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michel serres: thinking beyond boundaries

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The recent revival of interest in Michel Serres has given rise to a number of conferences, seminars and publications focusing on a single aspect of his thought (history, environmental philosophy, the environmental humanities, the social contract, the sciences). The impetus for this edition comes from the way Serres's work crosses boundaries and intersects with multiple disciplines. It stems from a conference held at the Maison Française d'Oxford in June 2022, which explored Serres's practice of interdisciplinarity and showcased how his work has fed into and renewed fields of enquiry such as philosophy, the history of science, anthropology, geography, translation, and ecocriticism.

This publication thus seeks to provide a broad view of Serres's thought, from his formative years up to his posthumous publications, in order to clarify how Serres has continued to challenge disciplinary boundaries throughout his career. Indeed, in the 1960s, structuralism invited bold *rapprochements* between the sciences, language, and myth. However, Serres distinguished himself by adopting a precise mathematical notion of structure and stating explicitly that the distribution of the encyclopedia into disciplines should never be taken for granted. Disciplinary organization should be problematized because it reveals the inner dynamic of knowledge, as well as its cultural and social underpinning. Where the usual point of reference was structural linguistics, Serres drew inspiration from mathematics and the philosophy of Leibniz and developed a distinctive approach to working across multiple disciplines. By tracing connective patterns that run through the sciences, the arts, literature and painting, and which also shape our own embodied relation to things and to the world, his work draws on multiple disciplines that all cross-fertilize. In addition, his pursuit of traditional topics such as truth, time, nature, religion, and what it means to be human along these paths gave new life to philosophy itself, which had been his ambition from very early on.

Serres claimed that the role of the philosopher is to let things speak for themselves and to take part in their communication without assuming a privileged position. He forged his conceptual tools by drawing on mathematics, information theory, the physical sciences, geology, the life sciences, law, and mythology. He challenged orthodox ways of thinking by introducing figures and conceptual tools—such as Hermes, Pan, Harlequin, angels, noise, the parasite, the natural contract, hominescence, and Biogea—that operate in several disciplines at once.

Serres was so convinced of the inventive power of this way of thinking that, before his death, he asked the Foundation Michel Serres-Institut to set up an annual prize to reward a fully multidisciplinary French PhD dissertation.

The contributions to this issue, written by international scholars who have published extensively on Serres, highlight the singular nature of his approach

to thinking through or beyond boundaries. They also bring him into dialogue with his contemporaries, especially Michel Foucault, Jacques Derrida, and Gilles Deleuze. Finally, they raise the issue of what kind of ethics and politics can be inferred from Serres' predilection for the "*randonnée*", the journey across borders. Taken together, the articles make up a mosaic of perspectives that underline the relevance of Serres' thought for the understanding of our contemporary society as well as his unique position within contemporary French thought.

Christopher Watkin's article explores not what Serres thinks about this or that subject, but how he thinks about everything. It seeks to identify and analyse Serres's "figures of thought", a term he uses to describe a unique way of thinking that crosses the boundaries between the natural and the cultural, the conceptual and the personal, the mute and the linguistic. Some of his figures Serres has already named, while Watkin's article suggests labels for others, using terms taken from his own work: the figures of webs, trees and crystals participate in and exemplify, respectively, the federative, ecological and relational aspects Serres's thought and writing. These figures cohere into what Serres calls his "global intuition", a term that describes a corporeal, affective and intellectual orientation within and towards the world. The article briefly sketches how Serres's own global intuition offers crucial and unique insights into some important contemporary issues, such as the climate crisis and the need to reimagine our evolving social contract. It closes with some reflections on the very idea of attempting to characterise how a given philosopher thinks.

Roland Schaer presents Serres's notebooks written in the formative years (1960–1974) and published as *Le cahiers de formation* by Le Pommier in 2022. This substantial work reveals the genesis of his philosophy. Serres's reflection on modern mathematics, and in particular on the structural idea of importing and exporting concepts, led him to replace the old philosophy of the subject with a philosophy of communication. This was a radical transformation because communication is no longer defined as the circulation of information between subjects. It is among objects, in the world itself, that information is exchanged.

Lucie Mercier focuses on Serres's approach to the question of the "history of truth" during the years he spent in close contact with Foucault, his colleague in Clermont-Ferrand (1961–1968). Though Serres rarely used this expression himself, Lucie Mercier claims that the problematic of the "history of truth" may be considered as one of the key organizing problems of his early works; an interrogation from which Serres's transdisciplinary philosophy developed. Her paper examines the ways in which Serres's engagement with the question of "the history of truth" evolved, accompanying various aspects of his reading of Leibniz and beyond Leibniz. She argues that Serres's positioning in this contested field crucially relied on the concept of translation, and in addition shows that this issue was at the heart of his contention with Foucault and his relation with Georges Canguilhem.

Bernadette Bensaude-Vincent seeks to identify the scientific roots of Serres's philosophy of time. While Serres is well known as a philosopher of communication, the question of time runs through his entire works, from the first *Hermès* to his last, posthumously published book, *Relire le relié* (2019; translated into English as *Religion: Rereading What is Bound Together* in 2022). His reflections on time do not proceed from the history of human societies. They were first inspired by mathematics, thermodynamics and cybernetics and they gradually changed through his reflections on biology, geology, astrophysics, and ecology. Without surveying all of Serres's reflections on time, this article examines how his various sources of inspiration intersect and stresses the contrast between Serres's earlier views on multiple times and the Grand Narrative developed in the 2000s.

Massimiliano Simons explores the ethics that Serres derived from his interpretation of information theory. In his work, Serres often criticized society, politics, and language as distractions from science, nature, and the world. What is less clear is the basis on which Serres formulates these critiques. Simons argues that there is a logic behind these critiques, which he calls an ethics of noise and fleshes out in three steps. First, he shows the central role of the opposition between information and noise in Léon Brillouin's information theory. Second, he points

to the interpretation of this theory in the work of the French biologist Henri Atlan. Finally, he argues that this framework can then be applied to a number of social issues in order to demonstrate not only the systematicity but also the fruitfulness of this ethics of noise.

Henriette Korthals Altes approaches Serres's view of religion in *Relire le relié*, in connection with his longstanding interest in mathematics. Completed on the eve of his death, it has the portentousness of a testament, even though religion had always been a question underlying his work as is revealed in the recently published *Cahiers de formation*. She examines the specificity of Serres's approach in the debate opened by other French thinkers such as Jean-Luc Nancy and Derrida, who have teased out the continuities between the secular and the religious. The questions of violence and the Girardian scapegoat of community, of good and evil, of justice and the relation to alterity all find their way into *Relire, le relié*. However, the originality of Serres lies in addressing the question of God, not so much as an ontological principle but as a formal one. It is mathematics, its abstractions, and the lures of the unknown variable of an equation, that stirs up his interest in religion as a unifying principle capable, like science, of accounting for the invisible, or what he called "the functional value of the idea of god" (*'la valeur fonctionnelle de l'idée de Dieu'*) in *Cahiers de formation*. Drawing on *Relire le relié* and the *Cahier de formation I*, this paper seeks out what this unifying principle would be, how it compares and contrasts with elements of Spinozian and Leibnizian philosophy, and how ultimately Serres's own poetic philosophical language creates transcendence.

David Webb focuses on *Le Contrat Naturel* (1990; translated into English as *The Natural Contract* in 1995), to explore the relation between the world, knowledge and politics. In *The Natural Contract*, Serres argued that the exclusion of the natural world from the social contract had promoted an attitude of violence and domination towards the world that was destroying the conditions on which our existence depends. Serres's response was to propose a natural contract to establish a three-way relation between individuals, political communities, and the

natural world. His proposal calls for changes in the relation of science to political governance, emphasizing the importance of these changes, but warning that we should not treat this uniquely as a problem regarding the relation of science and politics, since to do so would perpetuate the exclusion of the natural world. In order to see what a natural contract involves we must: first, re-think the idea of “contract” entirely by going back to his account of the formation of order, which is to say to the relation between order and disorder; second, and more specifically, renew our understanding of empiricism, which is to say how sense is made from our exposure to the natural world. Webb argues that these considerations allow us to identify principles regarding invention, de-escalation, and reserve that can be seen “in translation” across the natural world, knowledge, and politics. This opens the possibility of communication between the three domains, without establishing a single foundation for them all or making one subordinate to another.

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how serres thinks

christopher watkin

What does it mean to explore not *what*, but *how* someone thinks? In a famous 1951 essay, Isaiah Berlin takes his cue from an enigmatic line by the ancient Greek poet Archilochus: “a fox knows many things, but a hedgehog knows one big thing”, a line which, he explains, may well indicate one of the deepest differences between not only styles of thinking but human beings in general.¹ Hedgehogs, for Berlin, analyse all of life through “a single, universal, organising principle in terms of which alone all that they are and say has significance”. Foxes, on the other hand, “pursue many ends, often unrelated and even contradictory, connected, if at all, only in some de facto way, for some psychological or physiological cause, related to

no moral or aesthetic principle”.² Hedgehogs are centripetal, foxes are centrifugal.

A very similar analogy surfaces again over thirty years later, in a conversation filmed in 1989 between Michel Serres and René Girard at Stanford University and broadcast as part of Bernard Pivot’s long-running *Apostrophes* TV series. Just before the hour-long episode draws to a close, the conversation turns to the question of philosophical styles. “I am originally a scientist with a secondary training in literature”, Serres begins, “and I have sometimes been irritated by the division of universities into faculties”.³ Girard’s response is immediate: “Life is short when it comes to ideas, that’s what strikes me. I think it takes twenty-five years to develop one idea”.⁴ It is at this point that Serres gives Archilochus’s image a suitably rural French twist: “There are boars and there are foxes. You are a boar and I am a fox. Boars dig in one place until they find what they are looking for, and foxes dart here and there, exploring.”⁵ Boars analyse, and foxes federate, tracing paths between disparate points. Serres is quite clear in his own mind: he is a federator.

This brief exchange is an ideal place to begin a reflection on how Serres thinks, for two reasons. First, in this brief exchange he offers a brief and fascinating description of his own style of thought. But secondly, and equally importantly, an animal analogy cuts much more with the grain of Serres’s own thinking than would a detached and forensic description. No doubt a string of abstract Latinate and Greek nouns could be trotted out in an august attempt to capture Serres’s style of thinking: anti-phenomenological, ecological, resistant to the linguistic turn, and so on. But like describing a human body in terms of the relative mass of its constituent elements, such an approach would be of limited help in understanding that style of thinking in its own terms, and it is notable that Serres hardly ever uses these sorts of labels to talk about his own thinking.

The closest he comes is in the course of a conversation with Bruno Latour. When pressed to describe his style of thinking as a whole, he reaches for the language of relations, explaining that “No single word, neither substantive nor verb, no domain or specialty alone characterises, at least for the moment, the nature of

my work.” Nevertheless, and not without a little irony, he proceeds to describe the nature of his work in one substantive: “I only describe relationships. For the moment, let’s be content with saying it’s ‘a general theory of relations’”.⁶ More commonly, though, and when he is not responding to a specific question, Serres seems much happier to describe his way of thinking with an analogy from the natural world, to characterise himself as a fox, as he does in the Stanford exchange, or to say “I write like light, crystal or a stream”.⁷ This is no superficial literary affectation, as some have reductively and hastily accused him of indulging. It already reveals something very important—perhaps the most important thing—about how Serres thinks.

When Serres uses images of people or animals to describe styles of thinking and being in the world, as he often does, he calls them “conceptual characters”.⁸ These conceptual characters avoid the siloed disciplinary vocabularies that create divisions between theoretical approaches, and the treacherous abstractions that sunder intellectual discourse from the world it describes. A conceptual character embodies and presents, in a particularly concentrated form, a whole world: a mode of engaging with the world, a suite of sensibilities and predispositions to notice particular things in the world, to value them in particular ways, and to act in relation to them in particular ways.⁹

Though they are somewhat unusual in contemporary philosophical discourse, Serres’s conceptual characters are far from without precedent, and he situates them in “a grand tradition running from Montaigne to Pascal”.¹⁰ As precursors to his own characters, Serres mentions Plato’s Socrates, Montaigne himself as a figure of humanity, Descartes’s evil genius, La Fontaine’s animals, Leibniz’s Polish twins and Martin Guerre, Voltaire’s Candide, Zadig and Micromégas, Nietzsche’s Zarathustra, Sartre’s Roquentin, Camus’ Sisyphus, and Deleuze and Guattari, with their conceptual personae (a further word about which I will offer in the following paragraph). We might also think of the way in which Georges Dumézil evokes the Capitoline Triad of Jupiter, Mars and Quirinus as representative of the great institutions of religion, war and the economy. So when eyebrows are

raised at Serres's conceptual characters, it is not because he is innovating; indeed, the history of philosophical characters is extensive and canonical. It is because casting concepts as characters is further grist to the mill of those who would dismiss Serres as a "poetic" and "literary" writer, one who does not conform to one disciplinarily rigid or historically and geographically limited paradigm of philosophy.

It is clear that Serres admires and draws from Deleuze and Guattari's conceptual personae, stating that "besides creating concepts, philosophy creates characters. It was Deleuze again who recently said it best, in a way that I can't".¹¹ It would, however, be unwise to characterise Serres's own conceptual characters in terms of reconstructed Deleuzian and Guattarian conceptual personae. As he explains in an interview with Marianne Durand-Lacaze, his character-concepts are more of an end in themselves:

Deleuze said: "what is a philosopher? The one who creates concepts". I think that the conceptual character is even more important. Because he carries in himself the sense and the whole of the depth of the concept, along with a sort of almost independent life.¹²

Whereas for Deleuze and Guattari the conceptual persona serves the creation of concepts, for Serres the concept is a distillation and reduction from the character who gives it life.

Before discussing the particular figures that characterise Serres's thought, it may be worth dealing with a more fundamental possible objection to the approach I am taking in this article. The objection is this: isn't all this reflection on how someone thinks just by the by? Isn't analysing how someone thinks like discussing the route that gets them from A to B, as if it is not the mode of transport that is important to a successful journey, not the destination? This is emphatically not the case. As I will argue in the conclusion to this article, the way we think makes all the difference in the world, and all the difference *to* the world. As Foucault

has shown us in the notion of regimes of truth, the ways in which our thinking produces truth and meaning shapes the possibilities of our existence:¹³ what is viable for us in the world, what is visible to us, and what is valuable for us. The way in which Serres thinks is not an aesthetic or rhetorical supplement to his thought, it is the very substance of his philosophy, and one of his greatest contributions to contemporary attempts to address the great challenges that face us.

In trying to answer the question of how Serres thinks in a way that does not betray that thinking, I propose three images, each taken from Serres's writing and each embodying something important about his intellectual style. Serres's thinking is like a web, like a tree and like a cave. These three images are not separate components of the ways that Serres thinks, but three aspects, three overall perspectives, on the same style of thought, helping us to see in what sense Serres thinks beyond boundaries.

THINKING LIKE A WEB: FEDERATION

In his earlier work, Serres describes his style of thinking as being like a web as opposed to a path. The image of the path is borrowed from Descartes's *Discourse on Method*, and Serres cannot resist showing a little bemusement about how Descartes uses the image to describe his own style of thinking.

In the second moral maxim of Part Three of the *Discourse*, Descartes describes his manner of thinking through the image of finding one's way in a forest. In his stubborn determination to adhere to his method come what may, he fancies himself a traveler who, upon becoming lost among the trees, resolves not to wander this way and that in the vain hope of finding an exit, but to walk "as straight as he can in one direction, never changing it for slight reasons even if mere chance made him choose it in the first place".¹⁴ This way, whether or not he ends up exactly where he intended, he will at least have reached the edge of the forest.

Faced with this Cartesian maxim, Serres can hardly contain his derision. One thing is clear, he comments: Descartes has never found himself lost in a forest, for

if he had he would know what a hopeless strategy he proposes.

Has he ever attempted it? In order to define the said line, two points are necessary: this tree, for example, and another one further away. Run to it. Starting from its trunk, begin again and go towards a third. But no reference point guarantees that, between the first and the second straight line, an infinitesimal angle will not appear. Repeat this as many times as necessary, with the result that you run the mighty risk of going round in circles and becoming ever more lost. The second method is as little serviceable as the first: it is not only useless but it leads inexorably to wandering.¹⁵

Such a method may work well enough in an aseptic, flat space of Cartesian extension, but it is hopeless in the world in which—most inconveniently for Descartes—we happen to live. No-one sails that way, Serres points out,¹⁶ and no-one succeeds in flying to the moon that way;¹⁷ both require thousands of corrections and accommodations en route, responding to changes in current and atmosphere, and constantly rectifying miscalculations.

In contrast to Descartes's straight path, the Serres of *Le Système de Leibniz et ses modèles mathématiques* favours the image of the web¹⁸ or network ("réseau"). Logic, Serres argues, does not extend like a straight line but "develops by a composition of terms arranged in different directions, a composition that grows like a tissue, invading domain after domain like expanding rings in water",¹⁹ each new crossing or composition finding new models and carefully, painstakingly, falteringly relating them to other models.

