the absence of fangs, commands the use of artificial organs, that is, of implements. Erect posture, short face, free hand during locomotion, and possession of movable implements – those are truly the fundamental criteria of humanity. (p. 19)

The conditions for tool use, facial expression *and* language are, according to Leroi-Gourhan, established by the event of erect posture, thus providing the conditions for neurological development. We read here that, instead of intelligence and brain size, it was the body, the mechanical relations between its parts, its mobility, the way functions were exteriorized and given to other body parts, the hands freed from walking, the mouth freed from grasping and carrying, that provided the conditions for the emergence of the human configuration as we have come to know it. This is Leroi-Gourhan's major contribution to Serres' thinking and to the philosophy of technology in general, particularly the French approach.[4] Technology externalizes functions and thus leaves the original to take on new roles. What is more, technologies, once they depart from the body, also evolve on their own, in a process of exo-Darwinism. The use of the term *appareillage* is a move that allows

Serres to discuss technologies as exteriorizations that begin to evolve in place of the human organs that they substitute. He sums this up: 'what we shape and think we master departs to seek its fortune in the world, being born to a life of its own' (Serres, 2020: 102).

Like a boat departing from the harbour, our organs, now artificial, go out to 'seek their fortune in the world' (Serres, 2020: 143). In this, Serres wants us to look at technological objects and processes not as dead objects opposed to living subjects, but as parts of our own body, externalized and now independently evolving.

As Serres (2019: 39) writes:

> it took millions of years for birds to grow wings and feathers; in a few months, we build an aircraft. This gain in time defines technology fairly well. The invention of the first tools caused us to leave evolution so as to enter into culture.

Because of this, humans now risk disappearing less and therefore changing less. Reptiles once grew lateral outgrowths that became wings and, because of this, certain reptile bodies disappeared as others came into being. For humans, however, an emergence like this happens on the side of technology, not on the side of the organic body: 'once the airplane is made we embark; when making a tool is enough, the body changes little if it uses the tool' (Serres, 2019: 39). This marks the human exit from evolutionary laws as tools start to change much faster than our bodies had previously. But in a type of feedback loop that Serres refers to as hominescence, the technologies that once insulated us from evolutionary change start to force the body to adapt. The city dweller, for instance, becomes soft, less muscular than the country dweller.

All of this sounds familiar to those of us who are aware of the arguments playing out over the last 50 years or so about technology forming, conditioning, or setting the scene for the becoming of human subjects, from Marshall McLuhan to Friedrich Kittler, from Don Ihde to Bernard Stiegler. Is Serres then just re-treading the old ground of media theory, to explore how technology impacts the way we think? In *Hominescence* (2019), what Serres offers that is unique is a focus on the physical human body and specific local emergences, such as changes in the body including our relationship to sickness, pain and death. Rather than addressing technology and epistemology, which has so powerfully been addressed by Stiegler and has also been a highly visible trend in media theory, Serres focuses on humanness per se. He is interested in the relationships and the bodily experiences of the world that he sees as prefiguring consciousness (see, for instance, Serres, 2008). Serres lists a number of examples to show the way technology has begun to 'remake' the human, beyond simply providing the conditions for the possibility of thought: The average height of a human in an industrialized country has increased by nearly four inches, with a small measure being added each generation. The average life span has been extended by decades. The pain and illness previously associated with being human has changed dramatically. Not only have technologies set sail from the body, throwing our functions out into the world, but they also return to the body and enable it to change in tangible ways.

If, as already mentioned, for Leroi-Gourhan (1993) the freeing of the hands made it possible for the mouth to be used for other things, then for Serres the technologies that externalize our functions also, and more powerfully, have the capacity to drive

evolutionary change. For Serres, once humans begin to invent tools that start to form an environment for living, they are differentiated further from other societies and, at this point, the point at which tools enter into the time of evolution, humans start to escape. They escape nature and become active architects of their own naturing, their own life and their own death.

