

Serres's Philosophy of Science: An Introduction for Business Ethicists

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Abstract: Many of the issues discussed in the field of business ethicists seem to involve a certain understanding of science. For example, the debates about sustainability or globalization oftentimes appeal to scientific understandings about facts and processes taking place in the actual world. Hardly ever, however, do business ethicists discuss the role that scientists can or should play in the way organizations cope with these issues. In the paper, the work of the French philosopher of science Michel Serres is discussed to shed light on two kinds of roles that scientists might play. It will be argued that complex issues such as sustainability are better served by a '*Leibnizian*' rather than a '*Cartesian*' understanding of science. A concern with these issues requires a different kind of rationality than the one that has generally prevailed in the history of science and perhaps also in the world of business and enterprise.

Key Words: science, rationality, sustainability, Leibniz, Descartes

The work of the French philosopher Michel Serres has so far hardly been noticed in the field of business ethics. If at all, then attention was paid to *Le contract naturel* (1990), a book in which Serres passionately argues for a more sustainable relationship between us and the natural world. His ideas about sustainability are intertwined with his ideas about philosophy and science. More specifically, he argues that philosophers who conjured up the famous idea of a social contract among citizens in a particular state have completely ignored our relationship to nature. In fact, Serres goes so far as to claim that the different versions of the social contract that we have seen throughout history can best be understood as declarations of war against nature. In a characteristically sweeping and poetic style, he

urges us to rethink our relationship to nature. But in order to do that, we also have to completely rethink the role of the sciences in our society. Serres's point is that scientists have by and large been subservient to social requirements at the expense of their interest in the natural world. For example, controlling nature has been much more important task for them than understanding nature. This is one of the reasons why scientific methodology and technical accuracy have been deemed by many philosophers and scientists alike to be more important than passion and concern about whatever it is that they are studying. In what follows, it will be argued that the claims about science as they appear in *Le contract naturel* do not appear out of the blue. On the contrary, Serres has always presented himself as a philosopher *and* a historian of science.

Hence, the purpose of the paper is to show that the ideas about science in *Le contract naturel* can only be properly understood in the context of Serres's entire work. It will be shown that he has, in spite of his sometimes exuberant style, a very systematic and formal understanding of science. The problem he faces in developing such an understanding of science is that different ideas about what system and formalism in science might amount to, have prevailed in Western society. Serres suggests that the sciences have been torn apart by what one might refer to as a Cartesian and a Leibnizian way of thinking. Throughout his work, he has advocated that the Cartesian system is inferior to the Leibnizian approach, not only in the field of mathematics (which is pivotal to Serres) but also with respect to other sciences. It will be argued that this is not at all an abstract or obsolete philosophical discussion. A Leibnizian reconceptualization of science might help us to get a better grasp of the kind of complex problems—sustainability, globalization, complexity, and so on—in which business ethicists take an interest as well.

The paper proceeds as follows. In the first section, a brief summary of *Le contract naturel* will be provided. In the second section, we will provide the reader with some biographical information about Serres because his philosophy needs to be considered in the context of his life. In the third section, the Descartes/Leibniz controversy and Serres's position in it will be outlined in a rather detailed way. In a final session, the question will be asked what the sciences might mean in a world that has to cope with increasingly complex problems such as sustainability or globalization. The overall argument of the paper is that in order to think these problems, we—and business ethicists are included in this 'we'—should also ponder the role of the individual scientist. This is why ideas about whom he or she might be will haunt every single word in this paper.

The Natural Contract

The omission of the social contract, Serres argues, is that the natural and the inhuman are not taken into consideration at all. Stones, God, children, animals, and women did not have anything to say when the contract was formulated. Neither did future generations, because the contract, Serres argues, always pertains to the here and now. In this way, it cannot secure the peace that it promises to deliver. A contract merely warranting peace now does not have any relationship at all to the future, to sustainability (*durabilité*), to the environment. So, a new contract is necessary, a contract with nature, for it is nature that has been declared war upon by those that adhere to the social contract.

This is the central argument of *Le contract naturel*. It is supported by a set of underlying ideas:

1) The social and the natural should both be the object of a heuristics of fear. The problem with an exclusively social contract is that the fear (of war) that undergirds it only relates to social injustices. A nature that continues to be plundered and exploited should become the object of fear as well. Perhaps not so much fear of war as a more general fear of disaster, or fear about our planet's very destiny.

2) The natural contract that springs out of this fear has become indispensable because human impact on the world has become unequalled. It is not a matter of individuals or even groups who inflict damage upon the planet, it is the human aggregate, the human ensemble as such that weighs upon it. With typical sardonic wit, Serres claims that the human aggregate can nowadays be seen as one "big animal" that is involved in a deadly struggle with what he refers to as "world-wide nature." By this expression he does not refer, for example, to this or that forest, or to the forest in your or my neighborhood, but to forests all over the planet. The same holds for rivers, seas, mountains, and so on. The environmental problems we face have a truly global impact and call for a novel way of global thinking.

3) Using hyperbolic metaphors such as the 'big animal,' Serres wants us to think of humanity as a kind of physical entity with global impact. One other way to compare the unfolding drama on our planet is to see humankind and world-wide nature as two tectonic plates bent on collision. Such a collision goes way beyond what an individual person can do. Neither is it a matter of what humanity can do to an animal, even to an entire species. It is rather a matter of what the 'big animal' might do to the planet as such, its climate, its seas, and so on.

4) The problem is that 'we' are, in some technical sense of the world, masters of our planet, but at the same time we slowly become aware that we do not control

our mastery. Western societies do not fight each other anymore—and undoubtedly this should be seen as an important achievement—but they collectively have waged war on the environment. Our mastery is aggressive and dangerous. We need to discuss it, and this means that we also need to discuss the role that knowledge and science play in it.

5) Serres is undoubtedly an alarmist. According to him, we are standing at a crossroads: one road leads to extinction and the other to what he refers to as ‘symbiosis,’ a way to live not only *on* but also *with* the planet. In order to make the second option work, we need to atone for our parasitic view of the world.