For Descartes, to think is to analyse, to divide, but for Leibniz and Serres after him, to think is to federate, to trace relations. This distinction profoundly shapes Serres's understanding of philosophy: "analysis might be valuable, with its clarity, rigour, precision and so on, but philosophy really has the opposite function, a federating and synthesizing function. I think that the foundation of philosophy is the encyclopaedic, and its goal is synthesis."²⁰ In direct contrast to Cartesian

analysis, Serres wishes “for the advent of a desmology, a discourse of ties, ligaments, ligatures”,²¹ a thought under the banner not of cuts and divisions but of knots and folds. As he succinctly puts it in *Le Gaucher boiteux*, “Federating, thinking: same difference!”²²

Both Descartes’s and Serres’s approaches could be characterised as a mode of thought that foregrounds relations, but the relations that characterise their styles of thinking are very different from each other. Descartes’s straight line creates filtered, restricted, precise relations that connect already existing entities. Serres’s relations, by contrast, are original: “Relation precedes being” he writes in *Hominescence*, “there you have my philosophy in a word”.²³ This style of thinking is, of course, not without precedent. The early Serres bases his combinatorial, web-like approach on Leibniz. But later he departs from the Leibnizian image of the web to prefer (in *Genesis* for example) images of unstable disorder like cyclones, storms and clouds.²⁴

THINKING LIKE A TREE: ECOLOGY

The second image that helps us come to terms with Serres’s thought is a tree. It is an image which few philosophers can embrace, Serres notes, because they think from a position of seclusion behind a closed window. Serres can barely suppress a weary chuckle when he discusses the linguistic philosopher who, having built himself a house of concepts and logic, sits in his comfortable Fifth Arrondissement apartment and gazes through his closed window at the apple tree outside, taking it upon himself to compose a verbose dissertation on its blossoms which he cannot smell, touch or distinctly see. He is protected from the wind, rain, sun, cold, fog, scent and light that make the tree what it is, and conveniently forgets the frame, the curtains, and the opaque glass and window that insulate him from ever coming into contact with the object of his linguistic flights of fancy: “The house-skull quietly contemplates the tree through the porthole-eye”.²⁵

Just as the implausibly straight path is an emblem of Descartes’s philosophy, the

closed window is a damning cypher of philosophy's intellectual and linguistic isolation from the "outside" world. The guilty party here is the Merleau-Ponty of *Phenomenology of Perception*, a book that made the young Serres laugh out loud at its incipit, "At the outset of the study of perception, we find *in language* the notion of sensation".²⁶ Before the reader has even finished the first sentence of this five-hundred-page tome, Serres laments, perception has already been reduced to language. Serres dismisses this phenomenology in no uncertain terms: "What you can decipher in this book is a nice ethnology of city dwellers, who are hypertechnicalised, intellectualised, chained to their library chairs, and tragically stripped of any tangible experience. Lots of phenomenology and no sensation—everything via language".²⁷

For his own part Serres does not simply open the window, he wants to let the tree teach him how to think and use language. The premise here is that thinking is not the exclusive preserve of human beings. For Serres, everything thinks: stones, rivers, cities, crystals, planets, supermarkets, towns, animals, even human beings, because everything receives, stores, processes and emits information. This is nothing other than basic thermodynamics and information theory. Thermodynamics allows us to theorise how entities receive, store, process/exchange and emit energy, and information theory allows us to theorise how those same entities receive, store, process/exchange and emit information,²⁸ where information is energy at orders of magnitude smaller than thermodynamics.

For Serres, this completely changes how we think. No longer do we think *about* the apple tree outside the window, we now think *like* the apple tree.²⁹ In other words, the relationship between my thinking and the apple tree is no longer one of mimesis, imitating the tree, but methexis, participating in what it is already doing. So it is completely appropriate for Serres in *Récits d'humanisme* to say that, as a writer, his little stories are part of the universe's big story, not an imitation of it from the outside but a participation in it from the inside: "The speaking subject mingles its sound with those of resonant objects. I write like light, crystal or a stream; I tell my story like the world".³⁰

What does this mean? Serres tells us: The background noise of my body hears the background noise of the world.³¹ The world opens itself to me and I to the world. I do not simply think about rivers; I think like a river,³² following the energy-transferring rhythms of the river, or I think like the sea,³³ like the earth and like a mountain.³⁴ Writing is not something estranged from the processes of the natural world. It participates in those processes: “Work flows from me like honey, like the spider’s web [...] I am a bee or a spider, a tree. I no longer can tell the difference between work and secretion”.³⁵

THINKING LIKE A CRYSTAL: PREPOSITIONS

Thirdly and finally, Serres’s relational thinking articulates itself not in nouns but in prepositions. We can see what is at stake in this difference by considering a contrast he draws between two caves, Plato’s famous cave from *Republic* book VII, and a lesser-known cave in Jules Verne’s novel *The Vanished Diamond*. For Serres, Plato’s cave is emblematic of a way of thinking that privileges substances. What does the escapee from Plato’s cave find when he loses his chains and climbs to the surface? For Serres, he finds a noun. Plato’s sun is substantial: it is *the* substance, *the* eidos, the transcendental signifier that sheds its rays of meaning abroad to the whole world. Like Descartes’s path through the forest, this sun is a rather fanciful image for Serres, for it seems to cast no shadow and illuminates everything perfectly. Any earthly atmosphere would distort and discolour such a perfect radiance, Serres notes, and so the only place where Plato’s cave can function as he presents it is on the moon.

This solar pathology is indicative of a wider trend in Western thinking for Serres: “Traditional philosophy speaks in substantives or verbs, not in terms of relationships. Thus, it always begins with a divine sun that sheds light on everything”.³⁶ Once more, Serres makes this suturing of philosophy to the noun sound faintly ridiculous—“to be and to have, consciousness, nothingness, thought, will... nouns that are not declined, infinitives that are not conjugated”³⁷—and that relegates all other language to a secondary status. These nouns are the “statues”

and “fetishes” of philosophy,³⁸ touting a telegraphic language—“Me arrive tomorrow”, “Me be ego”, “Being and nothingness”³⁹—that he likens to playing the piano while wearing boxing gloves.

In opposition to this Platonic cave with its substance-sun, Serres opposes his own cavern, borrowed from the nineteenth chapter Jules Verne’s *The Vanished Diamond*, which describes an underground, bejewelled grotto into which the novel’s heroes descend with lanterns, the light of which is reflected and refracted by its crystalline walls as in thousands of prisms.⁴⁰ In Serres’s view, Verne’s cave is a systematic undoing and rewriting of Plato’s allegory. The lights in Verne’s cave are not one single imposing, self-generating, self-sustaining presence like Plato’s sun, but myriad relays and reflections. And these lights glitter next to each other, between, over, through, and within each other. In other words, if Plato’s sun is a noun, then the glittering lights in Verne’s grotto are prepositional.

Serres finds prepositions attractive because they change things and describe topological transformations. Every preposition lends itself to federating without excluding or denying; prepositions describe “the possibility of a relation, a bending, a declension”.⁴¹ Prepositions “describe [...] the set of possible procedures” and trace the fundamental web of all relations:

“Toward” goes to the end on the route, “for” accompanies, in the neighbourhood, “by” goes around obstacles... The web that they deploy and that they knot between themselves sketches the linguistic or a priori form of all our webs.⁴²

Semantic meaning is declarative, but prepositional meaning is directional, spatial and temporal; it produces meaning not as a series of immovable land masses but as the shifting relations and flows of an ocean. Serres’s turn to prepositions is not just a matter of style; it facilitates a radically different imperative that “thinks without reference: by relations, speaks by flexions or declensions”.⁴³ When it is animated by prepositions “[t]hinking does not settle down [se pose], it indicates

[*se prépose*]”.⁴⁴

A GLOBAL INTUITION

In the course of a conversation with Bruno Latour, Serres explains that “my goal is not above all to be right but, rather, to produce a global intuition, profound and sensible”.⁴⁵ The term “global intuition” captures the cumulative, symbiotic, federative but not synthetic effect of Serres’s various figures of thought, not as a concept or ideology, but as a way of being in the world with its distinctive sensibilities and sensitivities. A global intuition does not represent the world but participates in it.

Serres has a global intuition that is federative, ecological and prepositional. Or, in a language more amenable to the thought it describes, Serres thinks like a web, like a tree and like a crystal. His thinking is relational in the sense not of relations between pre-existing substances but like the symbiotic relations between parasites—say between ourselves and our gut bacteria—that create and sustain the very entities they straddle.

This is perhaps as much as can be said about Serres’s thinking in the mode of a journal article. To claim any more would be to render him a disservice because, in his books, he is not doing what I have been doing. He is not describing how he thinks; he is thinking. He is not describing a science of relations, but practicing such a science every time he weaves an anecdote with a theorem, or bounces from Sadi Carnot to Lucretius, or from Zola to Thales.

If we want Michel Serres to teach us how to think, we will not adequately learn it from a book, even one of his own books. As he says of his own apprenticeship, it was his gym teachers at school who taught him how to think, with a style of thinking intimately intertwined with the body in movement, a style that thinks not only *on* its feet but *with* its feet.⁴⁶

What might we gain from such an apprenticeship? What does it matter whether

our thinking carves a straight line through the forest, keeps the window closed as it contemplates the apple tree outside, or lets itself be blinded by an improbable noon-day substantive? If Serres is to be believed, it makes a very great difference indeed. The order and connection among ideas, Spinoza famously asserted, is the same as the order and connection among things. One way of reading this assertion is as an affirmation that thinking and language find themselves in a relationship with the world not primarily of mimesis, but of methexis: they participate in the patterns and rhythms of nature. Serres makes the same point via Lucretius: atoms and letters behave similarly.⁴⁷ The order and connection among our ideas—or, in other words, our style of thinking—will predispose us to expect and, if necessary, to force similar orders and connections in the world, and the horizon of our engagement with the world will be both enabled and limited by our style of thinking.

The case can be made that, today, the stakes of our style of thinking are higher than ever. We live, as Serres notes, in a world of our own making, in which atmospheric and “natural” occurrences that we used to imagine were beyond our control and comprehension, are changing in response to our interventions. It is no longer implausible to say, not “it is raining” but “we are raining”.⁴⁸ We can make two observations about this methectic relationship of language and reality. The first is that we have an interest—both a selfish interest as a species and a broader interest in the flourishing of the world’s ecosystems as a whole—in our style of thinking participating in, and taking account of, the rhythms and patterns of nature, rather than forcing the natural world into an alien and, ultimately, destructive, set of categories. Just as we would find precious little insight in measuring time with a hammer or weight with a stopwatch, we can hold out little hope of seeking to understand and live wisely in the natural world with the tool of a detached, atomising, substantive language.

The second reason why our style of thinking matters is that, as Serres notes, the types of problems we face have changed over recent decades. In centuries past we may have been largely faced with local difficulties that were best solved through

the application of specific academic disciplines like economics, theology or physics. But the great problems of our own age, he notes, are “transversal”⁴⁹ and “de-localised”,⁵⁰ spilling over disciplinary boundaries and geographic localities and requiring sustained interventions from across the arts, humanities, social and natural sciences. The paradigmatic example of such a transversal challenge is climate change, and Serres’s federative, ecological and prepositional style is just the sort of thinking that can help us understand and respond to the hyper-complex challenge that it poses.

A federative style of thinking predisposes us not only to see the connections between the economic, psychological, physical, symbolic, social and theological stakes of an issue like climate change, but to understand these relations themselves, rather than the nodes they federate, as the situation that is to be addressed. In the context of an intellectual and disciplinary landscape increasingly operating in siloes, with scholars incentivised to be Cartesian bulldozers bludgeoning their way through the forest on their own straight little path, Serresian eco-methectic thinking can help point the way to a more sensitive, more agile and more authentic cross-disciplinarity that allows for a truly federating vision across the arts and the sciences.

At a moment when our relationship to the natural world is becoming of ever greater existential moment, Serres’s ecological, methectic way of thinking and writing is not only a refreshing change, but a militant resistance to the prevailing drift of our institutions and our society. It situates us differently in relation to the natural world, which is one important step in restoring a healthy relationship with it.

Finally, Serres’s prepositional thinking helps us to see that we are not masters of the universe, designating and manipulating discreet entities as if they were counters on a gaming board, under the impression that, if we make a change in one area, it will have no effects anywhere else in the game. Prepositional thinking positions us not as those who are playing a game from the outside, but as parasites

interrupting its flow from the inside, parasites whose actions are all too likely to have unintended consequences. In this way, a prepositional manner of thinking helps us to see that our thinking is always a doing, always an intervention that moves through, around or over the world, re-routing its flows of energy and information. In each of these ways, the type of boundary-crossing thinking that Serres models and in which he invites us to participate is far from merely “poetic”. It is a very immediate, very practical way of addressing the roots of the institutional and social pathologies of our age.

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NOTES

1. Isaiah Berlin, *The Hedgehog and the Fox: An Essay on Tolstoy's View of History* (Princeton: Princeton University Press, 2013), 2.
2. Berlin, *The Hedgehog and the Fox*, 2.
3. Serres : “Je suis scientifique d’origine et littéraire de formation seconde, et j’ai toujours été comme René impatient et irrité parfois par les découpages universitaires concernant les spécialités” (“Michel Serres et René Girard, 2 Philosophes Français Aux USA.” Archive INA. July 21, 1989. Video, 1:07:29, <https://www.youtube.com/watch?v=puu8P-SWQUI>.) All translations from this and other French texts are my own, unless otherwise indicated.
4. Girard : “une vie est très courte, sur le plan des idées, c’est ça qui me frappe. Moi je crois qu’il faut 25 ans pour développer une idée”. “Michel Serres et René Girard”, 1:07:38.
5. Serres: “Je crois qu’il y a des sangliers des renards. Toi tu es un sanglier et moi je suis un renard. Un sanglier c’est un homme... c’est une espèce bien particulière qui creuse, tandis que le renard est une espèce particulière qui explore un peu partout”. “Michel Serres et René Girard”, 1:07:54.
6. Michel Serres and Bruno Latour, *Conversations on Culture, Science and Time*, trans. Roxanne Lapidus (Ann Arbor, MI: University of Michigan Press, 1995), 127. “Je ne décris que des relations. Jusqu’à maintenant contentons-nous de dire: théorie générale des relations.” Michel Serres and Bruno Latour, *Éclaircissements: cinq entretiens avec Bruno Latour* (Paris: François Bourin, 1992), 186.
7. “J’écris comme lumière, cristal ou ruisseau; je me raconte comme le monde.” Michel Serres, *Récits d’humanisme* (Paris: Éditions le Pommier, 2006), 80.
8. Christiane Frémont, “Philosophie pour le temps présent”, In *Cahier Michel Serres*, ed. François L’Yvonnet and Christianne Frémon (Paris: Éditions de l’Herne, 2010), 19. See the extended discussion of conceptual characters in Christopher Watkin, *Michel Serres: Figures of Thought* (Edinburgh: Edinburgh University Press, 2020), 189-199. Examples of conceptual characters, or character-concepts, range from eponymous Serresian figures like Thumbelina and The Troubadour of Knowledge, to figures from literary or cultural history like Hermes, Don Quixote, Harlequin and Pierrot.
9. See, for example, Michel Serres, *Le Gaucher boiteux: puissance de la pensée* (Paris: Éditions le Pommier, 2015), 53-4.
10. Michel Serres, Martin Legros and Sven Ortoli, *Pantopie: de Hermès à petite poucette* (Paris: Éditions le Pommier, 2014), 91.
11. Serres, *Éclaircissements*, 112/*Conversations*, 74.
12. “Deleuze disait: « qu’est-ce qu’un philosophe? Celui qui crée des concepts ». Je pense que le personnage conceptuel est encore plus important. Car il porte en lui le sens et l’ensemble de la profondeur du concept et une sorte de vie presque indépendante.” Michel Serres and Marianne Durand-Lacaze, “Biogée: ‘En cousine compagnie avec le monde’”, 16 January 2011, <www.

canalacademie.com/ida6415-Michel-Serres-de-l-Academie-francaise-Biogee.html>. Last accessed 27 February 2024.

13. See Michel Foucault, *'Society must be defended': Lectures at the Collège de France 1975-6*, ed. Mauro Bertani and Alessandro Fontana (New York: Picador, 1997), 164-5; *'The Birth of Biopolitics': Lectures at the Collège de France 1978-9*, ed. Michael Senellart. Basingstoke: Palgrave Macmillan, 2008, 182-1.
14. René Descartes, *The Philosophical Writings of Descartes, vol. 1*, trans. John Cottingham, Robert Stoothoff and Dugald Murdoch (Cambridge: Cambridge University Press, 1985), 123.
15. "A-t-il jamais essayé ? Pour définir ladite ligne, il faut deux points : cet arbre, par exemple, et l'autre, plus loin. Courez-y. À partir de son tronc, recommencez vers un troisième. Or, aucun repère n'assure qu'entre la première et la seconde ligne droite un angle infini ne n'apparaîtra pas. Et ainsi autant de fois. De sorte que vous avez un risque puissant de tourner en rond ou de vous égarer plus encore. La seconde méthode sert aussi peu que la première: non seulement inutile, mais conduisant vers l'égarement, inextricablement." Michel Serres, *Habiter* (Paris: Éditions le Pommier, 2011), 95.
16. Serres, *Habiter*, 95.
17. Michel Serres, *Les Cinq sens: philosophie des corps mêlés* (Paris: Grasset, 1985), 298; *The Five Senses: A Philosophy of Mingled Bodies (I)*, trans Margaret Sankey and Peter Cowley (London: Continuum, 2008), 270-1.
18. The image of the web declines in significance in Serres's thought by the fourth volume of the Hermes series, but the principle and the distinction which it exemplifies do not. For a detailed discussion of the image of the web in Serres's thought over time, see Stephanie Posthumus, "La nature et l'écologie chez Lévi-Strauss, Tournier, Serres", PhD Thesis, Faculty of Graduate Studies, The University of Western Ontario (London: Ontario, 2003), 189-200.
19. "par une composition de termes arrangés dans différentes directions, composition qui s'élargit comme un tissu, et qui envahit domaine après domaine, comme les propagations d'un cercle dans l'eau". Michel Serres, *Le Système de Leibniz et ses modèles mathématiques* (Paris: Presses universitaires de France, 2007), 391.
20. Michel Serres and Raoul Mortley, "Chapter III", in Raoul Mortley, *French Philosophers in Conversation*, 46-60 (New York: Routledge, 1991), 53.
21. Michel Serres, *Rome: The First Book of Foundations*, trans. Felicia McCarren (Stanford, CA: Stanford University Press, 1991), 103. "Je souhaite l'avènement d'une desmologie, discours des liens, des ligaments, des ligatures." *Rome: le livre des fondations* (Paris: Grasset, 1983), 67.
22. "Fédérer, penser, même combat!" Serres, *Le Gaucher boiteux*, 226.
23. "La relation précède l'être; voilà bien le mot de ma philosophie." Michel Serres, *Hominescence* (Paris: Éditions le Pommier, 2001), 321.
24. Notwithstanding this transition, the notion of unstable disorder features in Serres' thinking

from very early on, for example in the information theoretical idea of ‘noise’, and with the turbulent flows of *The Birth of Physics* (1977). I am grateful to David Webb for pointing this out to me.