As is seen when this landmark lines up with the previous, the tool, both for Leroi-Gourhan and for Serres, is not simply a solution to a problem. Instead, the tool itself *poses* a problem. The tool creates a disturbance in the collective, a change to the way things are done, and, in doing this, through its participation in an environment that is already constructed by other tools, acts as an *invitation* to evolve. Serres (2019: 37) writes:

> Of course, evolution moves by mutations, but also by selective pressures set up in and through the environment. Begun millions of years ago, the original process of hominization experienced the first of its splits when in making tools, we began to construct our own environment . . . When this human environment took on a density compact enough to become a world unto itself alone, it acted upon, as though in return, the very population that had produced it, through a feedback loop that's now well understood. So in sum, we construct our bodies through the intermediary of the products of our body since technological objects set sail from it. Thus, hominization doesn't resemble so much vital evolution as a production by us . . . we construct ourselves.

This passage can be read as a response to the lamentation that we alienate ourselves more and more from life by depending on manufactured technologies. For Serres, it is precisely the opposite: technology is a product *of our* body that in turn begins *to produce our* bodies. Or as Leroi-Gourhan (1993: 246) puts it:

> generally regarded as historical phenomena of technical significance, the invention of the four-wheeled carriage, the plough, the windmill, the sailing ship, must also be viewed as biological ones – as mutations of that external organism which, in the human, substitutes itself for the physiological body.

The human lives and changes within the environment created by tools, which act as external substitutes for parts of the body. Serres (2018) calls this process 'hominescence', which he describes as a progressive liberation from the laws of natural evolution. Hominescence is now a product of the exo-Darwinism of technology, which evolves in place of our bodies. These technical objects, once evolved, return to the human and characterize their hominization. Technology, understood as more than just its practical finalities, for Serres sculpts the human by 'sculpting its time, its habits, its customs, its morality' (p. 47). Technology that was once designed to substitute for the body – the hammer for a fist, the knife for teeth – now, according to Serres, separates from the body, only to later return to it changed.

With these two landmarks in view, we can now say that, for Serres, after the last world war and the invention of world-objects, the question of being was transformed for philosophy. What can be called the 'human condition' is not – and is revealed to never having been – able to be thought of as a condition prior to technologies, the deviations that they cause from the time of biological evolution, and the worlds that they bring into

being. Instead, in Serres we can see no essential human condition apart from that which is produced by the relations between nature and the bodies of others, mediated by technologies and communication channels. Because of this position, he is then able to argue that the human relationship to time is governed by technologies that have accelerated evolution. Technologies and the relationship that they condition – to death and to life –have in Serres' eyes *invented* the human. If we line up these first two landmarks we see that the theory of the quasi-object, first appearing in Serres' (1982) early *Hermes* work, then significantly expanded in *The Parasite* (2007) and *Genesis* (1995a), comes to full fruition in the way that it directs his thinking about technology as world-objects and the process of hominization, where our tools set sail, acting as both quasi-objects and quasi-us.

From the position that these landmarks establish, it could also be said that the blind spot for Serres is thinking explicitly about those humans that do not use technology in the way that others do. At first reading, we could say that the manner in which disability, gender and race effect an individual's relation to technology is not really addressed in any serious way in Serres' account. What happens, for instance, when the quasi-object of, say, social media apps, excludes members of society, due either to technical constraints, local political contexts, the mobilization of aggressive ideological views or levels of digital literacy, amongst other things? What happens when the rugby ball excludes a certain group of players? What happens when the quasi-object of the online video lecture excludes certain students because it does not meet their access requirements? Like Leroi-Gourhan (1993), Serres imagines an able-bodied, normative, synoptic picture of the human as a tool user, entering into a process of hominization.

Even though he does not go into fine-grained detail around access and exclusion, this may be beside the point of Serres' analysis. Though he does not discuss the stakes for differently abled users of technology and those occupying increasingly marginal positions due to imbalances of technological power, there may well be something different that Serres offers to these discussions. Due to the way he asks us to conceive of the relationship between the use of technology and the condition of being human, Serres does provide the opportunity for philosophers of technology to take his work further and to argue that these very exclusions, sometimes produced by, sometimes amplified by the design of technology (for example, lack of accessibility or biases in software algorithms), is a continuation of the process of hominization. The hard-felt exclusion and divisions exacerbated by technology – synonymous with the critical discussions of the so-called 'Fourth Industrial Revolution' – are a continuation of technology making us human by, in this case, creating a humanness that is based on divisiveness and polarization. After all, the way that technology is making us human is not necessarily the way that technology *ought* to make us human – it is the task of philosophy to ask this question. For Serres, the imperative is to be conscious of what technology is doing to humans and for philosophers to ask ourselves what we want it to mean to be human in the 21st century.

