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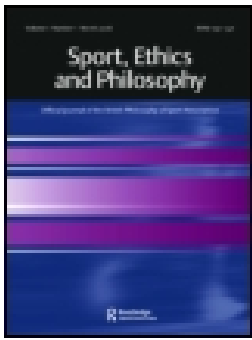
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# Sport in an Algorithmic Age: Michel Serres on Bodily Metamorphosis

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## ABSTRACT

The algorithm has become an increasingly important concept in understanding human behavior in recent years. In the case of sport, human bodies are seen as superficial to the driving force of the algorithm, whether it be genetic, behavioral or surveillance-technological algorithms (Harari 2015, 2020; Zuboff 2019). However, the French mathematician and philosopher Michel Serres (1930–2019) structurally relate algorithms to sports and bodily experience at multiple places in his oeuvre. According to Serres, sport actually enables us to reprogram and rewrite our behavior, moods and thoughts, and therefore modifies our algorithmic status (Serres 1999, 2019). Against deterministic conceptions of the body, Serres argues that human bodies possess a ‘metamorphic’ nature that is similar to the procedural character of computer programs. This paper investigates the relationship between the algorithm and bodily existence through a reading of both Harari and Serres on sport. It will be argued that, against deterministic conceptions of the algorithm, the algorithm can actually broaden an understanding of the role of sports and physical activity.

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## Introduction

Due to the emergence of the concept of the algorithm in the fields of computer science, machine learning, neuroscience, biology and behavioral studies, also within the philosophy of sport we can see the algorithm showing up. For example, John-William Devine (2021) argues for the virtue of a captain to judge, claiming that ‘no algorithm’ is able to decide what a sports’ captain should do in a complex situation. Evans and McNamee (2021) argue that data collection with nano/biosensors in horse racing exposes the sport to corruption and technological determinism, and that the use of algorithms also could make the sport more predictable and therefore reducing the elements of ‘intuition and luck’. Whereas in the context of the participation of trans and intersex athletes, Sailors (2020), Teetzel (2020), as well as Cathy Devine (2021) discuss the desirability for an algorithm that would sort athletes into multiple categories in order to obtain fair

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competition, based on 'socioeconomic status, gender identity, and physiological factors' (Sailors 2020, 428). And lastly, Breivik (2019) suggests that enhancement in sport opens up the more general question whether a longer, more successful and healthier life comes 'at the cost of being increasingly controlled by algorithms and artificial intelligence'. All taken into account, it is safe to conclude that the conception of the algorithm within the philosophy of sport is a rather deterministic one. Algorithms are seen as predictors and controllers of behavior, and therefore they threaten human values or virtues such as autonomy, intuition, unpredictability, fairness and freedom that we can find within sportive practices.

In viewing algorithms as determining or constraining human life, philosophers of sport join their view with popular theorists of the algorithm, such as Harari (2015) and Zuboff (2019). A key element within Harari's work is that algorithms are in control of human behavior and, therefore, we should carefully examine the nudging effects of the algorithms from big tech companies or national states. Zuboff argues that we are now in an economic order of 'surveillance capitalism', in which big tech companies parasitize on 'human experience' as 'free raw material for hidden commercial practices of extraction, prediction, and sales' (Zuboff 2019, 9). For Zuboff, surveillance capitalism always comes with two texts: the seductive algorithm that makes people click, swipe and scroll, and the 'hidden' algorithm that accumulates a surplus of data that 'says more about us than we can know ourselves' (Zuboff 2019, 185).

Within the above sketched authors, the concept of the algorithm consists of three main theses. Firstly, algorithms work *deterministically* in the sense that, *given* the algorithm, a person or a thing *must* behave or move in a certain way, or *must* have a certain experience. Secondly, the algorithm is *hidden* in the sense that algorithms are active on exactly those (biochemical) levels which human experience is unable to access. Finally, knowledge of the algorithm is considered to be *domain-specific* or *specialistic*, in the sense that machine-learning specialists, biochemists or econometrists are the only ones to provide us with the key to understanding the algorithm.

In a couple of his works, the French mathematician and philosopher of science Michel Serres (1930–2019), develops an understanding of the algorithm that rejects the view that algorithms work deterministically, are unable to be accessed and need specialist knowledge. Serres traces back the origins of the algorithms within Egyptian and Babylonian traditions, where algorithms expressed not deterministic laws, but *procedures* for a specific problem, such as measuring the height of a pyramid. Serres coins the term 'Algorithmic Thought' for a more step-by-step, embodied, and elastic way of reasoning, and contrasts this to 'Declarative Thought', associated with fixed axioms, laws and non-locality. Whereas the algorithm consists of elemental instructions for the execution of a procedure, algorithmic thought is in fact tightly linked to the body (in 'executing') and sensory capacities (in 'being instructed'). In addressing this link between algorithms and embodiment, Serres characterizes sport, exercise and training as procedures for the transformation of our sensory capacities and bodily constitution. Instead of developing skills or qualities of character, Algorithmic Thought views training and repetition as developing the body's capacity for 'metamorphosis' into another body and to mimic the bodies of other animals.<sup>1</sup>