25. Serres, *Les Cinq sens*, 147/*The Five Senses*, 155. “La maison-crâne considère placidement l’arbre par le hublot-œil.”

26. Quoted on *Éclaircissements*, 192/*Conversations*, 131–2, M.S.’s emphasis.

27. Serres, *Éclaircissements*, 192–3/*Conversations*, 132. “Déchiffrez, en fait, dans ce livre, une bonne ethnologie des habitants de grandes villes, hypertechnicisés, donc intellectualisés, attachés à leur chaise de bibliothèque et tragiquement dénués de toute expérience sensible. Beaucoup de phénoménologie, pas de sensation: tout dans la langue.”

28. Michel Serres, *La Distribution: Hermès IV* (Paris: Éditions de Minuit, 1977), 262.

29. Serres does not have in mind, of course, the arborescent paradigm of Deleuze and Guattari in *A Thousand Plateaus*, in which trees—in opposition to rhizomes—characterise a thinking that is rigid, linear, and hierarchical. For Serres, to think and write like a tree is to do so a way that resonates with the tree’s own patterns and rhythms of existence.

30. Serres, *Récits d’humanisme*, 80. “Le sujet parlant mêle son bruit à celui des objets résonnants. J’écris comme lumière, cristal ou ruisseau ; je me raconte comme le monde”.

31. Michel Serres, “Temps, usure: feux et signaux de brume”, in *Cahier de l’Herne Michel Serres*, ed. François L’Yvonnet and Christiane Frémont (Paris: Éditions de l’Herne, 2010), 212.

32. Michel Serres, *Biogée: mer et fleuve, terre et monts, trois volcans, vents et météores, faune et flore, rencontres, amours* (Paris: Éditions le Pommier, 2010, 27. *Biogea*, trans. Randolph Burks. Minneapolis, MN: Univocal, 2012, 23.

33. Serres, *Biogée*, 29, 79/*Biogea*, 26, 88. This may put readers in mind of Aldo Leopold’s famous phrase “thinking Like a Mountain” in *A Sand County Almanac*, or John Seed’s book of the same name. Though Serres’s approach does share with Leopold and Naess a rejection of anthropocentrism, an insistence on interconnectedness and continuity with nature, Serres seeks to echo and resonate with the rhythms and patterns of the natural world in his writing, leading to a much more “poetic” idiom than either Leopold or Naess, and his focus is on epistemological questions more than the explicit intention primarily to inculcate a specific ethical stance. See Aldo Leopold, *A Sand County Almanac: And Sketches Here and There* (Oxford: Oxford University Press, 2020); John Seed, *Thinking Like a Mountain: Towards a Council of All Beings* (Philadelphia: New Society Publishers, 1988).

34. Serres, *Biogée*, 32/*Biogea*, 29.

35. Michel Serres, *The Parasite*, trans. Lawrence R. Schehr (Minneapolis, MN: University of Minnesota Press, 2007), 118. “L’œuvre, tout à l’heure, coule de moi comme du miel, comme le fil de l’araignée [...] Je suis une abeille ou une araignée, un arbre. Je ne vois plus la différence entre l’œuvre et la sécrétion.” *Le Parasite* (Paris: Grasset, 1980), 86–7.

36. Serres, *Éclaircissements*, 150/*Conversations*, 101. “La philosophie traditionnelle parle par

substantifs ou verbes, non par relations; donc elle part toujours d'un soleil divin qui éclaire tout". Serres, Legros and Ortoli, *Pantopie*, 93.

37. "l'être et l'avoir, la conscience, le néant, la pensée, la volonté . . . Des substantifs qui ne se déclinent

pas, des infinitifs qui ne se conjuguent pas." Serres, *Pantopie*, 95.

38. Serres, *Éclaircissements*, 163/*Conversations*, 110.

39. Serres, *Pantopie*, 94. "«Moi arriver demain», «Moi être ego », « Être et néant »".

40. See Serres, *Le Gaucher boiteux*, 20–37.

41. "la possibilité d'une relation, d'une flexion, d'une déclinaison, plus compliquées qu'elle, mais, peut-être, composées à partir d'elle". Michel Serres, *Atlas* (Paris: Juillard, 1994), 80.

42. Michel Serres, "Préface", in Michel Serres and Nina Farouki, eds., *Le Trésor. Dictionnaire des sciences*. (Paris: Flammarion, 1997), xvii–xviii.

43. Serres, *Atlas*, 65. "pense sans référence : par relations, parle par flexions ou par déclinaisons, au moyen des prépositions".

44. Serres, *Le Gaucher boiteux*, 175. "La pensée ne se pose, elle se prépose".

45. Serres, *Éclaircissements*, 170/*Conversations*, 115.

46. Michel Serres, *Mes profs de gym m'ont appris à penser* (Paris: Cherche Midi, 2020).

47. Michels Serres, *La Naissance de la physique dans le texte de Lucrèce: fleuves et turbulences*. Paris: Éditions

de Minuit, 1977, 175/*The Birth of Physics*, trans. David Webb and William James Ross Groundworks (London: Rowman & Littlefield, 2018), 141.

48. See Michel Serres, *L'Incandescent* (Paris: Éditions le Pommier, 2003), 338; *The Incandescent*, trans. Randolph Burks (London: Bloomsbury, 2018), 191.

49. Jean-François Serres, Michel Serres and Catherine Cornu, *Solitude: dialogue sur l'engagement* (Paris: Éditions le Pommier, 2015), 17.

50. Michel Serres, *L'Interférence: Hermès II* (Paris: Éditions de Minuit, 1972), 33.

michel serres: the “formative notebooks” — 1960-1974

roland schaer

translated by stella harvey and david webb

This short paper is on what we have called Michel Serres’s “formative notebooks”, his *Cahiers de formation*. These are 18 large spiral-bound handwritten notebooks, which were his “logbooks” from May 1960 to May 1974. On the last page of volume XVIII, as he is about to take leave of the notebooks, he writes “end of the diary and of adolescence. And about bloody time.”¹ In the previous volume, he had written: “The Romans were more insightful than us. [For them] the period of *adulescens* comes to an end around the age of forty” (*Cahiers* XVII 1417).

This “logbook”, or youthful diary, has a threefold function:

First, to practice writing, an essential requirement for anybody who wants to be a writer. Like a musician who plays their scales every day or a swimmer who does their lengths, he gets up early and writes every morning.

Its second function is for noting down ideas that come to him. Serres is acutely aware of the intermittent workings of the mind: “my time passes from a spark to nothingness and on again. [...] A packed instant, empty moments, waiting—insight, waiting—insight...” He also knows the virtues of spontaneity, as with tennis, “when you ‘knock a few balls around’”, he writes, “you may have flashes of brilliance. If you’re playing seriously, you become all fingers and thumbs” (*Cahiers* I 82). Hence the importance of piecemeal writing: during the period of the notebooks, apart from his doctoral thesis, he writes only articles, and publishes books that are collections of articles. The first “real books” appear in 1975, after he has left the notebooks behind.

Thus, he records in these notebooks, very freely, the insights which come to him, and summarises them at the end of each notebook, to enable him to retrieve this material when the time comes to write an article, a class, a lecture or a book. It is, he writes, “the time of sowing”. I will come back to what writing means to him shortly.

The third function is as a “personal diary”. Michel Serres hardly gives away any secrets, but he reveals a side of himself he did not show more widely. We find a far more troubled man than we might have expected, a man who has experienced and continues to experience moments of deep crisis, a man who often feels excluded, humiliated and condemned to the most extreme loneliness. In a sense, the notebooks are therefore “confessions”: in Volume V, in 1962, he writes, “I am Jean-Jacques!” and immediately adds, “like everyone else, dammit!” He wanted the notebooks to be published. In Volume XI, in October 1965, he writes:

When I die, I may in my finished life have published abysmal *universiterre-à-terres* studies which assemble and disassemble and lose their way in

reasoning.² Then perhaps my life will begin. After covering my head with the bitter ashes of knowledge of *caste* and *castre*, *clan* and *rataplan*, my few friends will read in my old papers and dead pages, those small testaments of what I would have liked to be, what I have never ceased to be, what I have fiercely wanted to hide that I was: I'm dying, my soul, fly away. Go and caress the sticky buds and dawn's robe; disappear in the sea's burst of laughter (*Cahiers* XI 875).

We have talked of “sowing”, as one speaks of a sowing time, followed by a harvest time. When reading the notebooks it is striking that from the outset everything that the Michel Serres we know goes on to do seems already to be there. Everything is already there, sown, germinated, waiting to grow. There is an initial core, from which his thought propagates, branches out, proliferates and enriches itself. It is this process I would like to try and sketch out.

When he begins the notebooks, Serres already has what he calls his “theory of the export of concepts”. To see what this involves, we need to go back a bit.

On finishing his military service, in 1958, Serres's aim was to revolutionise philosophy along the lines of the Bourbakian revolution in modern mathematics. He opened up the question in his Diploma Dissertation, entitled *Observations on some number systems*, written in 1953-54 and supervised by Gaston Bachelard. In mathematics, the “revolution” began when specialists in algebra in the first half of the twentieth century placed emphasis on structure; their aim was no longer merely to study the properties of large sets of numbers—whole numbers, fractions, real numbers, etc.—but to introduce a new level of abstraction by revealing formal structures, sets of objects of any kind characterised only by specific properties. These are the structures of “groups”, “semi-groups”, “rings”, “bodies”, etc., where the same structure can apply to a set of numbers but also to sets of mathematical entities in other regions. By revealing different “models” of structure in this way the process of mathematical axiomatisation highlighted transversal formal analogies, formal analogical communications between mathematical regions.

This is what Serres called the “export of concepts” (*Cahiers* IX 814). Highlighting these structures had a twofold effect: on the one hand it restored the unity of mathematics—the series of books the Bourbaki group published during the second world war and beyond is called *Éléments de mathématique*—which is a nod to Euclid but also refers to “mathematics” in the singular—and on the other hand it reorganised the field of mathematics, no longer as a hierarchy of disciplines that can be deduced from one another, but according to ‘horizontal’ analogies such that each region can be a “model” for others. I believe this formalism was and remains the active core of Michel Serres’s thought from beginning to end, which he later expanded further and further beyond the field of mathematics.

When he takes up the issue as a philosopher, Serres stresses another fundamental consequence of this revolution, which concerns the relationship between the sciences and philosophy. In accomplishing this work of axiomatisation and formalisation, says Michel Serres, mathematics has become reflexive. It has embedded, in its own sphere and in its language, a reflection on its foundations, its norms and its methods. Before Bourbaki, it could be assumed that this reflection derived from philosophy: whether it be in the form of transcendental analytic, logic or epistemology, the philosopher seemed able to establish rules, from the exterior, about the foundations of mathematics. Those days are now over: a seismic moment for philosophy. “Bourbaki,” writes Serres, “is mathematics aware of its power, it is a philosophy.” (*Cahiers* I 55). Serres describes this as a revolution in maturity, and as a possible generalisation to other domains. He gives the example of astrophysics, which also underwent a revolution in the 20th century, elaborating, in its own language, theories on space, time and matter, and even turning its attention to cosmogony, the question of the history of the universe, to all those matters which had long delighted philosophers. A crisis in philosophy. His reflection on modern mathematics leads Serres to think about the need to reform philosophy if it is at least to remain contemporaneous with the scientific knowledge of our time.

Let us recap. What has happened? Philosophy has shattered, exploded, diffracted.

“The theoretician of science thus encounters a discipline that has disappeared as such, a dead discipline which can only continue to exist by seeking refuge in the delights of its own history. (...) But a discipline that has died from giving birth to so much. In fact, we find it alive everywhere, and how alive!” Quite simply, he writes, “it has emigrated into numerous domains, a plurality of branches, and if the philosopher has not wished to venture with it to other shores, it is most often out of a sacred fear of luminous and demonstrable knowledge, by which he has deeply betrayed his vocation as lover of truth” (*Cahiers I 54*). Henceforth, Serres concludes, the philosopher must reconnect with the encyclopaedic project: “the situation is the same as in the early 18th century, when the need for an Encyclopaedia of the sciences became apparent, given the plurality of diverse fields of scientific and technical knowledge. Now a philosopher’s principal endeavour must be an Encyclopaedia of philosophies” (*Cahiers I 56*). And this is the plan:

So I say there is now only the law of everything or nothing. Either philosophy has become nothing, in which case let’s close our schools and retrain our academic leaders, and I’ll go and put my bag on the slippery deck of some cargo ship. I don’t mind, I’ll have lost my game, and I’ll go and prod the stars with the end of my sextant. Or else, philosophy is everything. And the one, the only problem for the philosophical spirit of our time, and I mean the only one, is the problem of the general structures of the Encyclopaedia of knowledge. The historic task we philosophers must undertake is to pursue transversal paths through the totality of knowledge (*Cahiers II 219*).

Let us pause for a moment. The opening gambit is thus that philosophy is now everywhere. Should we say nowhere? Either way, shattered, dispersed. Fragmented, philosophy no longer has a clear delineation. It’s an exciting moment. Philosophy is breaking up all the more because, for Serres, the field is broadening swiftly: into the sciences, but also literature, myths, etc. as if the philosopher’s true delight was not to build or rebuild an edifice, but to “trace transversal paths”, that is, to cross borders, to go always *plus ultra*, to imagine a philosopher as a rambler, to take Hermes, the ubiquitous messenger of the gods, as a model. I am convinced

there has been a heavy price to pay for this apparent “dissolution” of philosophy, this shattering which, by depriving it of a territory, renders it at first sight indeterminable, but at the same time it invites the philosopher to cross borders, to leave the comfort of a homeland in order to discover the world, to weave a web and to create a network in the universe of cultures and things. But in the society of philosophers there are many who have seen this new project as a betrayal of their native soil.

Let us return for a moment to mathematics. It was stated that mathematics had become reflexive and in so doing gained its independence from philosophy by taking over the question of foundations. First and foremost, its independence from philosophies of the subject which, since Kant and perhaps since Descartes, made the subject, that fetish of the Philosophes, the foundation of scientific rationality. “Closing this gap (between mathematics and epistemology) consists in being situated within mathematical discourse, and this discourse is no longer epistemology. Mathematical discourse alone can speak authentically of itself, it is a solitary and proprietary discourse, a language which speaks without a mouth, thought which thinks by itself and without a subject” (*Cahiers* IV 396). Thought without a subject which thinks, thought which dispenses with the thinking subject, this is the clearest, and also the most abrupt, formulation of the independence that mathematics can achieve. It is as if reflection on science had acquired its scientificity by dispensing with the subject, as if the “transcendental” had been ‘objectivised’, borne away in its entirety in the *cogitatio caeca* of calculus and demonstration. “Science hates the cogito”, he adds a little further on. Hence his critique of both Kantianism and Husserl’s phenomenology. I quote:

Going straight for the I, setting aside the only instructive things about it, implies that one discovers any old thing, an originary unity whose purity is just ineffability, inexpressibility, which claims to be the basis of everything and is the basis of nothing (*Cahiers* III 267–70).

It is necessary first to turn to this objectified world of technical knowledge and

objects, where thought is embodied, alive and graspable, and set the—empty—subject aside.

What then becomes primary is the domain of effectuation, the coordinated complexity of all possible networks. The independence of these networks in relation to a single pole has been the great lesson of mathematics, technology, etc. Philosophy takes cognisance of this and expresses it (*Cahiers* III 272).

To say that the “domain of effectuation”, objectified thought, takes the form of “networks” is to say that once the subject is ‘set aside’ what remains is self-organised structure, a complex web of analogical relations: structure, which is the face of independence from the subject.

And at this point in the trajectory the notion of independence becomes the central issue—Serres speaks of a “philosophy of independence”—and from the critique of the transcendental subject that branches out in all directions. I would like to give a brief overview of five of the directions his thought takes from this point in the notebooks.

- (1) In a certain respect, independence must refer to the world of technical objects, which is our world, the one we now live in, this ‘new world’ we have created. “Man is this extraordinary god who creates things which start to exist by themselves, to think without him.” He calls it Seventh Day philosophy, which refers to the automatising of machines, a kind of independence of the technical object achieved through information technologies. Globally speaking, it is also an invitation to think of technology as an objectivisation of thought that contributes to the abolition of the subject (*Cahiers* VI 575–6).
- (2) To the question “what is thinking?” or rather the question “who thinks when I think correctly?” he answers: something which is not me, but which imposes itself on me like an alien force. “In thinking, I become a stranger to myself” (*Cahiers* VIII 772). This recalls the formulation that described mathematics

as ‘a language which speaks without a mouth, thought which thinks without a subject.’ This abolition of the subject also relates to an intimate experience: “Writing, that is, inventing, remains the only way of believing in a god, or in God. Because it means listening to a voice without place, face or voice. Who is speaking?”

- (3) For the philosophers of modernity the transcendental subject had been a reference point, a fixed point, that was the wellspring and foundation of rationality. Thus Serres embarks on a global reflection on the issue of the fixed point. It is not a matter of knowing where to locate the fixed point—in space, in the subject, in God, in time, etc. The question he asks is whether there is any need of a fixed point at all.

If I now set aside the poles or vertices of segmental relationships, [...] if I reject the prejudice of *l'ἐποχὴ* in general, insofar as *l'ἐποχὴ* is stoppage, suspension, interruption, cutting and assignation of a fixed point, if I finally free myself from all Epoché philosophy, which is, ultimately, all western philosophy, with a few exceptions, there will remain networks of multiple relations in which information flows circulate indefinitely. [...] Hence, [...] I'm no more than an inter-ceptor of flow, whatever it might be (*Cahiers* XV 1160).