Landmark #3: Information Technologies

In *Hominescence* (2019), Serres explores the way technologies can remake the human body; in *Thumbelina* (2015a) and *Branches* (2020), he addresses human intelligence and education, which (implicitly)[5] takes the already mentioned discussions in media theory

and asks, *if we know that our technology changes the way we think, how do we need to change our practices of education and of reasoning*?

It has become something of a common place to say that if technologies, such as the wheel, the hammer and the lever, externalized physical operations of the body, information technologies, such as writing, externalized functions of memory. Critical thought on inscription technologies almost always traces a tendency of thinking about memory technics to Plato and the legacy of his thought about writing and forgetfulness. For Serres, the externalization of memory raises a different question from that which will ultimately lead to Stiegler's (2010) and Derrida's (2016) *pharmakon*. For Serres, the question is not whether the externalization of memory is positive or negative, or both, but instead is related to the new knowledge and new types of pedagogy that this externalization necessitates. This is Serres' *anticipatory* thinking, moving from critique to the anticipation of the new scenes for knowledge to come. Just as the wheel, by externalizing the hips, knees and feet, produced a more powerful means of transportation, the externalization of memory makes it function more powerfully and, in addition, frees up the mind to do other things – this process of externalization, as organs set sail from the body, is a process of exo-Darwinism by which the body is made lighter, able to move and think faster (Serres, 2011: 119). Children of the digital age think fast; they access and analyse local examples in ways and speeds that were previously impossible. For Stiegler this results in his lamentation of hyperattention. For Serres, the task of philosophy is not to dwell on what is lost, but instead to form the conditions for new practices in this new context for learning and thinking. In other words, Serres focuses on the implications for what we do as educators when we meet young adults in classrooms. He states:

> we face a formidable deluge of details, information, observations, and data in general. As a result, together with a new concept of reason which is losing some of its abstraction, a new objective collective memory emerges, which tends to replace the subjective memory that is disappearing fast. (Serres, 2015b: 11–12)

Serres here puts in his own words the contemporary discourse that has emerged in memory studies and digital media studies (see, for instance, Garde-Hansen et al., 2009; Hoskins, 2017). The move that Serres makes which is most interesting, and that adds substantially to existing knowledge in this field, is the claim that with the loss of memory come possibilities for new functions and new ways of thinking. In *Branches* (2020), Serres sets out what is at stake when humans no longer need to think in terms related to the economy of memory:

> To understand thousands of examples, we have less need for a concept, whose ultra-economical memory we leave a little. Inscribed in the machine, a thousand algorithmic procedures permit us to construct and directly envisage the wealth and detail of singularities, consequently not planed down. (p. 178)

The declarative thought previously dominant in the West invented concepts and ideas with which to understand examples. Conceptual thought was economical because one only needed to retain the concept in memory and not the countless examples to which it

applies. Our new types of students can access and manipulate several forms of information at the same time but, according to Serres (2015a: 6), 'they neither understand it, nor integrate it, nor synthesize it as do we, their ancestors. They no longer have the same head.' We know from the cognitive sciences that using the internet, consulting Wikipedia, or writing text messages does not stimulate the same neurons or cortical zones as reading a book or using a chalkboard or notebook. Serres extends this by arguing that, when the work of memory is taken over by the computer, we have less need for a concept and are free to deviate from the old format. The potential exists to think differently, to think in a way that was previously impossible.

The upshot of all of this for Serres is that changes in technology require changes in education. The Greeks invented pedagogy along with writing. This then changed with the printing press, at which point it was more important to have a 'well made' rather than a full head, as Montaigne once said. With the printing press, accumulated knowledge became objectivized, now able to be searched through on the bookshelves. With the internet more so (Serres, 2015a: 19). We no longer remember the location on the bookshelf, now helped along by a search engine.