6) Even the Declaration of Human Rights does not allow for this, for humanity cannot be saved by a discussion about rights. What holds for the social contract also holds for the Declaration of Human Rights: it is exclusively social and will ultimately endanger our very species because—and this is very important in Serres’s understanding of what is going on—nature is no longer passively undergoing whatever we are doing to it.

7) In other words, if we take too recklessly from her, she will take back whatever she deems fit. The best we can do is to think her as a *subject*, a very disgruntled subject. We need ideas that allow us to put our mastery into perspective. One of the grave problems that we have in doing so is that the sciences do not allow for a variety of perspectives. They have, as we have seen, always allied themselves to the social and have therefore alienated themselves from the world that we inhabit. In fact, they have become a part of the social contract and tell us how different forms of knowledge need to be expressed. Methodology has become more important than observation. This is not to say that Serres is against methodology, but rather that scientists proscribe how their colleagues need to go on. In this sense, the social collective of scientists has started to function as a court of justice where designated experts determine what kind of knowledge is right or wrong. Science has come to play the role religious people once ascribed to the Last Judgment.

8) As a consequence nature has become an all-encompassing realm where human beings are no longer present and where only the learned are allowed to judge on the basis of putatively positive laws that they alone can fathom. The problem with these laws is that they do not bother ‘technicians and industrialists’ because nature is seen as something that is solely active outside the human world and does not represent a value in and for itself. “The state of nature,” Serres writes, “escapes the grasp of human language and social order. Sciences promulgate laws without a subject for a world without human beings.”¹

In what follows, we will elaborate further on points 7 and 8. The quest for sustainability implies a completely different role of science in our society. To think a different type of science is the task Serres sets for himself in his entire philosophy. Before entering into the theoretical underpinnings, we will first discuss some biographical details. After all, Serres thinks that life should and cannot be excluded from whatever it is that scientists and philosophers are doing.

Rugby

In 1930, Serres is born in a township called Agen that is about 80m south-east of Bordeaux on the banks of the Garonne. Small as it may be, Agen is famous because of its rugby, a sport in which Serres will remain keenly interested all of its life. Even though he is worried about rugby because it is increasingly being contaminated by commerce, he praises the game for its accessibility.² One does not need a special body, a special knowledge or a special skill in order to practice it. All that one needs is a sound physical condition. It is in this sense that rugby does not know any stars. It is a sport, Serres claims, which seems to be created for laymen and non-specialists. We will see that what he praises in rugby should also be characteristic of the type of science that he is defending. This science is, if anything, accessible to anyone. It comes therefore as no surprise that Serres is a dedicated defender of internet encyclopedias such as Wikipedia.

Young Michel grows up in a humble, catholic family. The Bible, he would later claim, was the only book available. His father owned a gravel pit on the banks of the river. Day after day he trawled for tuff and gravel that would be grinded in a small factory in order to transform it into building material for dams and bridges. The children assist or roam across the shingle of the Garonne. Michel is always outside, near the water, playing and wandering around, or simply admiring his father's craftsmanship. The philosopher that he will become will always cherish these aspects. Serres is a thinker who wants to make clear that human beings belong to the world and do not stand in front of it. It is a lesson taught by his father and a lesson that he will bear to mind the rest of his life. He loves the open air, the river, the sea, the clouds, and the sun. He also loves and admires human beings: painters, poets, craftsmen, scientists, sportsmen, and beautiful women too. He is proud of his family roots, the rugby game, and the region where he grew up. Real life is the life of outdoors people, not the life of administrators and armchair philosophers.³

On the other hand, life does not come without misery. He sees the first dead bodies at the age of six. Living not too far away from the Pyrenean, the people

of Agen are confronted with thousands and thousands of refugees escaping the civil war in Spain, a war that for all its cruelty just turned out to be the forerunner of what was even worse: Auschwitz and Hiroshima. A very strong aversion to violence and a desire for serenity becomes a hallmark of Serres as a person and as a philosopher. In 1945, he starts to study at the *École Normale*, a school he will later describe as a place of terror. In 1949, he takes up mathematics at a local naval school that he will leave for the *École Normale Supérieure* in Paris where he becomes familiar with the work of Gottfried Wilhelm Leibniz (1646–1716), by far the most important philosopher in his life. His relationship to educational institutions, however, remains very problematical. From 1956 to 1958 he works as a naval officer and sails the seven seas. It is only from 1960 onwards that he seems to be fully dedicating himself to philosophy and science. His star is rising quickly, especially after the publication of his dissertation on Leibniz in 1968. He collaborates with Michel Foucault, works on a series of five books called *Hermes*, is eventually appointed as a professor at Stanford University, and becomes a member of the prestigious *Académie Française* in 1991. His lectures are said to be mesmerizing and eloquent. In France, Serres is a very big name, but elsewhere he is much less known than other philosophers of his generation partly because his work—which consists of more than sixty books—has not been extensively translated so far.

Against Rational Unrealism

Many commentators have suggested that somewhere in the early 1980s there was a change in Serres's work. His sober style of writing was apparently replaced by a more poetic and metaphorical style, a change believed to have set in with books like *Le parasite* and *Génèse*.⁴ This may be the case, but in terms of subject matter there has never been such a profound change. In this sense, one cannot speak of an 'earlier' and a 'later' Serres. There is one over-riding question in all his work: what can sciences mean in our society? And his answer to this question has always been the same: sciences can only mean something if they do not isolate themselves from other cultural expressions such as art, poetry, sports, or music. Moreover, they should be located in the world and adopt a completely realistic stance. Serres thinks that discussions about whether the world exists or not are boring and stupid.