In order to deepen the understanding of the relation between sport and the algorithmic age, I flesh out two readings of the algorithmic athlete by making use of Harari and

Serres. Firstly, in order to reflect on prevailing readings of algorithmization, I present Harari's reading of the football player Mario Götze, scoring the winning goal in a World Cup final. According to Harari, this example from sports reveals that our emotions are determined by biochemical algorithms. I then argue that Harari's conception of the algorithm reveals a quite common, but ultimately instrumentalist view of human behavior, in which the lived and living body is seen as a vehicle for overarching programs. Secondly, I introduce the work of Michel Serres as an alternative way of relating embodiment to algorithmization. Here, I briefly describe what Serres considers as the 'Algorithmic Thought' of local procedures, in contrast to the more common 'Declarative Thought' that considers individual behavior as a demonstration of a general law. I then relate algorithms to bodily existence by considering the role of the body in mathematics, and present some of Serres's texts as illustrations of algorithmization in the context of physical activity, training, sports and enhancement. I conclude that, unlike Harari's reading of Götze, sports provide us with multiple ways of coding and programming ourselves through repetition, hence opening up a new discourse on the relation between algorithmization and sport beyond an instrumentalist view.

### *The Algorithmic Body in Harari*

Perhaps, the most well-known author on algorithmization is the historian Yuval Harari.

In his best-selling book *Homo Deus*, the historian Yuval Noah Harari sketches the future of humanity as being increasingly dominated by algorithms developed by big-tech companies and governments. It has already been argued that Harari's work is famous for its sensationalism and its fatal errors (Narayan 2022). However, my reason to discuss and criticize Harari's view of the algorithmic body is twofold: it offers the reader an example of a prevailing conception within the philosophy of sport of the algorithm as determining human existence, and it introduces the algorithm in a concrete sporting context, as Harari does with the football player Mario Götze.

An algorithm, according to Harari, is 'arguably the single most important concept in our world' (Harari 2015). He describes the algorithm as a methodical set of steps for a desired outcome, like a recipe for making soup (Id.). Where the soup-recipe is in need of a person with sense organs and hands to transform the ingredients into a hot and spicy soup, the human body can also be regarded as a recipe *itself*: 'a much more complicated algorithm than the vending machine, no doubt, but still an algorithm', Harari explains (Id.). What human bodies, being algorithmic bodies, produce are 'copies of themselves', meaning sexual reproduction (Id.). Like the algorithm that is controlling a machine through mechanical gears and electric circuits, Harari writes:

'[t]he algorithms controlling humans work through sensations, emotions and thoughts'.

And:

[. . .], [T]he most up-to-date theories also maintain that sensations and emotions are biochemical data-processing algorithms. (Id.)

Here, Harari's confusingly states that a.) human beings are algorithms, and b.) human beings are controlled by algorithms. Regarding a.), he claims that 'over the last few decades biologists have reached the firm conclusion' that a human being *is* an algorithm,

and therefore the identity of a human being lies in its being an algorithm (Id.). However, b.) suggests that the life of a human being is subordinated to something (an algorithm) that is not that same human being. Harari tries to avoid this confusion by stating that, similar to artificial machines, “in humans many sensory and emotional brain circuits can produce data and initiate actions *completely unconsciously* (Id., italics mine). According to Harari, human beings are algorithms in the sense that most of our emotions and actions are the outputs of a ‘biochemical algorithm’ at work in our bodies: an algorithm of which we are completely unaware.

In order to give the reader a sense of her pre-programmed and algorithmic body, Harari proposes to experience the same feelings as the football player Mario Götze. Götze scored Germany’s winning goal in the extra time of the 2014 World Cup Final against Argentina. Harari writes:

You stop the ball with your chest, it drops down towards your leg, you give it a kick in mid-air, and you see it fly past the Argentinian goalkeeper and bury itself deep inside the net. Goooooal! (Id.)

According to Harari, all these skilled actions—stopping the ball with the chest, letting it drop and kicking it into the goal—do not result from conscious decisions, but from a biochemical algorithm that acts on the brain circuits that cause the movements of the limbs. Besides, this algorithm, which ultimately seeks to produce copies of itself, is the driving force behind his conscious experience of having pleasurable feelings when scoring the goal. In this situation, the reader is supposed to experience that the stadium explodes, that team-mates are rushing towards her, and that millions of viewers are going nuts. According to Harari, these events are fully ‘external’ and do not affect our ‘internal’ emotional state. ‘You are ecstatic’, he states, but ‘[y]ou are actually reacting to the storm of sensations *within you*. Chills run up and down your spine, waves of electricity wash over your body, and it feels as if you are dissolving into millions of exploding energy balls’. (Id., italics mine) Scoring the decisive goal in a final is actually not necessary for having these sensations.