- (4) This is why Serres gives precedence to the collective, the intersubjective, the “we”: “the subject of science is the ‘we’, which is also called the ‘transcendental consensus’” (*Cahiers* XII 931). “A ‘we’ has spoken, therefore I think. A ‘we’ has loved, therefore I exist! Subjectivity is appropriation, that is, a kind of link in the circuit of communicative exchange. (...) Subjectivity is theft.” (*Cahiers* XIV 1122). Don Juan dies for having been the hero of the principle of individuation.
- (5) Finally, this setting aside of the subject entails a return to objects. Serres rehabilitates sensation and empiricism because there are things written on the

tabula rasa, things which are legible. “The time has come for philosophy to shift from the subject to things”. The idea that information is not only handled by new technologies in intersubjective communication, but is inscribed in things themselves—the idea of “objective communication”—is supported by molecular biology, which since the 1960s has interpreted genes as information carriers. This analogy between molecules and the letters of a language leads Serres to the ancient atomists, who posited an equivalence between atoms, “primitive elements”, and the units of the alphabet. “Snow reveals that the world is a book. It covers over signs, effaces letters, erases lines. Snow is virgin, like a blank album. A return to the dangerous silence of the morning of creation. The meaning of the earth is erased. Not covered over, but removed. Before God marked on the earth the graphics that allow us to know it, it was thus, like a page. Like a sea, like a desert” (*Cahiers* IX 833–4).

Like a page, he wrote in passing. Let me conclude with another quotation:

Philosophy is interested only in truths, in beings in a nascent state. Its concern is to bring forth a logos from the radically silent a-logos, an almost utterable schema on whiteness, the virgin earth, the prior non-sense. Its discourse is difficult because it constitutes the first word, the first writing on the blank page. The proper object of philosophy is blankness, emptiness, silence, nothingness, the unknown, the senseless (radical non-sense) absence, background noise, the substance of form before form... and its endeavour is to articulate on this whiteness a pattern, a graph, a schema, a first knowing, a primary discourse, a hesitant form, the presence of a first morning, a nascent sound, the unheard of (*Cahiers* XIV 1098).

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NOTES

1. Michel Serres, *Cahiers de formation* (Paris: Éditions Le Pommier, 2022), XVIII, 1514. The *Cahiers* comprises eighteen books, corresponding to Serres's handwritten notebooks. In-text references to the work will give the Book number in the edition in roman numerals followed by the page number.
2. Translators' note: In this quotation, Michel Serres uses wordplay to satirise the academic milieu he inhabited. "*Universiterre- à-terres*" is an ironical combination of "*universitaires*"—"academics", and "*terre-à-terre*"—"grounded, down-to-earth". "*Castre*" is a word Serres invented, derived from "castration", while "*rataplan*" is derived from a children's song and is playfully rhymed with "*clan*".

the history of truth: serres, canguilhem, foucault

lucie k. mercier

At a time when, progressing on the one hand towards the purity of their specific object, and on the other hand towards the intersection of their initially distinct domains, the sciences themselves assume the task of seeking their foundations, philosophy must recognize and accept the mutation of its own situation in culture. In a conference given in Leiden, Hyppolite characterizes such mutation as follows: “Philosophy, if it is not the field of truths, is the one where they translate themselves and where they connect with one another, it is the milieu of their encounter.”– Georges Canguilhem¹

This article will be concerned with the triangulation between Serres, Foucault, and Canguilhem, insofar as their 1960s projects constitute three variations around the “history of truth.” According to Étienne Balibar, the polymorphic question of the history of truth constituted one of French philosophy’s subterranean problems in that decade, which would explain the relative autonomy—or idiosyncrasy?—of the French philosophical field in that period. Rather than a single problem, Balibar claims, the history of truth designates various articulations of “historicity and veridicity, or objectivity” in the works of Canguilhem, Foucault, Badiou, and Derrida, among others.² The problem may also be grasped in the form of a double bind: *it is neither the case that truth is in history, nor that history is in truth*. The paradox contained in the history of science, namely the task of writing the history of an essentially axiological activity, was the cardinal theme of the French epistemological tradition as defined by Georges Canguilhem. In this article, I propose to extend Balibar’s narrative so as to include Michel Serres’s early works. Indeed, not only was this problematic the driving force of Serres’s early philosophy, but by focusing on mathematics as a singular and radical case of epistemological autonomy, he occupied, for a brief period, an influential position in the field of French historical epistemology.

After studying mathematics, literature, and philosophy, Michel Serres became a teaching assistant, and then a lecturer (*chargé d’enseignement*) in the Faculty of Letters at the University of Clermont-Ferrand, where he resided with his family between 1958 and 1968. During these years, Serres entertained a close, stimulating relationship with Georges Canguilhem, who, like himself, came from Southwestern France.³ While Serres considered Canguilhem as his master, we have good reasons to believe that Canguilhem was also very impressed by his young protégé: Canguilhem mentioned favorably Serres’s works in his own writings while supporting him professionally. It was therefore entirely natural for Serres to ask Canguilhem to preside over the juries of his two theses in June 1968. These years were also marked by Serres’s friendly exchanges with his colleague Michel Foucault, another of Canguilhem’s disciples, who between 1961 and 1965

taught in Clermont-Ferrand while residing in Paris. Week after week, Serres would pick up Foucault from the train station and over lunch they would mainly discuss Foucault's ongoing project—*The Order of Things*—which Serres would later claim to have indirectly contributed to.⁴ After 1968, Canguilhem and Foucault both distanced themselves from Serres, while reinforcing their intellectual partnership. While Serres's relationship with Foucault changed soon after Serres's move to the university of Vincennes, Canguilhem started taking his distance from Serres around 1968, and eventually broke with him in a short and acrimonious letter in 1976.⁵

Immediately after the publication of *The Order of Things* (1966), Canguilhem praised Foucault as a heretical yet legitimate heir to Gaston Bachelard's historical epistemology.⁶ Reciprocating this gesture, Foucault would advocate for Canguilhem's legacy—alongside that of Cavaillès and Bachelard—of a “philosophy of knowledge, rationality, and of the concept.”⁷ With hindsight, what played out in this mutual acknowledgement was no less than the determination of the philosophical significance of a distinctively French “style” of epistemology later known as “historical epistemology”.⁸ Eventually, this would lead to the authentication of a tradition initiated by Bachelard and crowned by Foucault, with Canguilhem as the key mediator, and August Comte and Léon Brunschvicg as forbears. How are we to interpret Michel Serres's contribution to, and dissidence from, the pictures of this tradition drawn respectively by Canguilhem and Foucault? How are we to interpret Canguilhem's break with his former mentee?

Drawing on his *Cahiers de formation* as well as on archival material,⁹ I reconstruct Serres's philosophical position in the early 1960s by showing that for him the problematic of the “history of truth” enabled a passage between two problems that were apparently distant from one another, namely the historicity of mathematics on the one hand, and “communication” on the other. Focusing on the reception of Serres's texts by Canguilhem and Foucault, I contend that while the publication of his essay “Mathematical Anamneses” placed Serres center-stage as an inspiring epistemologist and brilliant theorist of the history of truth, by generalising his

model into a full-blown positive epistemology he also immediately set himself apart from the French epistemological intellectual field. Reflecting on possible overlaps between philosophical, epistemological, and ethical considerations, I highlight the ways in which Serres's philosophy, by seeking to develop a global epistemological discourse, failed to conform to Canguilhem's fundamental "epistemological ethos." I finally contrast Serres's and Foucault's "global" ambitions, and comment on their contrasted reception by Canguilhem.

MODERN ALGEBRA

After writing his Master's thesis (*Diplôme d'études supérieures*) on the philosophy of algebra under Gaston Bachelard's supervision ("Remarques sur certains systèmes de nombres," 1954), Serres remained convinced of the crucial significance of the structural revolution in mathematics, announced by the algebra textbook edited by Bartel Van der Waerden (*Moderne Algebra*) and confirmed by Nicolas Bourbaki's *Elements of Mathematics*. As he strived to unravel the full philosophical significance of this event, Serres arguably re-enacted Jean Cavaillès's own epiphany in 1930s Germany, and realaborated the latter's call to develop a "philosophy of the concept" against a "philosophy of the subject." For Cavaillès, as Hourya Benis-Sinaceur explains, "mathematics, more precisely the new abstract mathematics in the work [...] of Cantor, Dedekind and Hilbert, the 'mathematics of algebraists' as he calls it in *Axiomatic Method and Formalism*" became "the model par excellence of the activity of reason."¹⁰ Documenting Cavaillès's trips to Germany, Benis-Sinaceur recalls that in Göttingen, Cavaillès was in close contact with Emmy Noether, who alongside Hilbert and Emil Artin was a leading figure of the revolution of modern mathematics. As Van der Waerden wrote, Emmy Noether considered that "all relations between numbers, functions and operations only become absolutely clear, apt to generalisation and really fecund when they are liberated from their particular objects and reduced to general rapports of concepts."¹¹ Algebra played a paradigmatic role in these mathematics because it had become an "instrument of formulation and resolution of problems,"¹² a heuristic language of its own. For

Benis-Sinaceur, Cavaillès's emphatic claim for the *concept* directly points to these so-called “conceptual mathematics” (*begriffliche Mathematik*).

Serres goes back to Cavaillès's general project of accounting for mathematics's singular becoming *after* Bourbaki's structural or even “architectural” revolution.¹³ Serres jotted down the following note in his *Cahiers de formation* in November 1960: “Philosophy of the concept said Cavaillès before dying. This means philosophy of the effective coordination of concepts among one another” (*Philosophie du concept dit Cavaillès avant de mourir. Il faut comprendre philosophie de la coordination effective des concepts entre eux*).¹⁴ Serres was convinced that structural mathematics, in demonstrating that formalisation and importation were mutually dependent, offered a unique and important vantage point from which to view scientific modernity. Modern mathematics was, for Serres, the only science that had “attained maturity.”¹⁵ Beyond mathematics, Serres sought to unravel the epistemological consequences of this revolution in abstraction, which he considered to be far-reaching. Firstly, by embodying full “rational autonomy” as well as the “autoregulation of its own language,”¹⁶ the existence of modern mathematics demonstrated the possibility of *science's* epistemological autochtony—its self-regulation and self-foundation. “This mathematics appears then as a science that comprises, in its autochthonous field, its own methodology, its own ‘self-description’, and its own ‘logic’, all of which have a positive status.”¹⁷ For Serres, this was the endgame of epistemology as such, for mathematics had “technicized” reflexivity from within its own operations, overturning *epistemology* itself.

Secondly, this mathematical revolution had also revealed that *operations*—which he explored under the heading of “importations”—were more significant than *objects*, thereafter to be recast as mere “media” (*supports*). As he jotted down in 1961, “[a]n explanation is almost always an importation.”¹⁸ Taking note of the closure of the sciences upon themselves (their tendency toward “autochtony”) implied, for Serres, the passage into a new, truly pluralistic epistemological age: an epoch in which philosophy's epistemological task was to *enter* science by

practising transregional transports. “On the one side, the philosophy of history of regional sciences, on the other, the philosophy of correlations between closed—or closing—domains.”¹⁹

As Serres theorized it in his doctoral thesis on Leibniz, mathematical interregionality constituted an exemplary case, a particularly successful model of inter-(or trans-)disciplinarity more generally. From the outset, he designated the various scientific regions as languages, and their connexions as translations. To speak of “languages” allowed him to describe how self-sufficient “systems” could relate, correlate, or translate among one another. Serres also immediately conceived of these correlations and translations topographically through “networks.” In these, truth is not static but circulates, transporting itself across various regions. This, then, enabled him to propose a diagrammatic, structural picture of the history of mathematics (and beyond that, of *science*)—a history not made of events but of stations.²⁰

In the French epistemological milieu, it is arguably “Mathematical Anamneses” that established Serres as a young, gifted philosopher who promised to be talented enough to construct a bridge between Bachelard’s and Cavallès’s world and of that of structuralism(s). Written between 1961 and 1966, this programmatic essay returns to the infamous episode of the *Meno* as the kernel of a theory of the history and historicity of mathematics—and of science more generally. The article demonstrates that taking note of science’s autonomy in its truth necessarily entails a radical rethinking of its historicity. Since mathematics can be conceived as a “logos that refers to itself,” the type of recurrence at play in mathematical history is particularly “pure”: it has a formal character.²¹ While mathematics is thus endowed with a purely formal or *empty* truth, it is also the bearer of a *historical* truth inasmuch as it is successively embodied by different (historical) languages. By generalizing the idea that mathematics progresses, not by accumulation, but by deepening and purifying its foundations, Serres places “purity” as the historical *telos* of mathematicity. As he already states in “The Quarrel of the Ancients and the Moderns” (1963), “rigour is mathematics’s infinite task.”²² Here Serres returns

to Cavailles's problematic of the necessary becoming of mathematics through the combined prisms of truth and temporality, demonstrating that they can neither be thought apart from one another nor synthesized univocally, and can only be figured in an ensemble of *models* for the history of science. While Bachelard and Canguilhem consistently opposed the historian of science to the scientist as incompatible role models,²³ the point for Serres is to show that these perspectives are *internal* to the becoming of mathematics: as Serres affirms, the mathematician *is* a historian, “an inventor of time and of history.”²⁴

[...] [R]ecurrence is not primarily a historiographical movement; it is not enough to say that each leap forward necessitates rewriting the uchronia of what comes before it, that it necessitates completely revising how things had been envisaged up till then in terms of “what should have been thought.” [...] It is primarily a movement proper to mathematical temporality as such insofar as it takes the form of a continuous systematic restructuration. The properly historical recurrence is only the secondary consequence of this internal and original movement.²⁵

In foregrounding the plural and composite character of truth, Serres broadly inverts the rapport between the history of truth and history: the history of truth no longer operates inside of a larger and more encompassing history. Approaching the history of science from the vantage point of the history of truth means that the history of science cannot be seen as an ordered sequence of events anymore. For him, as Bernadette Bensaude-Vincent insightfully formulates, history becomes no more than “a form of veridiction like any other.”²⁶

RECURRENCE AS STANDPOINT

In *Le matérialisme rationnel*, Bachelard affirmed that “every historian of science is necessarily a historiographer of Truth,”²⁷ pointing out that the task of the historian of science was fundamentally transformed by the acceleration of science's

progress in modernity. Mathematics was already one of Bachelard's arch-models for this peculiar temporality. As he goes on to say, "if in the progress of science, some truths appear as partial or incomplete, it is because they are absorbed by greater, clearer, more general truths. Science grows."²⁸ Before Serres, Bachelard had already considered mathematics to be the model of "fundaments through recurrence," and spelled out the idea that "fundaments are not at the basis, but instead where the last stone is to be placed, the keystone."²⁹

For Canguilhem, fundamental to Bachelard's philosophy was the idea of a "recurrent light" (*éclairage récurrent*), the notion of a "critical jurisdiction on the anterior of a scientific present."³⁰ For them both, the history of science remained the reconstruction of the *past* of science, its history qua *past*, even when such a past is recurrent in form, i.e. viewed from the present. Taking up and transforming Bachelard's concepts of recurrence and judgement, Canguilhem had drawn at length on epistemology's role as that of a judge or tribunal enabling a view onto the past of science from the perspective of its present.³¹ If we follow Camille Limoge's and Xavier Roth's readings, this axiological determination of the history of science was especially nodal for Canguilhem; with it he conserved the practical, moral outlook he had developed prior to his career in the history of science: his "total" philosophical project remained a philosophy of norms, oriented by the question of "resolving the tensions at stake in different values in experience."³²

Working against the grain of Canguilhem's conception, Serres sought to relocate "judgement" in the development of science itself. In the final subsection of the introduction to his dissertation on Leibniz (1968), "Récurrences et recouvrements historiques," Serres explicitly focuses on the concept of "recurrence" and "judgement" in order to clarify his own position on the relationships between epistemology, the history of science, and the history of philosophy:

There is always an interest (because truth is at stake) in centering thought around its strongest epistemological notions. Such force is best grasped

by history in its development, which is its best balance—the best judge, the best filter. Because the history of science is not a common evolution, it is a progression towards the deep, the original, the conditional, and the source. In a sense, the sciences move towards their origin: consequently, they deepen their predecessors, they move ahead of them. And it is because modern mathematics anticipates the *mathesis universalis* that there is a possible explanation: because the historical problem of science is the inverse of the historical problem of philosophy. Where for the latter there is an accumulation of inheritances, for the former there is identity between sequences and conditions. [...] To sanction the choices of recurrent history, these choices must contribute to those of history itself; either they explain, or they are guided by them: double adjustment—difficult to follow—of an epistemological truth whose genesis is inverted in relation to simple historical evolution. This indicates that a notion is important when it is the first approximation of a profound idea that posterity will elect, and that it is also a principle elected, in fact, in historically situated enunciation: it is then at the confluence of two geneses, the effective and the normed [*genèse normée*]; it is the place where the two opposite currents meet.³³

As Serres claims, Leibniz's oeuvre must be grasped at the confluence of variously "normed geneses" (*genèses normées*) and forms of truth: epistemological, historical, and philosophical.³⁴ While he defines epistemological truth as recurrence (against accumulation) and historical truth as "situation" (against trends), the unspecified nature of philosophical truth appears to be that of *composing* and therefore combining or mitigating between these different kinds of truths, endorsing a pluralism about disciplinary perspectives that was central to Canguilhem. Yet at the same time, generalising the consequences of his findings in "Mathematical Anamneses," Serres equates "judgement" with notions of "balance" and "filter." He reconfigures the normativity of "judgement" as a form of scientific teleonomy, thus as a kind of *election*, one that renders the epistemologist's task not just

secondary, but simply redundant vis-à-vis the objective historicity of the sciences.