He always declared himself to be a realist. But realism teaches us that the world is not linear, teleological, or rational. On the contrary, turbulence, dynamics, and chaos seem to be crucial elements of reality. Serres's philosophy is closely related to the work of scientists such as biologist Jacques Monod (1910–1976), physicist

Ilya Prigogine (1917–2003), and mathematician Benoît Mandelbrot (1924–2010) who have all, each in their own way, contested the idea that the world is a rational order. To arrive at an understanding that reality is not rationally ordered, these scientists all dared to venture outside their own discipline. Serres is concerned about sciences that become an elitist affair only meant to be for experts and specialists. Their goal, Serres believes, is basically to keep reality at bay. A sense for reality should permeate the sciences. However, many branches of science—think here, for example, of economists who have transformed their discipline from a social science into a kind of pseudo-mathematics called ‘econometry’—have marginalized themselves and have become painfully irrelevant due to their utter lack of realism. With hindsight, we may argue that this lack of realism among economists is one of the reasons of the financial crisis that has haunted the world since a few years. Analogously, we may wonder why so few business ethicists, for all their focus on codes and programs to infuse corporations with more responsibility, have been so silent about what might really be wrong in our economy.

However, the problem here is that the ‘econometrization’ of economy or the ‘codification’ of responsibility are not isolated events. Scientists, Serres believes, do always have the proclivity to distance themselves from reality. Unfortunately, there is a long history in science of otherworldliness, exclusion, and even violence. Serres loves to remind us of the Greek philosopher Hippiasus of Megaponte, a relatively unknown thinker who belonged to the sect of the Pythagoreans.⁵ Legend tells us that Hippiasus while sailing on a ship discovered the possibility of irrational numbers, something that profoundly unsettled the other members of the sect. In any right triangle, the number representing the length of the side opposite the right angle (the so-called hypotenuse) does not match the numbers representing the length of the two other sides. Suppose that for both these sides the length equals 1, then the hypotenuse will have a length we nowadays refer to as $\sqrt{2}$. Hippiasus did not get any credit for his discovery. As Serres puts it, he heard a noise in the harmonic sphere of integers for which the other members preferred to remain deaf. In his fascination for this noise, Hippiasus threatened to tell the world about his discovery, something that was completely unacceptable to Pythagoras who, to his perennial disgrace, ordered his disciples to throw Hippiasus overboard, after which our hero drowned. Serres claims that the Pythagoras/Hippiasus controversy is emblematic for science as such: what is irrational or formless needs to be hidden at any cost. Whoever wants to explore and penetrate into the irrationalities of the world is suspected to venture beyond the line of demarcation separating science and non-science and awaits capital punishment.

Hippasus's story is used by Serres in what became an ongoing struggle against a scientific rationalism obsessed by clarity and purity. He claims that many sciences have developed a rationality which is merely severe, formal, nominalist, and even tyrannical. We do not only see this in academic sciences, but also in the kind of 'sciences' that permeate corporations and organizations. A certain kind of austere, number-driven logic permeates their strategies and cultures. The world as such has become irrelevant for people who adhere to what Serres understands as an 'a-cosmic' rationality. In a field such as zoology, its supporters in fact claim that in order to understand an animal it is better to read the right stuff about it than to observe it. Methodological correctness is more important than the animal itself. Analogously, in the economic or corporate world, the supporters of this kind of 'rationality' claim that statistics, surveys, and audits are the only techniques that allow for relevant and objective information. In this way, sciences have deteriorated into a power game that is controlled by settled professors such as Pythagoras. It is not in their interest to develop or even to allow for a new, over-arching, 'global' vision. They are captivated by the 'local.' What happens outside their own area of expertise is either uninteresting or dangerous. This results in a gloomy view of science:

Myriads of the finest beams of light are looking for islands that become smaller and smaller and shed light on them by chasing darkness away to what is outside their periphery; this is why one has the impression of dancing fireflies in a global and dark viscosity.⁶

Sciences, Serres believes, should become part of society and humanity. This can only be achieved if they are willing to 'cool down' their rationalist pretensions. The sciences can only be useful and good in the way heat can be: it should be mild and moderate.⁷ If truth comes from the sun, there can only be foolishness. And foolish is the king who thinks he comes from the sun. So, the burning fire of reason should be tempered. Serres does not doubt that sciences can be incredibly useful for our society, but if scientists start to argue that their game is the only reasonable game to be played, they become foolish.

We need a science that is less obsessed by methodological purity than by the needs of our society. Serres dreams of a science which retains its formal character and is nevertheless capable of transgressing its own disciplinary boundaries. Indeed, he claims that it is exactly this formality that allows scientists to engage in what he refers to as *ars inveniendi*. This concept was coined by the Roman philosopher Cicero (106–43 B.C.) who developed a rhetoric in which the art of

judgment (*ars iudicandi*) is sharply distinguished from the art of invention (*ars inveniendi*). A person who is involved in a debate should not only criticize but also think of something new. Much later, it was Leibniz who established a link between the *ars inveniendi* and mathematics: exactly by remaining loyal to his or her formal methods, is a mathematician capable of constantly discovering new truths in constantly changing domains. When we apply this to science, we get a different view than the aforementioned gloomy vision of scientists acting like fireflies who fear the darkness around them:

[T]he place of the scientist is not the pre-eminent place of the specialist (and has not there always been an archaic-passionate cultural link between property and specialization?), but the universalizing place of a multi-specialist or, perhaps better, an inter-subjective community; this is why the *ars inveniendi* is absolutely necessary: the opening has a heuristic character.⁸

Given the problems that we face nowadays and that have been a concern for business ethicists as well, we need to think about new forms of expertise and science. Issues such as global heating, the depletion of rain forests, or the significance of globalization do not call for old-fashioned specialists anymore but for a new kind of scientist, one who is willing to make cross-overs to a variety of disciplines. The first step to make this idea of a novel science possible is to unmask the idea of a research area as a property: it is just a wrong form of economic thinking. Today, nothing is more undermining for the tackling of the issues I just mentioned than the unwillingness to trespass disciplinary boundaries.⁹ Serres therefore opts for a different kind of scientific communality, one that is no longer interested in a problem that has been duly appropriated, but that one opens up to different research areas and that is keen to interfere with them.