Harari’s argument for excluding the bodily act of scoring from our emotional state is that we experience similar sensations as Götze in other situations, such as when we get promotion at our work, and hence, circumstances are inessential for having bodily sensations. This argument is also supported by the fact that the situation in which someone got fired, but still feels happy due to stimulants, is a real possibility. ‘The deeper parts of your mind know nothing about football or about jobs. They only know sensations’, Harari states, again arguing that inner sensations are more real than the situation we are involved in (Harari 2015). According to Harari, the strength of a pleasant sensation, temporary in its very nature, diminishes over time, and can even turn into an unpleasant one. This explains that successful persons are constantly looking for new goals or promotions in order not to ‘end up far more bitter and angry’ than humble ones (Id.).’

The seemingly necessary condition of life that we cannot be satisfied with our current situation, but are constantly heading for new kicks, according to Harari, is due to our evolutionary history. ‘The biochemical system rewards actions conducive to survival and reproduction, not our happiness’, Harari writes (Id.), arguing that, because the momentariness of these sensations is evolutionarily advantageous, the pleasurable sensations from

food and sexual intercourse are only momentary, Harari places this mechanism within our neural organization:

When an animal is looking for something that increases its chances of survival and reproduction, the brain produces sensations of alertness and excitement [ . . . ] (Id.)

Now, it seems rather puzzling why Harari states that the ‘biochemical system’ is in fact ‘the brain’ that ‘produces’ our sensations, when he had previously discussed our ‘bodily’ sensations. Bodily sensations, such as feeling the rising of heartbeat or goosebumps on our skin, namely, seem to involve more than the nervous system alone. Especially in the explanation of the case of an athlete (Mario Götze), who is running towards the crowd and his teammates, it seems a little blunt to ascribe such activities to ‘the brain’. For Götze, his emotional reaction concerns his whole body that is in fact running and overwhelmed by the crowd.

In the philosophy of neuroscience, the ascription of the person’s emotional state *as a whole* to (parts) of the brain is considered to be a mereological fallacy, because it mistakenly ascribes properties to the parts that belong to the whole (e.g. ‘the brain thinks’ or ‘the hippocampus remembers’) (Bennett and Hacker 2003). However, Harari concludes from the scoring athlete that ‘[i]f science is right and our happiness is determined by our biochemical system, then the only way to ensure lasting contentment is by rigging this system’ (Harari 2015). Circumstantial factors such as economic growth, social reforms, and political revolutions are therefore completely redundant: ‘in order to raise global happiness levels, we need to manipulate human biochemistry’ (Harari 2015). Here, Harari neglects the existing literature in the philosophy of medicine that critically reflects the growing emphasis on self-governmentality in Western societies and links this tendency to ascribe shared moods to the brain of the individual to (neo-)liberal political ideology (Dehue 2014; Foucault 2009; Povinelli 2016).

In sum, Harari’s argument runs as follows: due to the fact that our bodies are controlled by biochemical algorithms, our experiences and sensations are epiphenomenal to our bodily states. Granting that we are not aware of many bodily processes, such as the firing of our nerve cells, the growing of our hair or the division of skin cells when a wound is healing, it is tempting to follow Harari’s claim that our bodily existence is the result of biochemical algorithms. However, we can also be very much aware of bodily processes, such as the rising of our heartbeat or the digestion in our intestines, let alone our emotions and actions. In such cases, the claim that human bodies are being controlled instrumentally by their biochemistry neglects the fact that the experienced or lived body is itself an indelible dimension of human bodies, as has been stressed out by authors such as Husserl and Merleau-Ponty.

Regarding the instrumental status of our bodies, Harari remarkably refers to René Descartes who considered animals as ‘mindless automata’ like robots or vending machines in the 17<sup>th</sup> century. Even today, Harari observes, there are many people who argue that animals have no consciousness at all or an inferior kind of consciousness. In this sense, we can read Harari’s claim that the human body is an evolutionary algorithm just like other animal bodies, as emancipatory to animals and consistent with modern day studies on animal consciousness. However, when animals are controlled by biochemical algorithms too, we can seriously question whether Harari’s theory does more justice to

the capacities of the animals for having emotions and thoughts than the 17<sup>th</sup> century view of the (animal) body as a machine.

Furthermore, Harari's claim of the organism as determined by an algorithm in the brain is itself still a residue from 17<sup>th</sup> century mechanistic thought. Descartes, namely, already claimed in parts of his *Meditations* and in *Treatise of Man* that our brain, like a puppet player, directs the movements of the lower body, leaving the rest of the body subservient. This kind of neurocentric thinking is still emphatically present in *Homo Deus*, in which Harari claims that brain circuits create both consciousness and behavior of human beings, leaving its situatedness within a living body and within a socio-material environment aside. Furthermore, Harari adopts 17<sup>th</sup> century mechanistic views in which bodies, or more generally, matter is determined by natural laws. Matter in itself is solid, inert, passive and motionless. Bodies lack creativity, autonomy, freedom and are in need of an external ruler, e.g. God, the state, or a biochemical algorithm which puts them into motion.