COMMUNICATION: FROM DEONTOLOGY TO HISTORY

Initially, in the early 1960s, Serres appeared keen on following Canguilhem's own intentions more closely than Foucault, adopting his language and examples. In his posthumous *Cahiers de formation*, Serres made multiple connexions between Canguilhem's works and his own, taking note of all the papers he had sent him to read.³⁵ The *Cahiers* offer essential insights into the scope of Serres's philosophical project at the time, revealing that, in a similar way to Canguilhem's, Serres's reflections on the philosophy of science were fundamentally driven by a series of practical questions. To Serres, the reading of Norbert Wiener's books on modern technologies of information had been eye-opening and they would remain in the backdrop of his reflections up until the mid 1970s. As Serres jotted down in 1960, "Our thoughts are not as broad as our instruments."³⁶ The task of contemporary philosophy (against atrophied academic philosophy) was to "make the world habitable" by bringing human thought in closer touch with modern technology. Faced with technologies which, like nuclear power, proliferated at uncontrollable speed without the capacity to ascribe *ends* to their own movement, the responsibility to bestow such ends on them fell on "culture."³⁷ However distant, apparently, from these reflections, Serres's earliest philosophy arises from this broad and exploratory terrain at the junction of the philosophy and ethics of science. For Serres, the concept of information proved key in bridging both domains as it provided an "ontology" able to dissolve the partition between the theoretical and the practical, and between science and technology.

A short article published by Canguilhem in the summer of 1961, "Nécessité de la 'diffusion scientifique'" appears to have been crucial in Serres's redefinition of truth through information.³⁸ The article analyzes the history of the idea of the way science "spreads" (by contrast with "teaching" and "vulgarization") and adopts information theory as a pertinent prism to account for this spread. As Canguilhem writes: By assimilating rigorously structured original knowledge to the highly

improbable state of a physical system, and the same disseminated knowledge—whose transmission, reception, and use have altered the initial coherence—to a system whose entropy has increased, we can conceive of a sort of casuistry in scientific deontology: in what cases and for what legitimate purposes is a loss of knowledge through the spread of knowledge worth accepting?³⁹

Canguilhem here discusses a question that would always be pivotal to Serres: in light of its catastrophic consequences, whether and under what conditions should science be curtailed?⁴⁰ Canguilhem's answer is relatively straightforward: "the restriction of the spread of science can only come from scientists themselves."⁴¹ For him, science shall not be confused with its applications:

[...] the social status of science and the dignity of science are not the same. Insofar as it has a social status, modern science is the work of men, but insofar as it has a *dignity, that is to say a relationship to a value which is here truth*, science is that light of intelligence which makes a man learned and surpasses him as a man.⁴²

Canguilhem frames science as doubly moral: science is not only a human activity with social status, it is also as "intelligence" inasmuch as it beholds truth as its core *value*. Serres's uptake of this article by Canguilhem is revealing of a very different orientation, which would prove increasingly divisive. In a long-winded footnote in "Structure and Importation: from Mathematics to Myths," Serres returns to Canguilhem's hypotheses regarding the entropic character of the spread of science in society, to shift Canguilhem's argument from the plane of scientific deontology to the plane of *history*:

It results from this—and henceforth, rigorously so—that the history of science, insofar as it is purely a history of truth (and nothing other than that) can only be a recurrent history and that a certain stage of this history is always situated, in the communication chain, in the closest possible

proximity to its origin. It is a history having come full circle, without parasite. If Pericles is infinitely remote from Clemenceau, Thales is one of Poincaré's closest neighbors: this is what is meant by the anamnesis of the Meno.⁴³

For Serres, Canguilhem's claim about the entropic aspect of transmission designates a kind of temporality, it points to a "rigorous," that is quantifiable, approach to recurrent truth. Reframing the history of truth as the *transmission* of truth, that is, its conservation through transports, Serres reasserts mathematics's exemplarity as model of recurrent or auto-normed history. As he reformulates it in "Mathematical Anamneses," mathematics shall be defined "as a world of communication maximally purged from noise and, consequently, of a traditionality undergoing the least loss."⁴⁴ Mathematics is a limit-case: because of its extreme degree of formality, it constitutes the "purest" form of scientific language and, therefore, of recurrence. Whereas Canguilhem separated scientific reason as a moral *value* from its practical spread within society, Serres redefines scientific reason itself from the viewpoint of communication or information.

To sum up, Serres transposed the concept of recurrence from the realm of deontology and epistemology of science (*how ought we to think and write the history of science?*) to another realm. But while it is clear that Serres made an important break with the epistemology and history of science as understood by his two masters, the plane on which he inscribed his own project remains enigmatic. In "Mathematical Anamneses" he claims that mathematics is "in itself, a quasi objective, transcendental field."⁴⁵ While disqualifying Husserl's general approach to science, he also borrows a number of notions stemming from phenomenology. "Sedimentation," "archeology," "ideality," "tradition," "reactivation" all appear in order to thematise the opposition between the purity of scientific idealities and the historicity of cultural formations.⁴⁶ With this resolutely composite register, Serres *de facto* placed his inquiry at the cusp of a historical epistemology and a formal or minimal "ontology" of relations (or "prepositions") yet to be elaborated.

In “Mathematical Anamneses,” he claims that in order to grasp the “history of truth” in its objectivity, we have to *start* from its elementary units—suggestively described as “atoms of sense”—as many inseccable monads or points wherein truth and history intersect. But by bringing in Leibniz as a key register and inspiration, by positioning himself on the very boundary between epistemology and ontology, Serres also willfully founded his philosophy on an ambiguity, which he would never fully depart from.

SCIENTIFIC AUTOCHTHONY

Canguilhem’s break with his former student has mostly been explained through the justification that Canguilhem gave in public: Serres’s failure to recognize his debt to Bachelard, and worse, his irreverence toward his former master. As Marcos Camolezi pertinently argues, however, it is only through an analysis *combining* intellectual, institutional, and philosophical aspects of their relationship that this rupture takes on full significance.⁴⁷ Camolezi notes that as the director of the Institut de l’Histoire des Sciences et des Techniques since 1955, Canguilhem was, in those years, committed to a project of the steady disciplinarization of the history of science in France. While Canguilhem initially perceived Serres as the potential heir and continuator of his project, he did not end up fitting the figure of the sober epistemologist that Canguilhem had initially praised.

Underscoring Canguilhem’s and Foucault’s initial convergence with Serres’s theses will be helpful for gaining a finer-grained understanding of their disagreement. For Canguilhem, Serres followed in Bachelard’s footsteps in deepening the thesis that mathematics constituted a special and *exemplary* case of epistemological autonomy. In “L’Objet de l’histoire des sciences,” a lecture first delivered in Montréal in 1966, Canguilhem explicitly set aside the Bourbaki group as a singular example of scientists who incorporated philosophical remarks within the exposition of their results.⁴⁸ On the ground of Serres’s essay, he explains that the historian of mathematics can only rely on present-day mathematicians for a “provisory definition of mathematics” (20), one which transforms past works

into “trivial applications” (20). Pursuing this point, he also insists, like Serres, on the “intrinsic temporality” proper to the history of science:

Thus, the history of science, the history of the progressive relationship of intelligence to truth, generates its own time, and it does so differently depending on the stage of progress from which it takes on the task of reviving, in earlier theoretical discourses, what the language of the present still allows us to understand..⁴⁹

In his *Archeology of Knowledge* (1969), Foucault also acknowledges Serres’s bewildering but brilliant “Mathematical Anamneses” in several places. He positions Serres’s discovery of “recurrent redistributions” alongside Bachelard’s notion of epistemological thresholds, Canguilhem’s study of the “displacement and transformation of concepts,” and Gueroult’s method of “architectonic of systems”—four ways of reshaping the fundamental units of the history of science and intellectual history. As Foucault explains, recurrent redistributions fundamentally pluralize history, revealing “several pasts, several forms of connection, several hierarchies of importance, several networks of determination, several teleologies, for one and the same science, as its present undergoes change.”⁵⁰ Serres’s influence is again palpable when Foucault presents mathematics as the only truly “mature” science: it is, as such, the only “discursive practice” that has crossed four “thresholds” (*seuils*) at once (of positivity, epistemologization, scientificity, and formalization). By setting a “formalisation threshold” as a constitutive limit of his own archeological investigation, Foucault makes room for a surprising “mathematical exception” in his archeological project.⁵¹ Endorsing the formalist and architectural view of mathematics that Serres developed, Foucault considers that the past notions of mathematics are “constantly undergoing redefinition [...] in the formal structure that mathematics constitutes”⁵² and he states that mathematics “in its original positivity” was an “already formalized practice,”⁵³ pointing to Serres’s “indeterminist” conception of the origin of mathematics

according to which “any origin is the origin itself.”⁵⁴ But, as David Webb notes,⁵⁵ while Foucault fully agrees with Serres’s characterization of mathematics as a singular model for a history of truth, he also takes a stance against possible uses of mathematics as model. Instead of being an especially pure and informationally efficient model of scientificity, as Serres considers, mathematics is for this very reason, a “bad example,” one that cannot be generalized. Whilst mathematics has long been used as model of “rigour and demonstrativity,” it should not be used by the “historian who questions the actual development of the sciences (*le devenir effectif des sciences*)” (189). Whereas Serres, in “Mathematical Anamneses” (echoing Cavaillès’s own ambiguity in *On Logic and the Theory of Science*) oscillated between theorizing mathematics and theorizing the history of science in general, calling for “practicing science” by entering the movement of *invention*, with the latter’s fundamental ana-chronicity, Foucault and Canguilhem would eventually remain attached to the retrospective *standpoint* afforded to the historian (as opposed to the scientist), retaining chronological, empirical history as a *ground* of a history of truth(s). Thus, while Canguilhem and Foucault both agreed with Serres’s own assumptions about the epistemological autochthony (and reflexivity) of mathematics (and science more generally), and with the idea that science produced its own time, this did not imply for them the short-circuiting of *historical* time itself. Though he shared many of Serres’s initial postulates, the question of standpoint will prove especially crucial to Canguilhem. Indeed, it is not so much the content of Serres hypotheses pertaining to the historicity of science and the technologies of communication that would encounter Canguilhem’s resistance, as their synthesis: the future-oriented, almost de-historicized epistemological-ontological *program* that Serres derived from these premises, and the type of philosophical project he sought to build.

AN EPISTEMOLOGICAL *ETHOS*?

The first sign of Canguilhem’s discontent with Serres occurred prior to the doctoral defense, on the occasion of an invitation by Jean Wahl to present his ongoing research at the Société Française de Philosophie, on November 25, 1967, where

Serres presented some ideas he would develop in his *thèse complémentaire*, “Essai sur le concept épistémologique d’interférence.” In this talk entitled “Le Messager,” Serres’s grounding hypothesis was that the “privileged place of innovation, that is to say the meeting of discovery and application” was not “productive techniques” anymore, but “communication” techniques. As he stated, “[t]he circulation of information in general, its confluence in pluralized nodes, are conditions for decision, innovation, investment. What interests me here is the impact of this global situation on the field of theoretical knowledge.”⁵⁶ Starting from an everyday, technical object, the road interchange, Serres introduced what he himself described as a “programme”, one which he wished to be “delivered from the fixity of reference,”⁵⁷ on the model of structuralism as a “non-referenced pluralism.”⁵⁸ The road interchange was the concrete and physical example of a fundamentally decentered epistemology, grounded on “interception,” transport, and translation.

The audience’s reponses were mostly skeptical and some fundamental objections were raised. Jean Hyppolite wondered how Serres could claim that “communication had become the center of everything,”⁵⁹ and how he could justify his direct shift from the plane of “human civilisation” to “a logic in which mathematics enable you to privilege no domain and to effectuate beautiful operations of transfers,”⁶⁰ pointing to Serres’s paradoxical reliance on mathematics as methodological meta-discourse. For his part, Canguilhem contested Serres’s claim to have freed himself from any referential or point of origin: “in the new philosophy, that is in the decentered philosophy about which we have just heard a presentation that was as brilliant as it was deep, where is the queen? [...] Is there a model or not?”⁶¹ Toward the end of their exchange, Canguilhem raised a completely different kind of question:

M. G. Canguilhem.—[...] having given up on determining any point, any origin, something to which one could assign the value of origin, you have also given up, in a certain sense, on any destination point. So I ask a practical question: what is the practical end of the philosophy of surpassing (*philosophie du dépassement*)?

M.M. Serres.—What is the practical finality of this philosophy? I cannot answer, as I have not thought about this practical finality...

M. J. Wahl.— The easiest answer, would be the surpassing of displacement and of philosophy itself

M.M. Serres.—To return to the metaphor [...] of the forest, it is clear that one is always wandering in the forest. But what sets the forest metaphor in Leibniz against the same metaphor in Descartes, is that by wandering in the forest, one ends up drawing a map.⁶²

Strictly speaking, the restless wandering through the forest of models that Serres advocated had no practical end (as overall value, norm, or regulative idea), but only a practical effect: to generate a map, to augment knowledge. Serres's difficulty in elaborating an answer to this question is also revealing, especially inasmuch as, if we read the *Cahiers*, Serres's project of a philosophy of interference was originally born from a series of ethico-political interrogations around technology and the "modern" world—but it had shifted elsewhere.

Delayed by the political turmoil, the *viva voce* ended up taking place in June 1968. While the examiners' reception of the principal thesis, *Le Système de Leibniz et ses modèles mathématiques* was overall admirative,⁶³ Canguilhem's lukewarm response to Serres's *Essai sur le concept épistémologique d'interférence* contrasted with their previous partnership. According to the official doctoral defense report that Canguilhem wrote, Serres's secondary thesis was a stimulating work, but it remained too programmatic and to some degree presumptuous, especially in its treatment of Bachelard's thought, to which Serres was, willingly or not, profoundly indebted.⁶⁴ In Canguilhem's view, as well as in Roger Martin's, Serres's secondary thesis was "more bold than demonstrative": it attempted to prove too much in too metaphorical a language, while offering too little argumentation. What Canguilhem viewed as Serres's irreverence towards Bachelard would henceforth become the

central matter of his discontent: “Mr. Serres cares about originality, and he has the right and the means to do so, yet he could have, while striving to lay down the tasks of a *New New Scientific Spirit*, found here and there a fairer tone for doing justice to a work that he has the ambition to extend, that of Gaston Bachelard.”⁶⁵

Canguilhem would justify his conflict with Serres through an issue of reference and reverence to Bachelard, to whom, in his view, Serres (like himself) owed so much.⁶⁶ But in the background of their dispute there was also an important theoretical disagreement over the respective tasks of epistemology, history, and philosophy—a disagreement about historical epistemology as philosophical and “disciplinary” project. Their conflict regarded more specifically the consequences to be drawn from epistemological regionalism and scientific autochthony. If the sciences already generated their own intrinsic epistemology, what was left, then, to philosophy? In a famous dialogue with Alain Badiou, Canguilhem claimed that there was no other “knowledge” (*connaissance*) than “scientific” knowledge.⁶⁷ To his surprising statements restricting the whole of “truth” to science,⁶⁸ he later added that “there is no ontology, there is no theology, there is no objective category that preexists science.”⁶⁹ For him the task of “describing the real” was lost to philosophy: it had effectively shifted from the realm of what *is* to “what ought to be” (*ce qui mérite d’être*).⁷⁰ Renouncing ontology, philosophy’s central concern was instead to be the “totality”⁷¹ of values, their mutual encounter and composition.⁷²

The position adopted by Serres across both his doctoral theses proved diametrically opposed to Canguilhem’s. In these early works, Serres indeed conducts a multi-pronged critique of the “acosmicism” which, in his view, dominated modern philosophy. His philosophical project would be one of a return to the world through various combinations of pre-critical metaphysics and contemporary science. Rather than being locked up within specific and contextual scientific departments and language with their own power of generalization, epistemological autochthony was instead to lead to the “real” world through a number of minimal, relational, ontological commitments.

At the intersection of institutional, personal, and philosophical concerns, something we might call an “epistemological ethos” appears to have been at the heart of their dissension. As Canguilhem would explain in his eulogy for Cavaillès, “rigour” meant more than a scientific quality; as a researcher’s personal *ethos* vis-à-vis the scientific community it bore some real yet intractable connection with morality. Celebrating those among his peers who, like Cavaillès, displayed a rigour that was at once intellectual and moral, exemplary courage and action, he vehemently condemned media intellectuals.⁷³ With distance, their conflict, which affected Serres profoundly, seems to have been bound up with what Canguilhem considered to be the composite register of the “profession” (*le métier*).⁷⁴ For Canguilhem, who considered himself above all a professor and valorized his institutional work *per se*,⁷⁵ Serres went beyond boundaries in the negative sense.

“INTERREGIONALITY”: TRANS- OR META- DISCIPLINARITY

Serres returned to a globalizing approach to science against the grain of Canguilhem’s own celebration of regionalism, itself pitted against the synthetic “totalitarian”⁷⁶ ambition of Comte’s positivist philosophy of science. As Canguilhem explained to Alain Badiou in the 1966 interview:

For Auguste Comte, the philosophy of science has the unification of knowledge as objective, at least through its method. This objective is unitary. [...] As for epistemology, as opposed to the philosophy of science, it is a special or regional study; it is the critical study of the principles, methods, and results of a science. This criticism involves, as such, an evaluation of results in relation to methods, an evaluation of methods in relation to principles. As a type of study, epistemology therefore assumes that the history of the science with which it is concerned is known; it can either be limited to itself, or—but *this is not without danger*—extend into theory of knowledge.⁷⁷

With distance, this Kantian opposition between self-delimitation and (undue)

extension of one's claim to knowledge appears to have been a fundamental pivot of Canguilhem's *ethos*. In 1963, Pierre Macherey opened his commentary of Canguilhem's works by pointing out that grasping their unity was an arduous task given the high level of specialisation of all of Canguilhem's writings.⁷⁸ Canguilhem's own "epistemology" appears not only highly specialized, it is also characteristically anti-programmatic, almost always integrated to concrete development on specific cases.⁷⁹ By contrast, the problem of globality is pivotal to both of Serres's dissertations and connects them both: his point was indeed to show that the type of interregionality formulated in structuralism had been anticipated by Leibniz's "pre-disciplinary" approach to the "ocean of the sciences."⁸⁰

As Canguilhem would state in his introduction to *Ideology and Rationality in the History of Life Sciences*, "samples" are preferable to "programmes," but they were all too rare: "compared with the inventory of intentions" Canguilhem regrets, "actual achievements are slender."⁸¹ While Canguilhem considered the epistemologist's role as a modest and delimited one, Serres, like Foucault, sought to reconfigure, from the plurality of scientific discourses, a *global* reflection on epistemology. Yet Canguilhem would, by contrast, be much more lenient towards Foucault's global ambitions.