In his battle against what one might refer to as a-cosmic specialization, Serres's main focus is the addiction to methodology that, in his view, undermines the *ars inveniendi*. When a science just focuses on a set of problems that can only be resolved by meticulously abiding by the method proscribed by it, then we can wave goodbye to its quintessential openness. Nowadays, given the kind of problems and issues humanity is facing, method should not be a tactical but a strategic affair. In other words, problems cannot be solved by following just one road (*hodos*), but need to be approached from many different angles. A problem is never isolated, it is part of a network of connections and intersections that by definition cannot be appropriated by one researcher or one research group. Indeed,

the researcher is part of that network as well. "A scientific problem," Serres claims, "is a mutual questioning between inter-subjectivity and the subtle demon that does not deceive us and which is the world as such. The problem is never in front of me: it surrounds us and we surround it: we plunge into it."¹⁰

For the initiated, this quote immediately makes clear that Serres thinks that not only Kant, but especially Descartes is an obstacle for the further development and innovation of science. Against the Cartesian suspicion that the world may be ruled by a 'malicious and deceptive demon' (*malin genie*) which can only be kept at bay by distance and method, Serres pictures an enthused scientist who does not care about property, classification, and objectivity but prefers to 'surf' the events we refer to as 'reality.' This implies that scientific work undergoes drastic changes. We cannot think of the scientist anymore as a person of strong principles. It is rather the case that he or she should open up to the many-sided aspects of the problems that we are facing. Issues such as pollution, fraud, or corruption are no longer the theme of a particular science but rather ask for ideas and solutions from many unexpected angles. The individual scientist combines his/her role as a researcher with that of the messenger who gets information from many different corners and is capable of spreading it. Hermes, the Greek deity of messengers and trade, is the personification of this scientist. Serres's point here is not that this is a scientist-to-come. He or she is already very present albeit quite exceptional. In this alternative scientific world, the differences between research areas or between what is allowed and what not do not matter as much as they used to. Science is no longer a classification game, but rather a permanent delving into an infinite world of connections and intersections. In Serres's own terminology: interference replaces difference.

What might this mean for business ethics? First, the field should address the well-known problem of 'monocultures' in organizations. What we mean by this is that certain dominant types of thinking and knowing prevail in the organizational world. Companies who stand accused of polluting the environment are unable to tackle, let alone to solve these problems because their approach remains one-sided. Engineers, technicians, or financial experts are generally not well-prepared to deal with communities suffering from the pollution. Second, the field should keep pointing out that the nature of the problems we have in mind here have changed, indeed, that the very terminology that we can use to discuss them, has changed. These problems require an approach that has become profoundly skeptic about the possibility of objectivity. The issue of sustainability is not of a mathematical or statistical nature. Neither does it require methodological rigidity. This insight

will now lead us to a consideration of what Serres understands to be a more viable method under the present, more complex circumstances.

Methodological Blindness

Serres is not against method as such. Neither is he a kind of postmodern anarchist. Science needs a more or less coherent kind of communality, but method is no longer simply directed at the solution of a particular problem. Today we face problems in an entirely different kind of way: a community of scientists faces as it were 'a community of questions' which are all related to each other and whose nature constantly changes. Climate change, for example, is not a problem that can be solved by an isolated discipline, let alone by an individual scientist. Insofar climate change poses a scientific problem (rather than an industrial or political one), it appears as a global complication that touches scientists from many different disciplines and background. The contemporary scientist is not an individual genius but a member of a community of people who understand that relevant issues do not ask for vigorous solutions but rather for a profound understanding of complexity.

Serres connects this idea of communality with rigid systematical thought. It is this aspect of his work that has bemused many commentators: how can he link systematical thought to poetry or, more generally, a strong sense of formalism to experimentation? To get an understanding of what Serres thinks is a formal system, we need to discuss his relationship to Leibniz. In his dissertation, Serres is adamantly clear about his great hero: one should never try to linearize Leibniz. Whoever tries to do that, will see that the dream of coherent science might end up in bitter disillusionment.¹¹ Leibniz's world is not at all like the linear world of Descartes who always tried to construct simple chains that depart from an indubitable point to end up in an equally indubitable point. Leibniz's world is labyrinthine. The threads in his world never go straightforwardly from A to B, but cross and intersect endlessly. Indeed, the idea that there are points needs to be complicated. One might understand this as the crux of the Leibnizian system and Serres's way of thinking. In the fourth part of the *Hermes*-series, Serres summarizes it as follows: "The orientation of thought towards a fixed point needs to be blown up."¹² Leibniz himself used the following metaphor to describe his system:

It is as if one throws a heap of pebbles into the water, each of them causing circles that intersect without destroying each other, but our eyes blur everything when the number of pebbles becomes too big.¹³

This kind of thinking is completely alien to seventeenth-century rationalism. This classical rationalism is characterized by a firm belief in a “unique deductive chain that warrants the consistency of a particular thought.”¹⁴ Leibniz renounces this way of thinking and argues that both science and philosophy should be seen as an art of combination (*arte combinatoria*) in which clarity and simplicity are much less important than Descartes thought they were. The price to be paid for this combinational thinking may be confusion, but it is, according to Serres, always better to be confused than to be dogmatic. Confusion is acceptable, as long as one does not give up coherence: “There is not one possible road, one can very well choose several crossroads without abandoning coherence.”¹⁵

The best way to think Leibniz’s system is to think in terms of a network. If there is the idea of a chain, then it can only be one that is entwined with many others. All these chains have openings and form a strong but elastic fabric that belies the idea of a pre-planned linearity, structure, or hierarchy. The coherence that Serres, following Leibniz, emphasizes, remains intact by a strictly ‘formal’ kind of reasoning. For Serres, formalism requires a radical departure from linearity, structure, or hierarchy. All intersections, analogies, and harmonies characteristic of the multi-linear fabric Leibniz referred to as ‘continuum’ can only be grasped by thought when it remains ‘methodologically blind’ for objects as such and instead focuses on the formal laws that determinate the relations between these objects. Leibniz’s (or Serres’s) formalism is a matter of grasping relations rather than objects.