Lastly, Harari's theory of the algorithm that controls the behavior of the human being, while the human being is unaware of being controlled, seems much indebted to the radical behaviorism of the American psychologist B.F. Skinner (1904–1990). Skinner regarded human beings as organisms that produce behavior from the viewpoint of an observer. It is the psychologist's task to observe, predict and control human behavior, just like the natural scientist. For Skinner, our experiences of freedom or knowledge have to be regarded as ignorance over the real causes of our behavior, the natural laws that guide our bodies (Skinner 2002). In her book, *The Age of Surveillance Capitalism*, Shoshanna Zuboff describes the influence of Skinner on tech companies like Apple, Facebook, Google, Microsoft and Twitter. According to Zuboff, for the last decade, the economic logic has shifted from production and consumption to the modification of human behavior via hidden algorithms. This has the dramatic consequence that 'the dream of a technology of behavioral prediction and control—for which Skinner had endured such public scorn—is now a flourishing fact' (Zuboff 2019, 381). Whereas Zuboff is very critical of Skinner's view on human beings, and her analysis is historical rather than biological, both Harari and Zuboff underline that human freedom is waning through algorithmization.

### **Michel Serres's Algorithmic Thought**

In the previous section, it was shown that the relationship between algorithms and embodied human beings was seen as instrumental. Algorithms were presented as an overarching principle, sufficient for controlling and governing the movements, experiences, thoughts and emotions of human beings. As a consequence, the constituting role of the body and its experiences, its variations and adaptations for the identity of human beings is neglected. In this sense, the algorithm can be considered as a hostile parasite that feeds on human existence, as Zuboff does in her criticism on surveillance capitalism (Zuboff 2019).

Instead of moving away from the concept of the algorithm, in the remainder of the text, I will argue against instrumentalist accounts of the algorithm and claim that algorithms actually enhance an understanding of bodily existence. Irrespective of Harari's deterministic understanding, algorithms can also emphasize the variations of using our body and offer a possible constitutive role of sports for dealing with complex issues, such



as surveillance capitalism, migration, waste and planetary disruption. In order to substantiate this claim, I will consult Michel Serres's writings on both the algorithm and the human body.

Algorithms play an important role in the philosophy of Michel Serres (Watkin 2020, 78; Bühlmann 2021, p. 76). For Serres, the birth of algorithms within mathematics reveals a different method in gathering knowledge of the world than the Platonic-Cartesian method of establishing general laws. Serres retrieves an algorithmic way of reasoning in the philosophy of Leibniz and traces it back to its origins in Babylonian (c. 2500 BC) and Egyptian (c. 1550 BC) mathematics, long before the Greek mathematics of Euclid (323–283 BC) and Pythagoras (570–500 BC). Serres writes:

Algorithm: contrary to appearances, the word does not come from Greek but from Arabic and means: a finite sequence of elementary operations for a calculation scheme or the resolution of a problem. (Serres 1989, p. 85n)

The algorithmic way of reasoning can be regarded as such: knowledge of the world is gathered by a sequence of singular steps and, as a consequence, knowledge is itself an operation on the world. Serres explains that algorithms ('operations') differ from axioms, in the sense that algorithms instruct how to solve local problems without necessarily establishing universal laws, as axioms do. Algorithms perform procedures on singular inputs and *transform* them into singular outputs or results (Watkin 2020, 78).

According to Serres, Algorithmic Thought has long been overshadowed in Western thought by 'the gigantic Greek construction of Euclidean geometry' (Serres 1993, 136). Within classical Greek geometry, particular objects are seen as instantiations of universal axioms under which they can be subsumed. The strategy to move from the local to the global therefore lies in the declaration of a general law. Local phenomena take part into or adhere to a single universal mathematical model, namely geometry. The Declarative method of Greek geometry was adapted in early modernity by the mechanistic thinking of Descartes and Newton, and can be characterized as universalistic, conceptual and rule-based (Serres 1968b, p. 219, 1993; Watkin 2020, 77). In contrast, a main characteristic of a Serresian take on algorithms is that they gather knowledge without establishing universal laws. Algorithmic thought, according to Serres, 'builds itself case by case and little by little, moving from the local to the global, without invading the universe all at once, like law does' (Serres cited by Watkin, p. 81). Algorithmic thought operates in the world with fast, subtle and local transformations, instead of demonstrating absolute and abstract clarity.

With re-instantiating Algorithmic Thought and its procedural method, Leibniz rediscovered around 1700 'a new world' consisting of new dimensions, relations and constructions 'without institutional objects, without already occupied niches defended tooth and nail' (Serres 1993, 242; Watkin 2020, 79). The second rediscovery of Algorithmic Thought took place in the twentieth century by Alan Turing, with the Turing machine that was able to perform operations itself, and by the French Bourbaki Group that introduced the notion of mathematical *structures* that replaced the deduction from axioms and laid the foundations mathematical structuralism. One of its applications is the *topological* approach to space: not an abstract space as a pre-defined container of objects, but undergoing constant transformations itself, as moving along with the arrangement of objects.