Published in 1966, *The Order of Things* was in various ways connected with Serres's epistemological project, as it claimed kinship with Canguilhem's works while advancing a historical and philosophical reflection on the ongoing "structuralist" revolution. Importantly, the concept of "order" plays an analogous role in *The Order of Things* to that which it plays in *The System of Leibniz and its Mathematical Models*: it both marks the specificity of the Classical Age *and* constitutes a methodical concept that enables to read the whole, suggesting that the fundamental spatiality of classical representation allows to better *objectivate* the epistemic "structure" of knowledge than the "modern" episteme. This topological, structural conception becomes the methodological cement that organises and consolidates the whole. In both books, the concept of order serves to grasp a structural or architectural systematicity, which is at once condition of knowledge and condition of reality.

However, in *The Order of Things*, Foucault's history of truth takes the opposite route to Serres's, for instead of inscribing history within languages, it shows how the use of truthful language is delimited by historical epistemes, contained in them as their (quasi-)transcendental condition. Instead of bringing different kinds of truth (scientific, philosophical, epistemological) into a fine-grained configuration, Foucault had chosen to subject scientific and philosophical truth to a totalizing historico-epistemological truth, in a move that differentiated him starkly, for Serres, from the type of recurrence and "internal epistemology" characteristic of the Bachelardian tradition of historical epistemology that Canguilhem advocated.⁸²

But Canguilhem's famous review of *The Order of Things*, where he compares Foucault's achievements to Kant's, suggests otherwise. Defending Foucault's concept of *episteme* against its critics, Canguilhem argues: "A science is an object for the history of science, for the philosophy of science. It is a paradox that the episteme is not an object for epistemology." This, he explains, is due to the *trans-regional* nature of the episteme: "In order to perceive the *episteme*, it was necessary to exit from a given science and from the history of a given science; it was necessary to defy the specialization of specialists, and to try and become a specialist not of generality, but of interregionality."⁸³ There is a floating irony in Canguilhem's paradoxical formula. Indeed, such "interregional" epistemology appeared no less ambitious than Serres's epistemological programme, but we may conjecture that its methodological orientation was perceived entirely differently by Canguilhem as it corresponded to a different kind of epistemological ethos, as well as a different kind of historical project. In the *Archaeology of Knowledge*, Foucault would indeed strive to situate his own intervention within a historiographical perspective and to address his text to historians. Whether the difficult ontological questions raised in *The Order of Things* were decisively transformed and transfigured by their historicization in *The Archaeology of Knowledge*, and whether Foucault succeeded in avoiding formulating a "'distinct fundamental' analysis to underpin the 'regional' analyses,"⁸⁴ remains in debate.

For Canguilhem, Foucault, and Serres, adopting the history of truth as a problematic nexus indicated their refusal to choose between internalism and externalism about scientific truth. For all three, “pure science” did not exist, yet science had a distinctive mode of being. They also agreed on the fact that we cannot clearly separate pure scientificity from its context, applications, practices, or languages. All three were interested both in regionalisms (in local forms of normativity) as well as in “inter-regionality”—in how to relate or connect different epistemological regions, languages, or forms of scientificity. From this starting point, however, their trajectories differed. Though he was interested in what he famously coined the “work” of the concept, i.e. the transformation of a concept when it travels across different sciences at different times, Canguilhem always remained reluctant to develop a general epistemological discourse. To a certain extent, Foucault and Serres both sought to produce the global discourse that Canguilhem would not allow himself to formulate. But they did so in very different ways, by relying on two different transformations of the transcendental. Serres transformed the transcendental by elaborating a plane we could designate as the (in)formational, a meta-disciplinary network which he described as “objective-transcendental,” which enabled him to elaborate transregional invariants. Foucault’s focus on “discourse” also allowed him to move across and compare regions through their different modes of “truth-telling” [*dire-vrai*]. With distance, these methods may appear to have been just as *transdisciplinary* as *metadisciplinary*, because they relied on establishing a plane that would enable movement across or the comparison of regions—be it the plane of “models” and modelization for Serres, or that of “discourse” for Foucault. Canguilhem’s siding with Foucault’s own brand of interregionalism appears then revealing of Canguilhem’s increasing interest, in the late 1960s, for the material and practical historicity of scientific productions, and the question of scientific ideologies. While Canguilhem’s focus on the translational logic in the “work” of the concept is indubitably one that inspired Serres and that the latter sought to develop, because of his focus on information and on an indeterminist philosophy of time, Serres’s translational epistemology would lead to a constructive “logic

of invention”: the main point was not to *reveal* the social, political, and other cultural humus surrounding science.⁸⁵ At the end of this analysis it appears that in spatializing and “transcendentalizing” the history of science, Serres and Foucault ended up affirming opposite virtualities contained in Canguilhem’s conception of the *history of truth*: while Serres chose to remain on the side of the historicity of “truth,” Foucault, with Canguilhem’s support, placed “error” center stage,⁸⁶ giving a decisive inflection to French historical epistemology as a whole.

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NOTES

1. Georges Canguilhem, “Hommage à Jean Hyppolite (1907–1968).” *Œuvres complètes V. Histoire des sciences, épistémologie, commemorations* (Paris: Vrin, 2018), 354. Translation mine. Following Camille Limoge’s note, it is worth remarking that Jean Hyppolite did give a conference in Leiden, but that he did not pronounce this specific sentence (or the sentence was not recorded). The similarity between the statement attributed to Hyppolite and Serres’s own is striking.
2. Étienne Balibar, *Passions du concept. Épistémologie, théologie, politique. Écrits II* (Paris: La Découverte, 2020), 20.
3. Canguilhem was born in 1904 in Castelnaudary, near Toulouse, and Serres was born in 1930 in Agen.
4. On this topic see L. K. Mercier, “Zwischen Formalismus und Geschichte: Serres und Foucault in Clermont Ferrand,” trans. R. Clausjürgens and K. Röttgers, in Reinhold Clausjürgens and Kurt Röttgers, eds., *Michel Serres: Das vielfältige Denken* (Paderborn: Brill/Wilhelm Fink, 2019), 193–211.
5. This letter followed the publication of Serres’s article on Bachelard “La réforme et les sept péchés,” in *Les Nouvelles Littéraires*, republished as “Déontologie: la réforme et les sept péchés,” in *Hermès II. L’interférence* (Paris: Minuit, 1972), 201–222.
6. Georges Canguilhem, *Œuvres III. Écrits d’histoire des sciences et d’épistémologie* (Paris, Vrin, 2019), 840.
7. Michel Foucault, “Preface,” in Georges Canguilhem, *On the Normal and the Pathological*, trans. C.R. Fawcett (Dordrecht: D. Reidel Publishing Company, 1978), x. On Foucault and historical epistemology, see Jérôme Lamy, “Foucault et l’épistémologie historique: entre fidélité et déplacements,” in *Michel Foucault: Un héritage critique*, ed. Jean-François Bert and Jérôme Lamy (Paris : CNRS Éditions, 2014), 113–23.
8. See Dominique Lecourt, *Pour une critique de l’épistémologie (Bachelard, Canguilhem, Foucault)* (Paris : Maspero, 1972) and Jean-François Braunstein, “Bachelard, Canguilhem, Foucault. Le ‘style français’ en philosophie des sciences,” in Pierre Wagner, ed., *Les Philosophes et la science* (Paris: Gallimard, 2002), 920–963.
9. Michel Serres, *Œuvres complètes 1. Cahiers de formation* (Paris: Le Pommier, 2023). The archival material I will be referring to is in a file concerning Michel Serres conserved in the Georges Canguilhem archives at CAPHÉS, École Normale Supérieure, Paris.
10. Hourya Benis-Sinaceur, “Structure et concept dans l’épistémologie mathématique de Jean Cavaillès,” *Revue d’histoire des sciences* 40, no. 1 (1987): 6.
11. Van der Warden, quoted in Benis-Sinaceur, “Structure et concept,” 20.
12. Benis-Sinaceur, “Structure et concept,” 12.
13. See Nicola Bourbaki, “The Architecture of Mathematics,” *The American Mathematical Monthly* 57, no. 4 (1950): 221–32.

14. Serres, *Œuvres* 1, 171.
15. Serres, “La querelle des Anciens et des Modernes,” in *Hermès I. La Communication* (Paris: Minuit, 1969), 47.
16. Serres, *Œuvres* 1, 353.
17. Serres, *Hermès I: Communication*, trans. Louise Burchill (Minneapolis: University of Minnesota Press, 2023), 39.
18. Serres, *Œuvres* 1, 339.
19. Serres, *Œuvres* 1, 354.
20. See Serres, “Introduction,” in *Hermès I: Communication*, 5–28.
21. Serres *Hermès I*, 78.
22. Serres *Hermès I*, 68.
23. E.g. Gaston Bachelard, *Épistémologie: Textes choisis* (Paris: Presses Universitaires de France, 1971), 161.
24. Serres, *Hermès I*, 94.
25. Serres, *Hermès I*, 93; 99.
26. Bernadette Bensaude-Vincent, “Michel Serres: historien malgré lui ?,” recorded paper presented in the seminar “Michel Serres: Philosophe des sciences et des techniques,” École Normale Supérieure, Paris, November 8, 2023 [<https://savoirs.ens.fr/expose.php?id=4429>].
27. Gaston Bachelard, *Le matérialisme rationnel* (Paris: PUF, 2010), 86. Translation mine.
28. Bachelard, *Le matérialisme rationnel*, 86. Translation mine.
29. Camille Limoge, “Introduction,” in Canguilhem, *Œuvres III* (Paris: Vrin, 2019), 61
30. Canguilhem, *Œuvres III*, 856.
31. Canguilhem, “L’objet de l’histoire des sciences,” 13
32. Xavier Roth, “Enseigner: La philosophie et ses normes,” in “Georges Canguilhem: Les traces du métier,” *Revue Philosophique de la France et de l’Étranger* 210 (2020): 42. The publication of Georges Canguilhem’s complete works relativizes the importance of the history of science in Canguilhem’s overall trajectory. Camille Limoge notes that between 1943 and 1952, the word “epistemology” occurs only eight times in total across the entirety of Canguilhem’s writings, underscoring that before 1955, “nobody would have had the idea of designating him as historian of science” (Limoge, “Introduction,” 25; 57).
33. Serres, *Le Système de Leibniz et ses modèles mathématiques: Étoiles—Schémas—Points* (Paris: Presses Universitaires de France [1968] 2007), 80. Translation mine.
34. Serres, *Le Système de Leibniz*, 90. Emphasis added
35. In his *Cahiers*, Serres kept a list of the articles he had sent to Canguilhem as well as to Hippolyte (see Serres, *Œuvres* 1, 327).
36. Serres, *Œuvres* 1, 118.
37. Serres, *Œuvres* 1, 118.

38. “I show in the paper that I gave Canguilhem (The Quarrel of the Ancients and the Moderns) that there is importation of any problem of classical epistemology towards modern mathematics. Canguilhem’s text (“Necessity of scientific spread”) shows that all the problems of deontology have followed the same line.” Serres, *Œuvres* 1, 394.
39. Canguilhem, *Œuvres IV: Résistance, philosophie biologique et histoire des sciences 1940-1965* (Paris: Vrin, 2015), 1008–9.
40. Serres would go back to the ethico-political question raised here by Canguilhem in “Trahison: La Thanatocratie,” *Hermès III. La Traduction* (Paris: Éditions de Minuit, 1974), 73–104.
41. Canguilhem, *Œuvres IV*, 1013–4.
42. Canguilhem, *Œuvres IV*, 1013. Emphasis added.
43. Serres, *Hermès I*, 262; *Hermès I*, 29.
44. Serres *Hermès I*, 96.
45. Serres, “Les anamnèses mathématiques,” 79.
46. The concept of “cultural formation” was fundamental to Serres’s early philosophy. In his conversations with Bruno Latour, Serres affirmed: “Let’s give Husserl his due—his *Krisis* invents precisely this notion of cultural formation. In his description of the crisis in Western science he wonders if this original formation that we call science is independent of the others. This word formation, as he uses it, signifies something like a layer of the Earth, geologically formed and deformed by and through the Earth’s evolution. The problem is well put.” (Michel Serres and Bruno Latour, *Conversations on Science, Culture and Time*, trans. R. Lapidus (Ann Arbor: The University of Michigan Press, 1995), 32–3.
47. See Marcos Camolezi, “Michel Serres et Georges Canguilhem,” recorded paper presented in the seminar “Michel Serres philosophe des sciences et des techniques” (2023-2024), École Normale Supérieure, on December 6, 2023 [<https://savoirs.ens.fr/expose.php?id=4430>].
48. Canguilhem, “L’objet de l’histoire des sciences,” in *Études d’histoire et de philosophie des sciences*. (Paris: Vrin, 1968), 10. Camille Limoge helpfully refers to multiple iterations of this idea across Canguilhem’s writings in his introduction to *Oeuvres III*, 60–65.
49. Canguilhem, “L’objet de l’histoire des sciences,” 19–20. Translation mine.
50. Foucault, *The Archaeology of Knowledge and the Discourse on Language*, trans. A.M. Sheridan Smith, (New York: Pantheon Books, 1972), 5.
51. The puzzling nature of Foucault’s reflections on mathematics in the *Archaeology of Knowledge* is the topic in David Rabouin, “L’exception mathématique,” *Les Études Philosophiques* 153, no. 3 (2015): 413–430, and in Juan Luis Gastaldi, “L’archéologie à l’épreuve des savoirs formels : Mathématiques et formalisation dans le projet d’une archéologie des savoir,” J.F. Braunstein, I. Moya Diez, M. Vagelli, eds., *L’épistémologie historique. Histoire et méthodes* (Paris: Éditions de la Sorbonne, 2019), 187–206. Surprisingly, neither of these articles comment on Serres’s influence on Foucault, which has been taken up by David Webb in his *Michel Foucault’s Archeology* (Edinburgh: Edinburgh UP,

2013).

52. Foucault, *The Archaeology of Knowledge*, 189.

53. Foucault, *The Archaeology of Knowledge*, 188.

54. Serres, *Hermès I. La Communication*, 93; 99.

55. David Webb, *Michel Foucault's Archeology*, 147.

56. Serres, "Le Messenger," *Bulletin de la Société Française de Philosophie* 62, no. 2 (April–June 1968),

35. Translation mine.

57. Serres, "Le Messenger," 40.

58. Serres, "Le Messenger," 48.

59. Serres, "Le Messenger," 60.

60. Serres, "Le Messenger," 60.

61. Serres, "Le Messenger," 57.

62. Serres, "Le Messenger," 60.

63. The examiners for the principal thesis were Jean Hyppolite, Yvon Belaval, and Suzanne Bachelard, and the complementary thesis was assessed by Roger Martin and Canguilhem. Canguilhem was the president of both juries.

64. Coming from Canguilhem, this was an especially serious matter, as he himself insisted on doing precisely the opposite, systematically acknowledging his debts to Bachelard, and underscoring the continuity between their two bodies of work. For Canguilhem, as Jean-Louis Fabiani has pointed out, commemorations were not accessory, but significant in their own right. (Jean-Louis Fabiani, "Organiser: philosophes et professeurs de philosophie," *Revue Philosophique de la France et de l'Étranger* 210 (2020): 26.

65. "M. Serres est soucieux d'originalité, et il en a le droit et les moyens, encore aurait-il pu tout en s'efforçant de fixer les tâches d'un Nouveau nouvel esprit scientifique, trouver ça et là un ton plus juste pour rendre justice à une œuvre qu'il a l'ambition de prolonger, celle de Gaston Bachelard." Georges Canguilhem, "Rapport de M. Canguilhem sur la soutenance des thèses de Doctorat d'Etat de M. Michel Serres, chargé d'enseignement à la Faculté des Lettres et Sciences humaines de Clermont-Ferrand," Archives, CAPHÉS, Cote 40.1/Michel Serres_GC. 40.1.10.

66. In a 1963 text on Bachelard, Canguilhem quoted Serres stating that he had "perfectly characterized" the spirit of Bachelard's conception of the history of science. Canguilhem, *Œuvres III*, 484. The references to Bachelard (and parallels with him) are also highlighted throughout his preparatory notes for Serres's PhD defence.

67. Georges Canguilhem and Alain Badiou, "Philosophie et science," in *Œuvres IV: Résistance, philosophie biologique et histoire des sciences 1940-1965* (2015), 1108.