This methodological blindness or *cogitatione caeca* which is pivotal to Leibniz’s formalism is precisely what allows for the ambiguity and semantic variety that structural or methodological thinking want to evade. The essence is that one has the courage to leave the elements of a system undetermined for it are only undetermined elements that can be taken up or absorbed by other orders. Summarizing, the endless variations characteristic of the *arte combinatoria* is rendered possible by formal reasoning. If we are to believe Serres, we will never see Leibniz thinking about the exclusivity of a particular problem. There are in his worldview no problems that can be disentangled from the continuum. All that matters are relations, variations, and bridges between as many elements as possible. It is not so much a matter of this or that object, but rather a matter of a ‘whatever’ object (*un objet quelconque*).¹⁶ Serres approvingly refers to the great Leibniz scholar Yvon Belaval when he argues that Leibnizian formalism implies “a logic of the whatever object.”¹⁷

In Leibniz’s system thought is never about a thing or a thing-like situation, but about the way it is included in a series of events. Suppose that a man cuts himself

with a knife. The cutting itself is not related to his flesh or to the knife. Yet, the cutting allows for an intermingling of flesh and knife which produces a result that is completely indifferent to what flesh and knife are. Serres has always argued that intermingling should be the focus of all knowledge and all epistemology. The latter oftentimes understands objects as what is fixed and unchangeable, but in reality they are fluent and constantly absorbed in a series of events. In *Les cinq sens (The Five Senses)*, this insight is expressed lyrically:

Between water and air there is a thick or thin layer of vapor; air and water meet each other in a bed of mist. Earth and water are wedded in loam and mire; they go together in a bed of mud. The cold front and the warm front are sliding over each other on a mattress of turbulences. Veils of things which are in each other's proximity, beds, layers, plates. We live on a conveyer which slowly and persistently moves thousands of yards under our feet.¹⁸

Poetic passages such as this show how Serres's understanding of the world is determined by fluidity and dynamics. This is what he shares with Leibniz. This is a world of clouds, flames, swarms, fish schools, rugby scrums, rivers, and seas—all phenomena that cannot be reified or reduced to fixed contours. Leibniz referred to them as *ensembles*. A nice example of these ensembles can be found in bio-hydrology, a scientific discipline that studies aquatic life. Scholars in this field are no longer interested in individual (micro-)organisms or even in isolated species inhabiting the oceans of our planet but rather in life as such and this life is understood as a constantly varying ensemble of genes.¹⁹ DNA appears as the formal code which makes combination and variation possible. Biosciences are no longer interested in rendering the individual organism visible, but want to show how it connects to a network of which DNA is the formal principle. They 'read' the world as a variable text that needs to be decoded rather than that they 'see' things.²⁰ Referring to ensembles, Serres enthusiastically proclaims that they are a "new object for philosophy."²¹ If we apply these kind of ideas to business ethics, we would no longer think, for example, that the financial crisis or the problems of globalization are related to some evil-minded individual or to an organization. We would rather think that the possibility of a particular evil is the result of certain network of interrelated problems prevailing in a particular context. To use Leibnizian terminology, many contemporary problems seem to be appearing as *ensembles*. For example, the 2010 oil catastrophe in the Gulf of Mexico is, according to this view, not only the mistake of particular business leader or of

a particular company, but reveals us something about contemporary oil industry as a whole. This is not to say that there are no mistakes on behalf of individuals or organizations, but rather that prevention of these kinds of problems requires much more than simple passing the buck to those who are considered to be the perpetrators. The catastrophe in the Gulf of Mexico tells us not only something about BP or about its management, but also something about the oil industry as such, about the relationship it entertains with politics, or about our dependence as consumers on this particular industry. We need to develop an understanding of the ‘aggregate’ or ‘ensemble.’ Serres has no doubt that Leibniz’s blind method anticipates these kind of complex problems much better than a Cartesian science. To get a better understanding of Leibniz’s world and the kind of new science Serres hopes to develop out of this—a science that is better capable of addressing the global problems of our planet—we must now enter into the quintessential openness of the system.

Science and the History of Science

Leibniz develops an encyclopedic and systematic philosophy that can be viewed as “a network of correspondences that should warrant the universal possibility of translation from one theme in whatever other theme and vice versa.”²² What we have here is a kind of multilingual dictionary with many entrances. A very simple structure should make the art of combination possible that was discussed above. One might compare this structure to a piano: whoever purchases this instrument is principally capable of producing an infinity of melodies. This analogy, however, is far from perfect: the piano as such is a finished product whereas Leibniz’s system is never finished. It is constantly being constructed, more or less in the same way as is the case with Wikipedia. In this respect the system is forever young: it is never completed. Neither is knowledge. Serres claims that Leibniz had an acute sense for ‘epistemological becoming.’²³ He understood that science is always developing. It is true that it is buttressed by traditions from the past, but it may always evolve in heretofore unknown forms and directions. Precisely because the objects remain undetermined, the entire system itself becomes undetermined.