Influenced by Leibniz, Turing and Bourbaki, Serres' claim is that Algorithmic Thought represents the operational and (self-)transformational nature of bodies. Algorithmic

thought reveals to us that not merely computer programs or artificial machines are continuously reprogramming themselves on the basis of new input or data, but human bodies and sensory experiences as well. In this sense, Harari's dictum that 'every organism is an algorithm' does not mean that human bodies are passively determined by a genetic program to perceive or move in a certain way, but rather that human bodies are continuously actively reprogramming their responses, inclinations, moods and thoughts.

With the above analysis of Algorithmic Thought, Serres proposes to regard mathematics not as a closed set of axioms and laws, but rather as a practical technique that is open to its applications and enables invention. A set of axioms or rules should be read as a code: as a 'condensation of a history', while at the same time as an 'opening of meaning' for future generations (Serres 1968a, 83). Algorithms reveal a self-applying and automatic nature, a method that does not discriminate between mathematics and technique, between the code and the coding, or between the script and the inscription enables. This view enables us to develop an alternative perspective to Harari's bodily existence as instrumental to the algorithm. For Serres, the biotechnological revolutions of the discovery of DNA and the human genome ultimately reveal that life is not only written but 'writes itself' in genetic code, and therefore pave the way for algorithmic thought (Serres 2019, 60). See below:

Algorithmic Life for	Harari	Serres
Genetic Code	Pre-programmed	Self-programming
Style of thinking	Declarative, law-like	Algorithmic, step-by-step
Body	Solid, deterministic	Elastic, metamorphic
Focus	Input-Output (product)	In between (process)
Place of the algorithm	Internal, hidden (Specialistic)	Everywhere (Generalistic)
Sensory Experience	Determined by brain activity, epiphenomenal	Transforming the whole body, opening the unknown
Importance of sport	Model (Homo Deus)	Module (Variations of the body)

### **The Body Exerts Upon Itself**

Using Serres's texts as a reflection on our algorithmic life, a first step in relating algorithmic thought to bodily existence, lies in the recognition of a practical and sensorial dimension within mathematical invention. In an early text *Mathematics and Philosophy: What Thales Saw . . .*, Serres presents a primal scene in the history of mathematics, which turns out to be an exemplification of Algorithmic Thought (Serres 1982, 84–97). Thales, the philosopher, stands in front of a giant and inaccessible pyramid and wants to measure its height. Instead of climbing the pyramid, Thales waits for the hour of the day on which the length of the shadow equals the height of his body. At this moment, Thales is able to find out the height of the pyramid just by measuring the length of its shadow. What at first sight seems inaccessible, becomes measurable for Thales by letting the light of the sun measure the pyramid for him. According to Serres, Thales discovered that the shadow is not only a 'model', e.g. a representation of the pyramid, but at the same functions as a 'module' for measuring its height, similar to computer modules.

Rather than making visible eternal forms, '[g]eometry is a ruse', Serres explains, 'it takes a detour, an indirect route, to reach what lies outside immediate experience' by inventing

an algorithm that functions as ‘a scale, a type of ladder’ (Serres 1982, 85). In determining the ratio between the shadows of the pyramid and his body, Thales’ ruse or cunning consists of a *double duplication*. Namely, a duplication of the *situation* in which he finds himself in by measuring the shadows, while at the same time duplicating *himself* involved in that situation, by making use of a scale or ratio (Bühlmann 2020, 73). This double duplication creates a space of information and invariance within a noisy and variable situation. Thales’ algorithm consists in transforming his body and the Pyramid into two shadows comparable to each other, leading to a desired outcome. According to Vera Bühlmann, Serres way of reasoning does not lead to a general principle, but is self-governing, automatic (*autos* = self, *matos* = thinking, animated), ‘it is the reasoning that happens as the world exerts upon itself’ (Bühlmann 2020, 75).

Another conclusion that we can draw from that the scene of Thales in the desert, entails sensory experience. The pyramid is inaccessible for Thales, in the sense that he cannot *touch* the pyramid in the same way as its builders who brought stones to the top: Thales cannot carry a ruler towards the top and directly experience its height. Hence, Thales is in need of a mnemonic, a procedure that is able to serve as ‘a substitute for those lengths my body cannot reach’ (Serres 1982, 86). Thales theorizes the scene in which he is in, and therefore transforms ‘practical’, and ‘hard’ knowledge from touching and contact into ‘theoretical’ and ‘soft’ knowledge from sight and distance. Serres therefore is able to show that mathematics cannot be separated from bodily knowledge, and as such, Thales must make use of his body as a necessary constituent of the algorithm for measuring the pyramid, just as 4- to 6-year-old children use their fingers as a computing device for addition and subtraction.

Whereas Algorithmic Thought exposes the major role of the body in the acquisition of mathematical knowledge, as we have seen above, Serres repeatedly refers to sports and exercise as self-programming activities in his work (Serres 2019, 30–1). The mathematician, the piano player, and the athlete show the importance of repetition for grasping a skill, otherwise the muscles grow rusty and the neural patterns diminish. Training considered from an algorithmic perspective therefore not only repeats or habituates but places the body before the unknown, it makes ‘the world change and promotes the new’ by reprogramming itself (Serres 2019, 32).