Surprisingly though, for the philosopher that radically reimagined communication as parasitic exchange, Serres does not, in this description of the new context for thought, talk about the design of search engines, the power of technology companies, the danger of algorithmic control or the economics of search hierarchies. In Serres' description, he is less interested in technical functioning – less interested in the impact of the new technological context for the information theoretical model – than he is in the experience, for a human, of forming knowledge. What Serres is interested in is thinking about the ritual practices of individuals being in the world – he is interested in the local expressions of life and what it is to be alive and learning – rather than arguments that knowledge online is subject to the dynamics of digital capitalism. As Serres well knows and as has been expressed in his research into myths and parasitic relations, knowledge, both in the contemporary and the ancient world, has always been related to ownership.[6] But what Serres does that is unique, particularly in *Thumbelina* but also in *Branches*, is to give us a different account of the relation of technology within this system by looking at personal, local practices. His focus is on process, on what is possible, rather than the critique of determining systems. He starts from the local in order to carry out what he sees as the philosopher's task: not to critique, but *to anticipate knowledge and practices to come* (p. 15).

For Serres, both in his philosophical project and also the changes that he sees ringing through the 21st century, knowledge changes because we now value the singular, the local example, rather than the concept – which he otherwise derogatorily cites as the process carried out by 'umbilical' disciplines, which set up central, dogmatic unifying concepts through which all examples are assessed.[7] As Serres writes, students can now access and organize a vast amount of examples online, lingering in these local narratives, not having to extrapolate a concept for the sake of economy. With this relatively newly acquired access to information, the difference between examples can be preserved, rather than the many reduced to the one. No longer needing to be cut up by reason, rather than declarative thought privileging the singular, Serres argues that life can now be thought as it exists in multiplicity.

When this landmark of 'information technologies' is lined up with the landmarks of 'the world-object' and 'setting sail', we begin to get a picture of Serres' position. There are now objects that have enlarged in a process of globalization, as humans move to inhabit a global niche and as action and knowledge increase towards the universal (Serres, 2019: 145). The new world-objects, externalizations of characteristics that were once experienced locally, by our own bodies, have now been designed that, little by little, have formed a new universe. 'A satellite, for speed, an atomic bomb, for energy, the internet, for space, nuclear waste, for time' (Serres, 2019: 139). These objects, each of which has at least one global dimension, are now inhabited like we do our world, and in turn change our relationships to our own bodies and to the way we learn, act and think. Just as hard technologies have changed our bodies, soft technologies – the technologies of inscription, storage, data processing, and search and retrieve – now, as Serres anticipated, require that we change our institutions for knowledge, not just by using these technologies in the classroom but by more radically changing the way we conceptualize knowledge in the first place.

Conclusion

In this article I have teased out and lined up three landmarks to explore the topic of technology in Serres' work. The first landmark showed us how Serres understands the technological world-object. Here Serres argues that technological objects on a global scale start to allow humans to control their evolution and their relationship to health, pain, life and death. The second landmark demonstrated how Serres understands technology as more than an extension of the body (as McLuhan would) and more than a limit of the body (as Kittler does), but as a setting sail, or a departure from the body. Technology such as the sledgehammer allows the function of driving a stake into the ground to leave the body. Technology like the internet allows functions like memory to leave the body, to happen somewhere else. The third landmark was Serres' exploration of the ways objects have changed the new generation of students that now learn and think differently, and thus need to be taught differently. Put together, these three landmarks give us a picture of a thinker for whom technology acts as a drawing together of a collective by causing a disturbance, creating deviations and determining a relation with the environment and a differentiation from others outside our temporal niche. These new formats will allow a new generation to learn in ways that his and my generation never knew, but it also brings into relief the multiple times that people with different relations to technology live within and the exclusions that are currently, sadly, making us human.

Notes

1. Someone with a different ambition could use this approach to introduce different landmarks – say of noise, of interdisciplinarity, or of pollution, read alongside the landmarks identified here – and might find themselves mapping a different territory of Serres' thought altogether.
2. The quasi-object has been discussed extensively in Michel Serres' inspired scholarship, most notably in Latour (1993). For an excellent introduction see Watkin (2020: 310–318).
3. For more detail see Brown (2002: 21–24).

4. In addition to Serres, Leroi-Gourhan's influence can be seen powerfully in Stiegler's work on techno-genesis.
5. Implicit because Serres has a distaste for using references to any outside work in the field.
6. In *Angels: A Modern Myth* (1995b: 190), for instance, Serres discusses the uneven relations between the developed and developing worlds, and their access to global networks of communication. In *Branches* (2020: 3–6), he discusses balance sheets, accounting and the formatting of information in Renaissance Mediterranean commerce. In *Hominescence* (2019: 41), he discusses the racism implicit in the old story that history begins with writing.
7. For more on umbilical thinking see Watkin (2020: 38).

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