Serres argues that this openness is an alternative to the closeness of the Cartesian world view. Leibniz’s system is not only outside-oriented, but it is also constantly tinkered with. It is not only looking for variation in the world, but also wants to vary itself. In other words, it explores itself, for example by its tendency to create or recreate new possibilities from the past. The system is diachronic and reflexive. Concepts that were once assumed to have a fixed meaning are now used

in a novel way, but may end up having the old meaning once again. Serres has no problem, for example, to argue that the Latin poet and philosopher Lucretius (99–55 B.C.) is a forerunner of contemporary physics and had a keen understanding of chaotic systems.²⁴

Here, it is crucial to make a distinction between science as such and the history of science. Skeptics might argue that Leibniz's system has a problem with the truth. On the one hand, we are dealing with a dynamic truth that is the object of the history of science and that is a product of the ideas that pop up during the course of time. On the other hand, we are dealing with the truth as it is discovered by the sciences as they are currently practiced. Both truths conceal something: the historian is blind for the actual state of affairs and the scientist is blind for what used to be the case. The historian aims to revive or reactivate old truths whereas the scientist is only keen on discovering new truths. This explains why it is that scientists are, unlike philosophers and artists, generally not interested in the past of their discipline. More importantly, however, is that historians always try to portray science as something that has coherence and continuity whereas the scientist's wish to discover new truths evokes, if anything, discontinuity. Those who are looking for evidence do not speak the same language as those who want to link the past with the present. The consequence is that the historian does not communicate with the scientist at all. Scientific discoveries engender new forms of knowledge and can even repress or destroy entire research areas. For the historian nothing is ever destroyed.²⁵

Serres endeavors to link science with the history of science. His fear for an isolated and hence violent kind of science is a recurrent theme in his work. Knowledge needs to be pacified.²⁶ Leibniz's system makes this possible. Each moment when there is a new discovery, when we believe to be witnessing some kind of progress, it seems as if the totality of what happened earlier needs to be revised as if not only the present but also the past and the future are undergoing all sorts of changes.²⁷ Each single discovery reverberates over the entire fabric of science. Each innovation compels us to think what will be rolling, surging, and changing too. This assumes a complex understanding of time, one which is very different from linear conceptualizations of time. Each scientific event evokes a series of other events, the consequences of which cannot be foreseen or controlled. These events are part and parcel of the entire system. The events are the system. Whoever does not recognize this originally stoic understanding of knowledge—the stoics always emphasized the uncontrollability of consequences—does not understand the boundless openness of knowledge and hence how it develops.²⁸ The idea that

consequences are uncontrollable is very difficult to accept in a society where the focus on results, excellence, and efficiency seems to be all-pervasive. Many people working in organizations would understand this as a form of cynicism that belies the very idea of manageability. Yet, Serres's entire reconceptualization of science takes issue with such a focus on control. The formalism he is advocating is not aiming for control, but for openness, variation, and an understanding that problems are embedded in a long and complicated history. What kind of method allows for such openness?

Meaning and Structure

In *Hermès I*, Serres makes a useful distinction between symbolic and formal scientific methods. In the first case, a scientist transforms a singularity into an 'archetype' by filling it with sense and meaning. He or she tries to establish a link between a single token and a certain semantic content. For example, Freud distinguished the obvious content of a dream, something we might describe as the narrative of the dream, and the symbolic meaning that this dream might have. The formal method, on the other hand, is not interested in concrete content. It proceeds like algebra in the sense that it is only interested in the relationship between correctly composed but never semantically defined objects. When a house is finally constructed, one might always reconsider if and how to fill it with content. The formal analysis simply wants a building which is constructed by following its own rules. To recap: either one departs from meaning and links this to an archetype or one creates structures that produce meaning at a later stage. In the first case, innovation is notoriously difficult, in the second case innovation is inevitable. The symbolic method has the problem that defining meaning engenders its own sort of inflexibility.

Serres understands structure as an 'operational ensemble' with an undefined meaning whereas an archetype is a 'concrete ensemble' with an over-defined meaning. Archetypes fix meanings whereas structures do not. The latter therefore imply many more possibilities. Serres advocates a new methodic spirit that allows a meaningless structure to create many more meanings than a symbolic analysis. While the latter is hijacked by meaning, the former can, in spite of its inherent formalism, only gain meaning and content. The strategy is to initially leave the structure undetermined and in at a later stage to allow for more and more content.

These insights have important consequences for our view of the history of science. Historians are always inclined to go back to the sources in order to criticize and combat the impurity that creeps in later. The important question here is how

realistic this is. On the one hand, Serres acknowledges that loss or intermingling occurs in the chains of communication that make up the history of science. It is not that ideas are simply forgotten, but perhaps one might argue that after due course they become weaker. Serres compares the history of ideas with what might happen in a series of telephone conversations: the longer the chain of communication is, the greater the likelihood that the original message will be distorted. Content and truth may be lost after a while. However, we should not exclude the possibility that a pure and original idea never existed in the first place. To put it differently, in any idea there is the capacity of interference and disturbance (*des puissances de brouillage*) which hampers the transition from one domain to the other. There is, just as in any kind of communication, noise. Serres considers it to be a task of the historian of science to render this noise as concrete as possible.

One might understand the history of science as a history of pure truth that does not know of any disturbance. But if one would indeed subscribe to this idea, then science can only be 'recurrent.' It would be a system which constructs its chains of communication in such a way as to remain as closely as possible to its original and pure source. This would result in a closed system that allows for just one sort of truth that towers high above all the work carried out by scientists who will never dare to come out of its shadow. The task of history then reminds us of Socrates who once asked a young slave called Meno to solve a geometrical problem. The great philosopher helped the boy to solve the problem by making him remember the original truth. In this case history just becomes the art of remembering, an anamnesis that unflinchingly pierces through the clouds of noise and interference to ultimately lay bare the pure. Whatever conceals purity, then becomes fashion, perversion, or relativism. And there are still many scientists who, like Pythagoras, are willing to teach troublemakers like Hippasus mores.

Yet, interference is inevitable. One cannot understand the history of those chains of communication without noise. In fact, one might understand theories and hypotheses themselves as noise. For example, one might argue that Newton is the noise that prevented us from understanding Leibniz or that Descartes is the noise that prevented us from properly judging medieval philosophy. Everything in science can be understood as noise. The system that Serres has in mind links the best of two worlds. Of course, there is forgetting and decay in the sciences, processes that need to be criticized. There is also chance, serendipity, innovation. Paradoxically, these latter elements can be brought into the system by dint of the radical formalism that inheres Serres's understanding of structure. The core of Serres theory about science lies here: the possibility of criticism needs to be decoupled from the

kind of purity and clarity that were so important for Descartes and Kant. When we discussed the *ars inveniendi*, we already saw that Serres argues that critical judgment is less important in science than innovation. It is precisely this formal idea of a structure that allows for innovation. The only kind of criticism that Serres is really willing to support targets the perseverance, oftentimes in the name of common sense, of conservatism and intolerance.