In a work on physical exercise and sports, *Variations on the Body* from 1999, Serres memorizes the primal scene of Thales, but recognizes a lack in his analysis:

When I was describing Thales upright and standing, attentive to the meridian sun, at the foot of the Great Pyramid, did I understand just how much he was obeying the most secret promptings of his body? (Serres 1999, 181)

When discovering the algorithm for measuring the pyramid, Thales, namely, made use of ‘the transparency of his skeleton, the vestibule of his hearing, the calmed tensions of his calf muscles’ (Serres 1999, 182). This implies that the human body itself can be considered as a mathematical object: e.g. with its vertical, leaning and spinning positions, its ‘axes, points, planes and symmetries’, the human body is far from a passively determined mechanism (Id.). Furthermore, regarding it as a mathematical object uncovers that the human body is an extraordinary accurate meter itself with nano and biosensors in the head, but also in the skin, in the joints, organs and muscles. Serres:

The body functions therefore as though it took into account Euclidean geometry, Cartesian and polar coordinates, infinitesimal analysis, vector spaces such as tensorial calculus. (Serres 1999, 181)

Hence, being at the same time transparent and dense, a measured figure and a measurer, a perceived object and a delicate sensor, the human body knows a wide variety of mathematical functions. Rather than our intellectual powers, our body 'forms, deforms, transforms, tightens and stretches, figures, disfigures, transfigures' and is capable of an infinite number of imitations or simulations (Serres 1999, 186).

### **Algorithmic Life as Bodily Metamorphosis**

So far, we have learned that Algorithmic Thought invites us to a careful consideration of how things transform from one state into another in a non-deterministic way. In addition to that, the tight relation between mathematics and embodiment revealed the many possible variations of our body's gestures, movements and postures. Algorithmic Thought unveils step-by-step embodied procedures of transforming input into output. The relationship between algorithmic thought and embodiment in the works of Serres, therefore puts forward the transformational character of human bodies. In this section, I propose to apply Algorithmic Thought to lived experiences in sporting contexts, thereby emphasizing the metamorphosis of human bodies within sportive practices.

In *Variations sur le Corps*, Serres draws from his experiences as a mountaineer to explain bodily metamorphosis. When holding the rock and measuring its size, his body discovers that its hands are not only for grasping but for locomotion as well, and therefore reprograms its own conduct while opening up its own evolutionary background and genetic code. When climbing, the human body takes again the meta-form of the quadruped, the species from which human bodies evolved. Another example of such a metamorphosis into other life-forms is the hundred meter-dash: at the start, all athletes place themselves with all four limbs on the ground, quasi-horizontally, such that they can launch out. According to Serres, this sudden transition of our bodies from a 'semi-bent position' to an upright, erect posture imitates a 4 million year long evolutionary history. Serres:

We thus stood up extremely slowly and through the same successive profiles that runners display during that ten seconds of lightning. Film them then and project their images as slowly as possible: stupefaction, pure paleoanthropology unfolds. (Serres 1999, 144–5)

Now, three elements can be abstracted from Serres's discussion of bodily metamorphosis within sports, like the above examples, namely the capacities of our bodies for elasticity, imitation and lightness. First and foremost, when exercising or practicing, our bodies become so elastic that they are able to transform into another life-form or species. Hence, rather than our minds or brains, our bodies enable us to imagine, to feel and experience what it is to inhabit a completely different existence. Secondly, bodily metamorphosis is made possible by the act of imitation or mimicry. A goal keeper imitates a spider in his web, a swimmer imitates a frog or a fish, and a gymnast hanging in the rings imitates a bat (Serres, 2008 (1985), p. 321) (Serres 1999, 30). Serres:

This [...] is what I want to show: that there is nothing in knowledge which has not been first in the entire body, whose gestural metamorphoses, mobile postures, very evolution imitate all that surrounds it. (Serres 1999, 96)

Metamorphosis of the bodies is therefore in the first place an imitation of already existing postures, gestures and positions, not an original act. However, exactly within the mimicking of other bodies lie our (intellectual) capacities for imagination, creation and anticipation.

Lastly, the metamorphosis of our body within physical activity, the plasticity that comes with it, and the ability to imitate other life-forms, go together with ascribing a certain lightness to bodily existence. Within Serres's philosophy of metamorphosis, the capabilities of human bodies are not determined by their lineage, gender, position, age or illness. The bodies of athletes are rather angelic, in the state of fleeing, mingling, and constantly leaving positions and places; directed by a force 'upward, vertical, toward discovery' and 'lifted by joy' (Serres 1999, 188).