68. On the disjunctive interpretations to be drawn from this statement, see Balibar, *Lieux et noms de la vérité*, 64.

69. Canguilhem et al., "Philosophie et vérité," in *Œuvres IV*, 1129.

70. Limoge in Canguilhem, "Introduction," in *Œuvres III*, 63.
71. Canguilhem et al., "Philosophie et vérité," 112.
72. Limoge in Canguilhem, "Introduction," in *Œuvres III*, 64.
73. Jean-Louis Fabiani, "Organiser: philosophes et professeurs de philosophie," *Revue Philosophique de la France et de l'Étranger*, "Georges Canguilhem: Les traces du métier," 210 (2020): 28.
74. On the various aspects of Canguilhem's approach to his own profession, see the special issue edited by Giuseppe Bianco of *Revue Philosophique de la France et de l'Étranger*, "Georges Canguilhem: Les traces du métier," 210 (2020).
75. Xavier Roth, "Enseigner: La philosophie et ses normes," in *Revue Philosophique de la France et de l'Étranger* 210 (2020), 39.
76. Canguilhem, *Œuvres IV*, 1202.
77. Canguilhem, "'Philosophie et science'. Entretien entre G. Canguilhem et A. Badiou," *Œuvres IV*, 1098. Emphasis added.
78. Pierre Macherey, "La philosophie de la science de Georges Canguilhem. Épistémologie et histoire des sciences [1963]," in *De Canguilhem à Foucault. La force des normes* (Paris: La Fabrique, 2009), 33–4.
79. See Macherey, "La philosophie de la science de Georges Canguilhem," 33–34 and Étienne Balibar, *Lieux et noms de la vérité* (Paris: Éditions de l'Aube, 1994), 169.
80. On this point, see my "Michel Serres's Leibnizian Structuralism," *Angelaki* 24, no. 6 (2019): 3–21; and "Introduction to Michel Serres' 'Transdisciplinarity as Relative Exteriority,'" *Theory, Culture and Society* 32, no. 5 (2015): 37–44.
81. Canguilhem, *Œuvres III*, 844. At the end of this introduction, Canguilhem swiftly reviews Lecourt's and Serres's works as emblematic of the "French epistemologists of the young generation" (863), both critical of Bachelard. In this quick summary, Canguilhem only refers to Serres's article for Jacques Le Goff's and Pierre Nora's volume *Faire de l'histoire*, which would be republished as "Point, plan (réseau), nuage" (in *Hermès IV. La Distribution* (Paris: Éditions de Minuit, 1978: 17–40)).
82. See Serres, "The Ship's Turning Back," *Hermès I: Communication*, 191–208.
83. Canguilhem, "The Death of Man, or Exhaustion of the Cogito?," in *The Cambridge Companion to Michel Foucault*, ed. Gary Gutting (Cambridge: Cambridge University Press, 2005), 85.
84. Webb, *Foucault's Archaeology*, 103. For David Webb, the concept of "temporal dispersion" is key in this transformation: "[t]he shift from ontology to history hinges on the introduction of temporal dispersion, which opens up the possibility of reconfiguring the temporal conditions of disclosure as the historical conditions of construction. However, it is not that ontology gives way to history entirely. If anything, ontology has to take history into itself, just as mathematics did before it" (Webb, *Foucault's Archaeology*, 103). See also Beatrice Han, *L'ontologie manquée de Michel Foucault* (Paris: Millon, 1994).

85. Likewise, in Serres's philosophy, etymology is not so much at the service of a philological-historical approach to texts but has instead a (re)constructive task.

86. On the question of "error" as a central Canguilhemian legacy, see Audrey Benoît, "L'épistémologie historique en héritage. Althusser, Foucault et la fabrique conceptuelle de l'histoire," in *L'épistémologie historique. Histoire et méthodes*, eds. Jean-François Braunstein, Ivan Moya Diez, and Matteo Vagelli (Paris: Éditions de la Sorbonne, 2019), 103–116.

the scientific roots of serres's philosophy of time¹

bernadette bensaude-vincent

In the course of his *Conversations* with Bruno Latour in 1990 Serres confessed “I have been working for a long time on a book on time and history. It advances as slowly as my own intuition

on these matters.”² This book never came out but the question of time is endlessly reopened, reformulated throughout in his works, from his earliest unpublished articles to the last posthumous book, *Relire le relié*.³ Serres's reflections on time are not primarily driven by historical circumstances. They rather proceed from a “global intuition” about how to articulate our cultural history to the long duration of the universe.⁴ Unlike the mainstream interpretation of Bergson's intuition of

duration as immediate, Serres's "global intuition" of the structure of time required a lot of work and the mediation of a variety of models that Serres derived from natural sciences or from his bodily experience of daily life. Therefore, the question of time springs up and frequently resurfaces all along the seventy volumes that bear his name.

This paper has no ambition to characterize Serres's metaphysics of time in a few pages. It more modestly aims at deploying the variety of his sources of inspiration. For Serres, there is no clear univocal answer to the question of time. No science, no philosophy, no religion, has the final word on its nature. It is rather through the variety of figures of time provided by scientific disciplines that Serres explores its structure. His earlier views of time were inspired by his work on Leibniz and the history of mathematics. In the 1970s, Serres shaped a new model of time on the basis of thermodynamics and cybernetics. He then found other keys in physics, fluid mechanics. Finally in the 2000s, he made full sense of the deep time introduced in geology by radiometric dating and in cosmology by the Big Bang hypothesis. None of these models is sufficient but each of them affords a particular prism revealing a facet of time that needs to be taken into account. To grasp the overall structure of time, Serres resolutely "wants to go everywhere" as he says in *Pantopie*.⁵ Going everywhere, embarking in a long journey through the encyclopaedia, this is how Serres captures the multiplicity of figures of times. From the outset he challenged Bergson's opposition between space and time as he had the conviction that the structure of time can only be understood through special properties of space and he envisaged a complex topological space in the first volume of *Hermès*.⁶

When working on the history of mathematics in the 1960s, the young Serres boldly questioned and subverted the chronological timeline on the basis of a topological approach. While geometry focuses on the measurable, topology is concerned with positions and "relations of vicinity, proximity, remoteness, adherence and accumulation."⁷ Topology—the qualitative science of space—provided the impetus to frame the question of time in terms of relations, as an interchange

between multiple timelines. Topology enables Serres to imagine multiple spaces and times intersecting and interfering in the world and he uses a topographical approach to describe the flux of time in terms of percolation. At the turn of the 1970s, thermodynamics, cybernetics and life sciences inspired both the distressing perspective of an end of time,⁸ and the view of a local counter-flows of organisation and information. Later in commenting on Lucretius' *De rerum natura*, Serres introduced the model of declinations and bifurcations. It opened up a grandiose perspective reconciling chance and necessity, being and becoming. By the end of the 1970s, Serres supported the thesis of multiple temporalities by treating things—living and non-living—as signatures of time or archives. In the 1980s, he earnestly bridged the gap between clock-time and weather, thus connecting social history and climate. Finally, in the 2000s, he rearranged all previous models in a *Grand récit*, which echoes the concept of Anthropocene forged in Earth System sciences.

In a sort of pendulum movement from the multiple to the one, the *Grand récit* reconstructs a synoptic view of time. While in the 1970s and 1980s, Serres promoted a polychronic view of multiple contingent temporalities, in the series of books beginning with *Hominescence* he outlines a unique global perspective. In thus embedding all multiple times in a Grand Narrative does he shift from a polychronic view to an overarching universal framework? To what extent can we read the *Grand Récit* as Serres's solution to hold together multiplicity and uniqueness, polychrony and chronology? Without providing a clear answer to this question, this brief survey of Serres's perspectives on time will at least make it clear that time is a core concept in his philosophy and a driving force to move beyond the man/world face-off established by modern metaphysics.

BREAKING THE TIME ARROW THROUGH MATHEMATICS

As he was working on Bourbaki's theory of sets in the 1960s,⁹ Serres quickly became convinced that the historicity of mathematics required a non-linear notion of time. The chronological timeline hides the variety and complexity of the

figures of time at work in a system of mathematics. In an unpublished manuscript entitled *Le matin des géomètres*, Serres noted that the elements of any treatise of mathematics—curve, equation, theorem—have a history of their own.

Hence the observation of the infidelity of the term history, which covers at first the unilinear schema of a homogeneous global evolution in a monodrome time: the evolution of mathematics follows on the contrary a heterogeneous plurality of distinct temporal sequences, it develops along several times.¹⁰

The historicity of mathematics does not follow a chronological thread. To escape the unique and continuous timeline, Serres turned to a geological metaphor. A landscape reveals archaic alluvium accumulated in the bends of rivers, as well as fractures, upheavals, moments of restructuring. Similarly, a mathematical system bears the imprint of the shocks of the past. Bourbaki so disrupted the landscape that ancient layers resurfaced. Strangely enough, through a feedback movement, their revolutionary system places us in the vicinity of the origin of geometry. Like the slave in Plato's *Meno* modern mathematicians recall a forgotten knowledge. As the history of mathematics establishes a short circuit with the past, Serres claimed that the quest for origins of mathematics should give way to an archaeological approach. This shift was anchored in his conviction that the linear time of chronology is unceasingly upset by precessions-retroactions due to the internal movements restructuring mathematical knowledge. From the onset, Serres strongly rejects the linearization of time and favours a topological view of time described with the help of geological and archaeological metaphors. He describes a complex landscape bringing together the most archaic with most recent.

Serres further explores the transformations of linear time by mathematical knowledge in “Les anamnèses mathématiques”,¹¹ and he firmly claimed that there are multiple origins in *Les origines de la géométrie*. He distinguishes various temporal modalities—direct or recurrent, connected or non-connected, and

describes crises as moments of reorganisation that question the foundations in an “endless iteration of passages through the origin [...] a feeding back of the development through the source and of the source through the advance.”¹²

To sum up, from the very beginning, on the basis of his study of the history of mathematics and of Leibniz, Serres subverted the chronological timeline in favour of a topological approach that allowed him to bring together distant episodes and to consider the contemporaneity of the origins of mathematics with the most recent research directions.

TIMES IN THE PLURAL: THERMODYNAMICS AND CYBERNETICS

In the 1970s, Serres connected the history of knowledge with the time of nature; or rather with the times of nature since the second law of thermodynamics added to the absolute, reversible, and imperceptible time of Newton’s mechanics the irreversible entropy of isolated systems that always tend spontaneously toward a state of thermodynamic equilibrium. Serres became interested in cybernetics after reading Léon Brillouin’s *Science and Information Theory*, a book that radically and definitively oriented his philosophy. Following on Werner Heisenberg’s view of life as “negative entropy”,¹³ Brillouin assumes that information (language, code) is a form of negative entropy, and that any increase of information is paid for by an increase of entropy. In thinking life and information as forms of negentropy, Brillouin brought biology into the realm of thermodynamics. He clearly identified information as a fundamental dimension of the natural world along with matter and energy.

This cybernetic theory is the cultural milieu where Serres’s view of time took shape. Echoing the regular meetings of the American Cybernetic Group that gathered Norbert Wiener, John von Forster, Claude Shannon and others from 1946 to 1953, a group of French intellectuals named *Groupe des Dix* gathered in Paris from 1969 to 1976 to discuss the implications of the interdisciplinary approach to cybernetics¹⁴ Serres became a member of this group and participated in the

meetings from 1973 to the end. This involvement had three major impacts on his philosophical views about time.

That entropy is linked to information is the greatest discovery in history, in the theory of knowledge and in the theory of matter. It is strictly the connection of chance and necessity. This is the natural philosophy generated by information science. It is inevitable.¹⁵

Fascinated by the purely formal definition of information as the opposite of statistical entropy, Serres read Jacques Monod's *Chance and Necessity* as a broad philosophical essay on time.¹⁶ He described it as an attempt to reconcile two opposite arrows: the universal entropic time arrow turned toward equilibrium or death and the local negentropic time generated by open living systems. Thus, the first impact of the cybernetic approach was to impose a plurality of times. Serres repeatedly claimed that nature composes at least three different times: the reversible time of clocks and calendars; the irreversible time of Carnot's principle that leads to equilibrium and death; and the third time is the negentropic time of systems out of equilibrium that locally generates order, life and information.¹⁷ It is not just physics that teaches us that everything is a knot of multiple times. Serres insists that we can experience the composition of these three times in our body, which follows various rhythms and continuously adjusts them in our daily life.¹⁸

A second major impact is that there is no teleonomy except locally. Serres fully adopted the idea of order out of noise developed by Edgar Morin and Henri Atlan, both members of the Groupe des Dix. The non-linear oscillator obtained by the Belousov-Zhabotinsky reaction became famous among intellectual circles such as the Groupe des Dix as an experimental proof that chemical reactions are not exclusively ruled by the second law of thermodynamics. Far from equilibrium reactions were promoted as evidence of the generation of order out of noise and models of biological phenomena. Serres assumed that collective behaviours locally emerge out of interactions between components without reference to any global structure. And since orders are rare and impermanent, Serres clearly understood

that he had to get rid of the traditional framework provided by an ontology of substance. What we read in things by decoding nature is not their essence, it is their history, their encounters and relations. In *Genèse* (1982, originally titled *Bruit*), Serres made a radical attempt to think multiplicity without assuming a pre-existing unity.

We can attempt to describe the flux and its way of encoding, we can also try our luck in following the processual, to see how it slows down everything surrounding its codes. ... I speak of the multiple fluctuations in the flux, I am speaking only of a pure process now. It is the time of worlds and things, the time of life, of history of the groups and of knowledge, and in every circumstance, it weaves combinations either that it undoes, or that slow it down.¹⁹

Local orders emerging out of noise, here lies the birth of times.

The third impact of the cybernetic notion of order out of noise, articulated by Ilya Prigogine and Isabelle Stengers in *La Nouvelle alliance* (1979),²⁰ is that it challenges Jacques Monod's claim about the insularity of humans in the universe. Serres wrote an enthusiastic review of this book which became a best-seller. As cybernetics places the physical world of energy transformations, the organic realm of living beings and the psychic world of information processing on the same ontological continuum, it undermines the distinction between mind and body between subjects and objects of knowledge.²¹ Serres assumes that the physical and the cultural worlds differ only by their order of magnitude: information is separated from energy on the scale of powers of ten by what Serres called the 'abyss of sixteen zeros'. But humans are able to bridge this gap by virtue of having at their disposal a double energy game—through language and technology. They actually bridged the gap when scientists invented atomic bombs and turned knowledge into a power of destruction in the service of death.²² Thus the 'communicational physics' outlined in *Hermès III* implies that everything is commensurable, it is a matter of relations between physical quantities on a continuous scale that extends

from the minimum (information, low energy) to the maximum (weapons). Serres not only challenges Cartesian dualism but as we will see below, he transfers to worldly objects the attributes traditionally attributed to human subjects.

TURBULENCES AND TRACES

The ideas of a plurality of times, of order out of noise, gained traction in Serres's interpretation of Lucretius's *De rerum natura*, a poem that he considered as a treatise of modern physics. In *La Naissance de la physique (The Birth of Physics)*, the clinamen, the infinitesimal deviation from the vertical flow of atoms that fall like rain in a void space generates an aleatory order.²³ From the chaos of atoms (*turba*) arises a vortex (*turbo*), a local temporarily stable order. This island of stability in a laminar flow generates time out of the smooth monodromic fall of atoms. Like the letters of the alphabet self-assemble in words, the clinamen, the slight deviation in the monotonous movement of universal gravity encodes nature.

The fall is without memory, it is without code. Nature does not code the universal. Whatever their initial conditions may be, things fall. The clinamen sets the first coding; it introduces a new time, writing, memory, the reversible and the negentropic.²⁴

Any contingent local turbulence generates a time. The creative power of the clinamen confirms the plurality of times. As a stable order emerges through aleatory vortex, there are as many orders as declinations. Each vortex generates a history, initiates a local time. Instead of the classical timeline, Serres displays multiple times, local times that unfold transient histories. Whether it be laminar or turbulent a flow generating islands of stability always combines various temporalities so that we are always in the con-temporary.²⁵

The Birth of Physics intimately connects the plurality of times with things. Since anything in the world is a combination of several times, at least a mixture of the entropic descent into disorder and the negentropic ascent toward order, "time is nothing without each thing, and each thing has its own."²⁶ "There is no time but

that of objects.”²⁷

At the global level, nature is a continuous and contingent process of self-organization. *Phusis* is autopoiesis.²⁸ ‘What is nature? The indefinite integral of bifurcations.... Quasi tautologically nature is said of the sum of these births.’²⁹ Nature is always *naturans*, generating local histories.

In thus capturing time as a process, a pure becoming deprived of being, Serres rejects all ontological categories. He twists the familiar liquid metaphors used for thinking time as a flux to better emphasize the contingency and multiplicity of flux embodied in things. He begins with describing sound and fury, noise, violence, then points out a few signals, rare moments of encoding which disturb or slow down the flows of time. Time is no longer to be viewed as the single absolute framework indifferent to anything that happens in it that Newton imagined, times in the plural become the fibres interwoven in the texture of things. To convey a view of the feedbacks and retrocessions in the history of physics and mathematics, Serres often mobilizes the image of woven, and folded textiles and he makes the rapprochement between texts and textiles

Nature is encoded with atoms-letters that inform each other to make a text. It can be viewed as a palimpsest of signatures. It’s not just living organisms that are encoded, everything bears the marks of time flows. In this respect all “solid things carry inscribed on them information that the whole theory conspires to decode, or they inform each other just as, previously, nature’s atoms expressed each other.”³⁰

The entire earth is a landscape of traces imprinted on a wax tablet as suggested in a poem by Serres printed in 1977 entitled *Gels* (Frosts):

Everything, crystal, mineral, molecule, rock, planet, star,
is a Rosetta Stone
marked by the plurality of objective languages left on its surface by the
thick chaos of things encountered.

Like us, it traces and receives traces,
Information under wrinkles and scars.
Like us, better than us.³¹

The reconfiguration of time as a knot of various processes of becoming embedded in things deprives humans of their exceptional status in the world. Writing and printing are among nature's capabilities. Serres repeatedly claims that all things are carriers and processors of information. 'I know of no physical objects, living beings or human communities which are not analysable according to the four operations of receiving, storing, processing and emitting information.'³² The gnomon, for instance, a simple metal rod that intercepts the natural light is an apparatus of knowledge. Its shadows write clock time on the sand or the marble as if the world knew itself.³³ "The construction of the sundial features the natural light and shadow intercepted by this ruler, an apparatus of knowledge [...] This point writes itself on marble or sand, as if the world knew itself."³⁴ Information resides in things, in their relationships, not in the subject. In a striking shortcut, Serres folds time like a puff pastry; immemorial beginnings stand side by side with the aftermath of Western science. "The 'I think' is 300 years old, while the gnomon says it has known for more than three millennia."³⁵ This material intelligence is presented as the ancestor of artificial intelligence.

FOLDS AND PERCOLATION

While diving into the processual, into flows and turbulence, the philosopher-historian turned into a geographer. Serres, like Gilles Deleuze in *A Thousand Plateaus*, shifted from the history of concepts to a philosophy opened onto the world.³⁶ In their effort to think a 'pure multiplicity' without concept, both focused on process and adopted an immanent position. They thus managed to give up the notion of time as a global framework and invented new figures of time as interwoven fibres that make the fabric of the world.