Discussion

It is not difficult to provide the reader with many examples of sciences that have succumbed to a kind of common sense that blocks off innovation. Economics is a case in point. Susanne Soederberg, a Canadian professor in development studies, has a long-standing record of criticizing economists for accepting the existent economic system as a natural given, as something which is 'out there' and which knows its own laws and principles. Such a common sense view of economic systems, has allowed them to completely disregard the importance of power effects, something which has, according to Soederberg, made them complicit to what she, already in 2004, described as the 'ongoing crisis of capitalism.'²⁹ Science cannot allow itself to operate in a political or historical vacuum. Battling common sense, seeing it at least as a site of ongoing contestation, is crucially important if we are to innovate our understandings of the world. Power, however, has by and large, been excluded from the economical mind set in a way that Pythagoras wanted to exclude the irrational numbers.

However, to open up to these novel ways of understanding the world is considered to be a threat to the methodological rigor of a certain discipline. Serres offers us a way of viewing science that combines openness with rigor. The Leibnizian system he advocates combines recurrence with openness and coincidence. It is a system that he juxtaposes to the Cartesian system which is, in academics as well as in corporations, often seen as the scientist's common sense. Serres argues that both systems are incommensurable. He claims that the Leibnizian system is much more suitable for understanding contemporary issues such as sustainability, globalization, or economic crises. The argument I put forward in this paper is that business ethicists who address these kinds of problems should be concerned about the role of the scientific researcher. There is no doubt that science will keep on playing an important role in addressing all these 'world-wide' issues but we need to think about what kind of science. In figure 1 have summarized Leibnizian and Cartesian understandings of science.

The Cartesian System

relies on intuition
 builds on evidence
 shies away from innovation
 departs from fundamental points

 restrictive
 argues truth is exclusive

 thinks in terms of actuality
 appreciates clarity and distinction
 thinks in terms of obstacles

 argues that knowledge is always clear

 claims that measurement determines mathematics

The Leibnizian System

relies on mathematical variation
 builds on formal thinking
 focuses on innovation and variation
 construes a pointless fabric of chain relations

 generalising
 truth is never crystalline clear, but always 'complicated' and 'implicated'
 thinks in terms of possibilities
 appreciates confusion and intermingling
 thinks in terms of leakages, blurs, transitions

 argues that knowledge and confusion go hand in hand

 claims that variation determines mathematics

Figure 1: Two Systems of Science

In a somewhat simplifying way, figure 1 represents the great shift that took place in thought about rationalities somewhere in the seventeenth century. It is important to see that we are not talking about a collision between rationality and irrationality. The Descartes/Leibniz controversy stands for a debate that takes place within the rational universe itself. Serres is welcoming this shift, but also thinks that its consequences have been concealed by Kant. Moreover, it is clear that Descartes and, in his wake, the Cartesians were an obstacle to scientific endeavors that were not rigidly abiding by the methodological norms they themselves so meticulously formulated. Serres depicts Descartes as a 'revolutionary' and Leibniz as a 'traditionalist.' In his view, Descartes violently tried to shake off the shackles of the medieval tradition. Leibniz, on the other hand, was the enthused 'encyclopedist' keen on collecting facts and trivia that populate history. Descartes felt contempt for trivia, for the past as such, an attitude that would become a hallmark of many scientists after him as well. Serres summarizes his ideas as follows:

What does Descartes in fact reject? Precisely this history in the Baconian sense of the word, history as the collection of picturesque and piquant facts,

just like Diogenes Laërtius. Why? Because it is devoid of order, proof, and fertility; because it is based on memory rather than intuition, on consensus and authority. Leibniz, however, recommends erudition, the description of factual truths (*vérités de fait*) about man and nature.³⁰

Descartes's scientific revolution in fact leads to stagnation. He saw himself as an absolute new beginning that methodologically fixes once and for all how the sciences are to cope with truth. Truth is always understood as clarity within the confines of a precisely described domain that allows for the cutting light of intuition. Whoever ventures outside this domain, excludes himself from science. It is exactly this idea of science that still prevents us from properly understanding the world-wide problems we discussed above. Issues such as global warming or economic crises cannot be approached with the kind of certainty or clarity many scientists have dreamt of since the days of Descartes. Leibniz's approach to science is completely different and offers us a better model to understand these problems. Nowhere does he find a single domain, for example, that of mathematics, where the light of the truth is intensely burning. Everywhere and anytime can we see tiny sparks of truth. This allows him to think that the truth is somehow historically embedded. The truths of yesterday may or may not be the truths of tomorrow. The paradox Serres alerts us to when he writes about Descartes and Leibniz is momentous: the revolutionary becomes the severe guardian of boundaries and the traditionalist indulges in formal variation and openness.

In fact, Serres wants us to believe that revolutions in science are jeopardizing renewal. Just as their political counterparts, scientific revolutionaries are bound to betray their initial openness and innovativeness. They do not share Leibniz's fascination with the world. The baffling point about Leibniz is that he knows how to link formalism to a passionate interest for history, something which is, as we have seen, completely alien to a revolutionary understanding of science. Science is indelibly anchored in tradition. This is the condition for constant renewal.