The role of the non-reduced, complex body and the element of joy in metamorphosis suggest that lived experiences, typically crucial for phenomenological accounts of sports, also play an important role in a Serresian approach to sport. From the many sporting examples within his oeuvre, such as the mountaineer becoming a quadrumane, the goalkeeper anticipating the free kick as a starfish, the runner that runs so easily that his feet leave off the ground, the rugby player for whom the ball feels as a hot coal, we can safely say that the lived experiences of athletes are far from epiphenomenal. This is also underlined in Serres's discussion of the meaning of the word 'experience', in which we can clearly see a denial of the dualism between 'inner sensations' and 'bodily movements', as follows:

The age-old wisdom of the Greek-Latin languages has formed this word of experience by means of two propositions: *ex*, which signifies departure, voluntary or forced, out of the usual or initial environment, and *per*, which describes the journey through a new world, completely different. (Serres 1995, 25)

Whereas Harari claims that 'sensations' belong to deeper parts of the brain of Mario Götze that 'know nothing about football', Serres's conception of experience is tightly linked to travelling or visiting, and hence, structurally dependent on a moving body here:

This double movement, of uprooting and strangeness, in wandering and peregrination, implies physical risks, therefore of death and social and political banishment, for which the term experience is close to that of peril and finds there a root. (Id.)

Drawing on the notion of experience as travelling, Serres even links experience to strangeness, danger, banishment and death. If we conceptualize physical activity and sports as a replacement of war and violence, which Serres does, then it is understandable that the experience within sports and physical activity possesses elements of risk and uncanniness.

In a Serresian framework, the living body is continually reprogramming its own conditions *via* extension of the limbs, repetition and imitation. Because of these continuous changes of our bodies, our algorithmic existence is rather flexible and can be linked to the concept of metamorphosis. Serres:

Training forms a paradox since by repeating the same action, the same research, the same concern that wakes us early in the morning, it makes the world change and promotes the new. (Serres 2019, 32)

Interestingly, Serres here expands the bodily metamorphosis in sport to a careful consideration of global phenomena, such as the atomic bomb, the internet, global warming, and the pandemic. 'My existence saw the human condition transform', he writes at the beginning of *Hominescence*, 'we recently went from the local to the global without any practical mastery of this latter' (Serres 2019, 9–10). Serres, born in 1930, points towards societal and medical developments during the twentieth century that pushed humans toward a whole new conception of themselves and the responsibilities that come with it. The birth of modern sports and their popularity is related to these developments, in so far as it presents our body as strong, beautiful and joyful rather than merely being the source of sickness and pain (Id., pp. 20–1).

First of all, there is the fast development of pharmaceuticals, analgesics and anesthesia after the Second World War. The consequence of this is that patients demand a return to a healthy state from a medical doctor, which life-expectancy grows enormously, and that the absence of pain or suffering is more and more considered as a human right. Related to this is increased hygiene, because of the presence of toilets and bathrooms with a light above the sink, clean water and a washing machine. Home hygiene replaces the function of the hospital, it entails that less people are in need of a clean hospital for their health. Another societal development with far-reaching effects is that labor moves away from the farm or factory to the computer or cellphone. In their work, people are becoming more and more communicators than producers; and they rather make use of their fingers than their arms. Lastly, the body has undergone substantial changes: people are getting taller, up until 20 centimeter in one century, women get their period earlier and relationships and marriages last longer. 'An object of science, our body has therefore changed so completely over the past half-century that the practitioner no longer meets the same patient', according to Serres, describing an 'anthropological transformation' that severely affects our relationships with pain, death, other people and the planet (Serres 2006, 137).

We have recently moved out of old houses, body and world. So we launch out precariously leaning structures and, if they don't collapse, we build vertiginous houses there. (Serres 2019, 35)

Within sports and physical exercise, the body experiences departure and is performing a new series of operations on itself, these transformations are not deduced from universal laws, but are concrete, 'local and rapid, subtle', according to Serres (Watkin 2020, 79). Hence for Serres, our individual algorithmic and self-programming existence goes hand in glove with societal trends and developments, a dimension which is almost completely absent in Harari's conception of the algorithm.

### **Software and Hardware**

The examples of bodily metamorphosis and imitation within sports provide us a way to understand the human body as something that is transforming, non-fixed, and variable. At first sight, such a conception seems contradictory to a highly computerized and programmed model of human behavior, such as we found in Harari and Zuboff. In

order to understand the potential counterbalance of physical exercise to Surveillance Capitalism, therefore, an investigation of the connections between bodily existence and digitization is required.

Whereas in 1985s *The Five Senses*, Serres argued that the emphasis on information-processing within computer science and information theory leads to a fine-grained account of the sensibility of the body, in his *Variations of the Body* from 1999, Serres develops the hypothesis that practicing sports can be regarded as ‘software’ (‘logiciel’) for our body (Serres 1999, 2008 (1985)). Here, computer software or computer programming is understood as the set of information that is needed to change the computer’s output, while maintaining its physical constitution. Serres writes:

Software entails the set of information that governs the machine’s conduct and enables, through its own modifications, this conduct to be modified at will; imitation carries the information that governs and modifies the body’s conduct in the same way. Software makes the machine programmable or makes its behavior first and foremost transformable from the outside. Imitation makes the body adaptable and indefinitely flexible. (Serres 1999, 137)

For a computer, software has the function of programming the machine, that is changing its behavior to other, more nuanced types of output. Hence, gestures such as bending, forming, stretching, imitating, and tightening create variations in the positions of our ‘hard’ limbs, without altering the body’s anatomy. Physical exercise and training thereby adds enormous flows of ‘soft’ information to the initial ‘hard’ information of the body, and therefore is able to transform the body, which is in itself a combination of software and hardware.

This difference between the soft and the hard is not a distinction in kind, because evolutionary theory informs us that (parts of) the body’s anatomy shows variations over generations, hence changing its own ‘hardware’. Besides, the human body consists itself of a ‘soft’ tissue such as our brain or skin that processes small-scales of energy next to the ‘harder’ muscles or skeleton dedicated to bigger energy scales. For Serres, the living organism and its genetic code is a ‘bouquet of times’, and therefore integrates long-term formations as well as short-term experiences into a bundle (Serres 2019, 53). This teaches us that all variations of the body (software) can only be regarded in connection with an invariant, such as its anatomy (hardware). ‘The union of the soul to the body, or the understanding to the somatic, is as clear and difficult as the relation of software to hardware’, he writes, emphasizing both the malleability and the rigidity of bodily existence (Serres 1999, 137).

Considering the body as algorithmic reveals that we actively reprogram ourselves by and are actively creating flows of information when doing sports. Hence, instead of Harari’s analysis, we are not only our genetic code, but are the coding as well: the program of our bodily existence coincides with the writing of the program. For Serres, the genetic code that can be read off the DNA-molecule is reminiscent of Galileo Galilei’s famous pronouncement that the ‘all-encompassing book that is constantly open before our eyes, that is the universe [...] is written in mathematical language’ (Galiliei 2008, 183). However, these biotechnological developments entail a view of bodily existence which is algorithmic and self-programming. The idea that life ‘writes itself’ overturns the Galilean mathematical model considers life as consisting of mathematical figures that are a priori given



and deterministic. Modern genetics, however, reveal that life consists of a long string of codes that actively reprograms itself by adding information to the code.

'Life writes itself in algorithmic language' – this is what a new Galileo would say first about contemporary invention. Not only 'writes itself' but 'constructs itself by writing itself'. (Serres 2019, 61)

Sports and exercise are therefore intrinsically woven to an algorithmic understanding of ourselves based on self-writing, but also by *collectively* re-programming the initial combinations within a group or crowd such as in exercising sports with others, without eliminating the wide variety of singular bodies and gestures.

The impact of regarding bodily existence in relation to the algorithm can be regarded as twofold. On the one hand, the encroachment of Surveillance Capitalism goes as far as it is programming and reprogramming the movements, thoughts and feelings of its consumers, as Zuboff convincingly shows. In a Serresian sense, the software developed in Silicon Valley is even transforming the 'hardware' of our limbs, sense organs and nervous system. This first take radicalizes Harari's and Zuboff's warning in the sense that it is affecting not only the hidden 'unconscious algorithm' (Harari) or 'human experience' that is transparent to us (Zuboff), but rather impairs the wide range of variations of our body.

On the other hand, a Serresian perspective can be seen as truly emancipatory, since developing algorithms, programming and coding should be generalized to all activity, and is therefore not only in the hands of computer scientists, platform capitalists or molecular biologists. In fact, a generalized notion of the algorithm enables us to see that the novels that we read, the instructions of our coach, and the conversations between a parent and her child—communicated through the code of the alphabet—as far more ingenious, 'local and rapid, subtle' programs in a Serresian sense, informing the 'hardware' of our body and transforming it.

## Conclusion

In the first part, I have been arguing that philosophers of sport share a view in which the algorithm is regarded as hostile to sporting experiences and sport ethics. I have taken Yuval Harari's reading of Mario Götze scoring the winning goal as an example of a prevailing conception of algorithmic life. This conception considers bodily movements and experience as the 'outer' result of a more important, hidden 'inner' biochemical algorithm. Understandably, such a conception of the algorithm engenders in defending human life and values against algorithmization.

However, I have shown that by making use of Michel Serres's philosophy, a radically different perspective on Götze appears, which enables to move beyond the opposition between algorithms and bodily existence. From Serres's analysis of mathematical knowledge, I have been arguing that the relation between algorithms and sporting experiences is very tight: sport opens up the possibilities of our body to actively reprogram our gestures, expressions, moods and thoughts. Algorithms emphasize bodily existence as transformative, elastic and self-programming, rather than solid, deterministic and pre-programmed. Besides, a Serresian perspective would highlight that the prevailing conception of the algorithm within the philosophy of



sport overlooks the tight links of computer programs with bodily existence. Here, algorithmization reveals the possibility for bodily metamorphosis, and actually embraces a broad and emancipatory understanding of sporting activities, which may be helpful in counteracting the dominance of Surveillance Capitalism in an algorithmic age.

## Note

1. Thanks to reviewer 2 for emphasizing the act of mimicry.

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