"Science is merely the new," Serres argues.³¹ But how useful is the new? And, how useful is science when it comes to solving the problems we have briefly discussed? These are questions that burden historians of science and, they should burden, business ethicists as well. On a local level there is no doubt that these questions can be easily answered. The oncologist makes headway with the battle against cancer, the hydrologist is needed because he knows how to irrigate arid soil, and the zoologist helps us to understand biodiversity. Progression is everywhere, Serres argues, and it would be nonsensical to cast doubt on this. However,

the question about science's global usefulness remains unanswered. Whereas it is undeniably the case that science deeply impacts our society, we do not know how it should, if at all, determine our way of life. Locally, sciences have goals, but an overall goal is lacking. Science does not move into one direction. In fact, we do not even know about the morality of all these scientific research centers, the people working there, that is, the morality of science as it is currently practiced. Asking for a goal is asking a moral question. Serres, however, shies away from moralizing science. In his view, the moralist is a ridiculous person (*personnage dérisoire*) whose main goal is to mask the way power is functioning.³² We can only answer global questions about science on a local level. There is no global answer. More precisely, the fact there is not an answer *is* the answer. In the end, the scientist is navigating an empty space. Exactly his or her formalism, his or her ability to leave matters undetermined, his or her boundless openness and eagerness for what is new presuppose such an emptiness. Whoever wishes to fill the emptiness by answering the question about why there is science, reduces a mere means to an end. Globally speaking, science refuses to be a means. It wants to be absolute, in the literal sense of the word: detached, isolated, in and for itself. The Leibnizian system is completely self-referential. And so is science. Or perhaps better, science should be like that. Unencumbered by rigidity, power, common sense, or academic restraints it should follow its course. The problems and crises we have briefly alluded to in this paper can never be fully grasped, but this should not prevent us from finding new ways to approach them. Combining economic analyses of the financial crises with the study of power effects is more promising than trying to nail down the precise cause of the crisis (as if it had a starting point). Likewise, our understanding of sustainability and the difficulties we have to achieve (whatever we should understand by that) benefits enormously from a philosophical analysis of the way we have, historically, excluded nature from our rightful concerns about social justice. Serres's understanding of science allows him to link two realms—the natural and the social—that most scientists have rigidly separated. This openness makes his analysis in *Le contract naturel* so painful and illuminating at the same time. Nothing prevents us from bringing in more insights and perspectives. It is the only way in which we may 'dis-appropriate' a certain issue and make it a concern for us all.

Endnotes

1. Serres, *Le contract naturel*, 126. All translations into English are mine.

2. See <http://www.temoignages.re/face-a-face-michel-serres,24693.html> (accessed March 8, 2011).

3. Michel Serres, *Eclaircissements. Cinq entretiens avec Bruno Latour* (Paris: Flammarion, 1994), 12–15.

4. Michel Serres, *Le parasite* (Paris: Grasset & Fasquelle, 1980); Michel Serres, *Genèse* (Paris: Grasset, 1982).

5. Michel Serres, *Hermès V. Le passage du nord-ouest* (Paris: Éditions de Minuit, 1980), 180.

6. Serres, *Hermès V*, 100–101.

7. Michel Serres, *Le tiers-instruit* (Paris: Gallimard), 187.

8. Michel Serres, *Hermès II. Interférence* (Paris: Éditions de Minuit, 1972), 32.

9. Serres, *Hermès V*, 109.

10. Serres, *Hermès II*, 33.

11. Michel Serres, *Le système de Leibniz et ses modèles mathématiques. Étoiles, schémas, points* (Paris: PUF, 1968), 549.

12. Michel Serres, *Hermès IV. La distribution* (Paris: Éditions de Minuit, 1977), 45.

13. Leibniz, quoted in Serres, *Système de Leibniz*, 2.

14. Serres, *Système de Leibniz*, 11. That this firmly anti-Cartesian position has been a constant theme in Serres's work becomes clear when one consults more recent publications. In a booklet devoted to the interrelationship between world-wide pollution and the human tendency to appropriate the world, he argues that a proper understanding of space—i.e., an understanding that space cannot simply be owned—has been hampered by Cartesian thought: “We no longer inhabit the same space; the new space can no longer be enclosed at all. We can no longer enclose a piece of land. This could be done only in the old space that was easily mapped. We no longer live there. We haunt a topological space without distances, rather than the old Euclidian or Cartesian expanse that could be located metrically by a network of coordinates.” See Michel Serres, *Malfeasance. Appropriation through Pollution* (Stanford, CA: Stanford University Press, 2011), 67. This book, which once more makes the case for a natural rather than a social contract, is a translation of Michel Serres, *Le mal propre: Polluer pour s'approprier?* (Paris: Le Pommier, 2008).

15. Serres, *Système de Leibniz*, 120.

16. *Ibid.*, 17, 56.

17. *Ibid.*, 130.

18. Michel Serres, *Les cinq sens* (Paris: Grasset & Fasquelle, 1995), 98.

19. Stefan Helmreich, “Menschliche Natur auf See,” in *Bios und Zoë. Die menschliche Natur im Zeitalter ihrer technische Reproduzierbarkeit*, ed. Martin Weiß (Frankfurt am Main: Suhrkamp, 2009), 136–151, 137. See also Stefan Helmreich, *Alien Oceans. Anthropological Voyages in Microbial Seas* (Berkeley, CA: University of California Press, 2009).

20. Michel Serres, *Hermès III. La traduction* (Paris: Éditions de Minuit, 1974), 20.
21. Serres, *Génèse*, 15.
22. Michel Serres, *Hermès I. La communication*. (Paris: Éditions de Minuit, 1968), 80.
23. Serres, *Hermès I*, 81.
24. Michel Serres, *La naissance de la physique dans le texte de Lucrèce. Fleuves et turbulences* (Paris: Éditions de Minuit, 1977), 10.
25. Serres, *Hermès I*, 104.
26. Serres, *Tiers-instruit*, 206.
27. Serres, *Hermès I*, 94.
28. Serres, *Naissance de la physique*, 231.
29. Susanne Soederberg *The Politics of the New International Financial Architecture. Reimposing Neoliberal Domination in the Global South* (London: Zed Books, 2004), 4.
30. Serres, *Hermès I*, 137–138.
31. Serres, *Hermès IV*, 126.
32. Ibid.