The images of vortex and deviation of the *The Birth of Physics* are developed via

modern modern fluid dynamics. Serres clearly intended to make Lucretius our contemporary (in the ordinary sense), and to abolish the distance of twenty centuries established by the linear chronology thanks to the model of folded textiles. In *Rome* (1983) he argues that under the light of modern rational science lies an obscure knowledge that demands implication and envelopment. This “knowledge is folded over itself like a rope, like a protein, or a tissue; it is invaginated as well and thus becomes dense.”³⁷ This knowledge made of layers covering layers, of knots upon knots creates a dense material that goes back up. Entropy is compared to the knowledge of the baker kneading dough by stretching, spreading it, folding, and folding it over once more. The baker’s transformation is nevertheless topologically predictable. The kneading dough results from iterative movements of squashing and folding.³⁸ The geological image of layers of time embodied in sediments should be completed by the sudden proximity of moments that abolish chronological distances. For instance, *Statues* (1987) begins with the rapprochement of two distant episodes, the ancient sacrifices embodied in the statue of Baal which belongs to a mythical time and the disaster of NASA space shuttle Challenger on January 28, 1986. And Serres later comments that these two times are close neighbours, that science and myth can never be dissociated, and that “we are ancient in most of our thoughts.”³⁹

In *Rome* (1983), Serres ventures an additional model of time that he further developed in *Les cinq sens* (1985), *Conversations with Bruno Latour* (1992) and *Les origines de la géométrie* (1993). Inspired by Pierre-Gilles De Gennes, a French physicist working on fluid dynamics, percolation is a unifying model replacing the common view of the flux of time. Percolation is not a smooth flow: there are obstacles, tipping points that determine sudden changes depending on thresholds of energy. This model clearly suggests that the flow of time has no directionality. It rather fluctuates in a random environment. As long as the world is becoming is the inscription of multiple co-existing and heterogenous flows, “time percolates in several dimensions, multiple speeds and numerous rhythms.”⁴⁰ It connects or disconnects islands, and these connections depend on both combinatorial

possibilities between multiple elements and on weather and contingencies. In other terms, the flow is not a vector (forget the time arrow), it is determined by the relation of the fluid to the material medium (it is context-sensitive) because its speed and rhythm depend on the topological properties of the surface.

The percolation model is incompatible with the cyclical view of lifetime. Serres firmly rejects the famous metaphor used in the secret of the riddle submitted by the Sphinx to Oedipus, identifying the cycle of circadian time with individual life “child at dawn, adult at noon, old man in the evening”:

The metaphor or homothetic projection of the solar day onto a human life is not easily justified Why would the body follow the regular course of the sun? Why would a group of species grow old like individuals? These images identify the time of life and that of history with the astronomical model. The odds that history, life and inert trajectory would beat with the same duration can be estimated to be very low. For that it would be necessary for the rhythm to remain everywhere the same. ... Everything leads us to think the opposite, for example the unforeseeability that increases when one goes from sunset to death and from the latter to the end of history, at times that are respectively certain, uncertain, unthinkable. There is often newness under the sun.⁴¹

Here Serres clearly rejected the homothetic projection of one time on another one, because there is no invariance of time through various scales. There are multiple times with different tempos and multiple rhythms. Their heterogeneity seems irreducible to a uniform timescale.

TIME AND WEATHER

The notion of heterogeneous times entangled in the dense web of the fabric of the world is reinforced by the rapprochement between time and weather prompted by a tentative etymology. Serres ventures three etymological roots for the word ‘time’. He derives it from two Greek verbs, with two opposite meanings: one, τέμνω

(τέμνω) means to cut, and the other τείνω (teinô), means to stretch. The former refers to the breaks used to distinguish epochs in historical periodization. The latter, by contrast conveys the image of continuous flow.⁴² Serres is not interested in the debate opposing advocates of continuity to advocates of discontinuity. So he calls a third more archaic etymology of the Latin term ‘tempus’ that conveys the idea of mixing, which is found in terms such as ‘temperate’, ‘temperance’, ‘storm’, ‘temperature’. This etymology leads him to a connection between chronology and meteorology that is as unexpected in English as it is easy in Latin languages.

“In their great wisdom”, Serres argues, Latin languages use the same term “*temps*” in French, “*tiempo*” in Spanish, “*tempo*” in Portuguese, to refer to the time of clocks or chronometers (time or *zeit*) and that of meteorology (weather or *wetter*).⁴³ But Serres immediately points out that with the global climate change the turbulences that characterize the weather are disturbing the stable clock-time based on rational mechanics. The climate interferes with the cycle of seasons, with the arborescence of biological species, as well as with the historical time of human societies and individual lifetimes. With this rapprochement Serres brings even more multiplicity and contingency in his notion of time. Clock time appears as just one among many possible times.

How to articulate these multiple and heterogeneous times? Serres develops a view of time as a mixture or a composite of various temporal regimes. He describes this assemblage as a cocktail, a mixed salad, a cassoulet or bouillabaisse. To outline a “composite philosophy” he took inspiration from chemistry and biology more than physics: “Like everyday chemistry and biochemistry, like life itself, philosophy combines molecules or crystals rather than simple atoms.”⁴⁴ This composite view reinforces the spatialization of time, not the homogeneous isotropic space of geometry but a topological space made of sites and positions that make up a complex landscape.

To sum up, this quick survey clearly shows that Serres rejects the notion of time as a universal chronological line and subverts Newton’s vision of time as

a universal container, indifferent to what occurs in it. The various models of time explored by Serres converge towards a view of nature as compound of many contingent histories. It is a composite of multiple, heterogeneous times embedded in everything. In assuming that times are encoded in things such as rocks and DNA, in portraying things as archives or signatures of time, Serres clearly blurs the modern divide between subjects and objects. He also overcomes the great divide between the time of nature and social time in the rapprochement between time and weather. The physical world and social history are mixtures of order and disorder, of necessity and contingency. There is nothing like a time of nature subjected to an inexorable necessity, on the one hand and a variety of cultural times subjected to contingencies, on the other. Natural sciences and human sciences meet in a complex landscape of heterogeneous time trajectories.

A GRAND NARRATIVE

While cultivating a composite philosophy and insisting on the multiplicity and heterogeneity of temporal regimes, Serres did not forget his early search for a unifying scheme, a global structure of time. As mentioned by a number of commentators, his entire work is driven by a distinctive tension between multiplicity and unity, between his empiricist inclination and his longstanding fascination for the abstraction and formalism of Leibniz's mathematics that were the object of his doctoral dissertation.⁴⁵ Along with his unabated aspiration to the shortcuts provided by formalism and abstraction he has developed an inordinate fondness for the multiplication and proliferation of concrete figures.

To articulate all the models of time explored along his journey through various sciences into a coherent whole, a new synthesis that binds the universe and culture, Serres does not eventually invent the complex topological space accommodating multiple modalities of time that he envisaged in his earlier works. He ends up narrating a *Grand Récit* in the series of books starting with *Hominescence* (2001), through *L'Incandescent* (2003), *Rameaux* (2004) and *Récits d'humanisme* (2006).

Unity or universality [...] does not come back from the side of space, decidedly landscaped, but from the side of time, provided it is not reduced to a line or its measurement, nor above all to what Westerners name history. Paradoxically, once again, universality comes back by what we name literature.⁴⁶

Universal time takes the form of a ‘chronopedia’ a journey through knowledge, literature, and religion that begins anywhere, anytime and proceeds to nowadays. Serres claims that as recent scientific results provide clear datations, a chronopedia will replace the old encyclopaedia and restore the ancient Cronos on its throne.⁴⁷

Why a narrative to sketch out a philosophy of time? Serres adopted the phrase *Grand Récit* partly to mock postmodernism,⁴⁸ and mostly to redefine the position of humans in nature. It spans the time of the Universe, the history of the Earth, the evolution of life and the epochs of human technologies beginning with the invention of agriculture and the domestication of animals in the Neolithic up to the atomic age and the age of artificial intelligence. It encompasses three geneses: “the productive codes of molecules of matter: the genetic code of living things; codes or pixels of information.”⁴⁹ Thanks to the identification of matter, life and information this story without hero is more than a form of discourse or a literary genre. It displays the process of becoming in its entirety. To capture this process in its effectuation Serres makes extensive use of the inchoative suffix “sc” as in *Hominescence*, especially adequate to refer to beginning and becoming. The Grand Narrative aims at providing an “authentic philosophy of time, as well as the philosophy our times long for.”⁵⁰

Serres insists that narratives are punctuated by contingent and innovative bifurcations. Such events are contingent and non-predictable from upstream although they look necessary from downstream. The coherence appears because of a retrograde movement. “Since time advances chaotically and contingently this reason doesn’t allow predicting or even sketching out the scenarios to come.”⁵¹ Still there is no narrative without a thread creating links between multiple

contingent events. Serres's grand narrative presupposes a thread, albeit tenuous, that connects all small contingent stories. Hence the question: Is it one single thread or multiple interwoven fibres?

TIMESCALES OR TIMESCAPES?

Let's begin with the vignette opening *The Incandescent* to figure out what is the nature of this format:

In front of the door of the house built at the foot of alpine pastures, a little girl of three is playing; as a birthday gift yesterday, she received a cream pink doll with green pants. Behind her, the calm facade with stone lintels still shines with the ochre paint applied with a great deal of effort back when the hay harvest abounded seven years ago. Her grandfather built the metal shed to the left of the main building, itself constructed at the beginning of the last century on the ruins of an old windmill erected in the location of an ancient monastery set up long ago on the premises of a temple—whether Roman or Gallic, we have forgotten—in front of rocks moved by a thousand-year-old flood on the part of this dancing and malicious torrent whose course is dug into the Jurassic strata of the mountains enclosing the semicircular horizon beneath snow said to be eternal.⁵²

The image of a 3 year-old girl playing with a doll in front of a farmhouse in the Alps, displays a variety of regimes of temporality coexisting in a single site: the succession of human generations, the historical time of the building, the medieval and ancient times, the cyclic time of seasons with the farming calendar, the aleatory time of climatic events (the flood), the geological time of Jurassic rocks over the house and the everlasting snow.... They are all co-present in this simple snapshot.

The interpretation of this vignette reveals a global tension. It hesitates between two ways of composing a synthesis of multiple times. The vignette presents a

dynamic landscape revealing a mosaic of con-temporary times, a composite multiplicity of regimes of duration that makes a complex timescape. It also displays different stages on a unique global chronological timeline embracing the shortest duration of humans' individual life, the sequence of generations, the evolution of life, and the long duration of mountains. In other terms, to what extent does the grand narrative rest on the hypothesis of scale invariance? Was the time of the emergence of life on Earth made of the same fibres, did it have the same texture, as our socio-historical time?

On the one hand, an assemblage of heterogeneous and incommensurable times, a composite with interfaces resulting from contingent events. This is the model outlined in *Statues* when Serres criticized "the metaphor or homothetic projection of the solar day onto a human life" that was the core of the riddle addressed to Oedipus.⁵³ On the other hand, the model of timescales that are literally commensurable since they align to form a chronology. From the history of technology to biological evolution, to the eons of the Earth and the five stages of the universe, each time is embedded in a bigger one, that is itself a subset of a bigger one, like Russian dolls. They are all in a relation of inclusion, together they form a space of similitudes.

On the one hand, Serres still insists that there are multiple tempi and rhythms in the dance of the world. On the other hand, he claims in *Relire le relié* that despite the variations from the slow tempo of galaxies to the fast tempo of technological changes, the *same rhythm is shared by all beings*. This common rhythm is the backbone of the world: 'Once rhythm disappears, existence melts away into randomness, disorder and death...inert, living or *sapiens*, we adhere to one another like strata laid on top of one another.'⁵⁴ This is a very strong claim that can be interpreted in two ways. Either it means that all beings share *the same* rhythm, they participate in the dance of universe on the same beat, repeating the same pattern. Or Serres's concept of rhythm is somehow more elementary, denoting repetition or regularity as such, rather than any specific pattern that beings share.⁵⁵ It would simply mean that all beings are *rhythmic* because they exhibit regularities, without

assuming that they all have the same regularities.

More broadly, Serres's final works suggest two different structures of time. Either a dense web of coexisting heterogeneous times, or a vertical long chain of beings that follows the smooth movement up and down of a ruler along a timescale, with even-spaced units that can be extended indefinitely and divided infinitesimally along the powers of ten. Either a timescape composed by the multitude of singular time fibres and textures of things, or a series of scale- invariant units reproducing the same pattern in all degrees of magnitude, like Mandelbrot's fractals. If all beings have the same rhythm, then the temporal character of a living being can somehow be combined with the history of the Earth. This common rhythm would provide a single thread for Serres's grand narrative. Does the unity of the grand narrative depend on there being a single scale—or thread—to which everything else is referred, or is it composed on multiple scales, not all of which are reducible to one another? It is not clear which way Serres himself goes on this. Certain remarks in his later publications point to the former alternative, while a great deal of his work suggests the latter.

A NARRATIVE OF RECONCILIATION

In *Rameaux*, appropriately subtitled *A Philosophy of Time, Event, and Advent* in the English translation, Serres provides clues to reconcile these two alternative structures of time. The Grand narrative is structured by the interplay between a 'format' and 'branches' that surge along the way. "Starting from the trunk, universal, necessary, of the format, a thousand of contingent suckers explode."⁵⁶ The format, which concerns nature and culture, things and humans, "is that for which repetition is law."⁵⁷ It produces homogeneous unit series, measurement, alignment, standards, uniformization, discipline. Branches by contrast disrupt the format, they introduce contingencies, events, unpredictability. An event is "that bomb whose contingent newness interrupts a state of affairs that has been formatted for a long enough time to make people believe in its perennality... it tears apart the old format."⁵⁸ All events are characterized by the disproportion

between little causes and gigantic consequences.⁵⁹ Not all of them are productive. Therefore, Serres distinguishes events and advents: “The event can be sterile as an exception to the rule a deviation from equilibrium an interruption of sequence; the advent causes an existence to emerge, a history...to be born, soon to be equipped with laws.”⁶⁰

Serres assumes that format and branches are not only compatible but complementary. They are like father and sons or daughters. Father, the grand formatter gives birth to novelties, inventions. The format introduces rules that are both enslaving and freeing because without constraints there is no art, no work. The format always leaves singularities exceeding the rules, thus enabling the advent of real inventions.

Natural clocks follow the circuit of the planets but mark with their strikes heartbeats, *coups d'état* and *coups de théâtre*; there can be no life without the law-abiding return of the dawn nor can there be spring without the eternal return to the vernal point, no poetry without rhythm, no harmony without the anharmony of sevenths or style without the breaking of style, no solar system without the chaos that can make a planet bifurcate from its ellipse. Time runs towards entropy or, bifurcating, cadences the expansion of the universe and vital evolution.⁶¹

Thus time is structured by the cooperation of formats and events. “The Grand Narrative then, in its entirety, obeys the following modalities: rare and full of information, a contingent event tends, with duration, towards a necessity, a format without information.”⁶² Format and events, laws and contingencies, interwoven make the fabric of the world as a continuous attempt at postponing its end. All inhabitants of the Earth are driven by a project of immortality: “We only have one project, one future, one hope: the inventive victory over necessary and formatted death.”⁶³ Thus format and events replay the drama of the cybernetic fight between entropy and negentropy.

Whatever the ambiguities that remain in Serres's final words on time, it's important to emphasize that he doesn't deny any of the figures of time he has elaborated over the course of his works. The Grand Narrative does not supersede the favoured models of chaos, turbulences, folds and percolation. Serres still claims that: "Time does not flow, does not pour *en masse*; it filters or percolates. Above certain thresholds it does not flow any more."⁶⁴ The 'format' does not abolish the multiplicity of times, although the very idea of the trunk can be misleading, in the sense that ultimately there is no one single trunk from which all branches spring. On the contrary, Serres still insists on the multiplicity of times embedded in everything. "Each genome contains virtually a bouquet of different times, as numerous as its genes and their combinations, as numerous as the mutations that can be carried out in it."⁶⁵ The Grand Narrative does not restore the Newtonian framework ordering all events. On the contrary, the branches "run from contingency to contingency, world, life, species and cultures, knots where each bough deviates from the trunk and where each branch bifurcates from each bough."⁶⁶ The central role that it gives to contingencies mirrors their increasing importance in climate sciences and earth System Sciences.

More broadly the Grand Narrative features as a 'situated philosophy' of time, in the sense that it translates in a narrative genre the worldview that emerges from the early 2000s sciences and technologies. This synthesis has been built through the exploration of the deep time of cosmology in Serres's conversations with French astrophysicist Pierre Léna.⁶⁷ Serres's philosophy of time has been deeply transformed by the techniques of datation with radioisotopes which give access to a kind of 'absolute time' and a measure of time with clear dates for the origin of the Universe, of the Earth, of life. In some sense, the ability to date events six million years ago seems to reintroduce an absolute scale on which events are placed. It favours the view of a universal format. Serres abandons the theme of order out of noise that he considers as 'a sterile path' that leads nowhere. He claims that the appreciation of time has changed since Darwin and Bergson

I believe we must begin to re-think time, taking these orders of magnitude into account. There is a great deal at stake when we say that... the general organism emerged around six million years ago. And what does this mean? That time is constructed out of things, that it must be understood in terms of this *real density or expanse*.⁶⁸

The Grand Narrative is also heavily influenced by the emergence of technosciences such as nanotechnology, biotechnology and Artificial Intelligence, that open up scientific knowledge so far focused on the adequate description of reality to the realm of possibilities and virtuality.

Serres claims that the Biosom is the site of a new aesthetic, a global empiricism based on the integration of various sources of knowledge from kinesthesia to the banks of big data. ‘Biosom’, a collective body of all species:

The Biosom attempts to ‘synchronize’ the times, highly multiple, of fish and of bacteria, of whales and of mayflies, of the rose and of the sequoia, of birth and of metamorphoses, of the nymph, of the chrysalids and of the imago, of reproduction and of death, of entropy and of rebirth... Biosom composes the global, complex and criss-crossed space-time of the entirety of this world’s living beings.⁶⁹

Serres, always aware of cutting-edge research, understands the real density of time and its expanse through references to recent scientific fields. The density of time is accessible through genomics. While in his lifespan he experienced that the world changes so rapidly that clock time seems to abolish or delete what it measures, Serres finds in the sequences of the human genome located in his chromosomes a recapitulation—a “chrono-sum” of the history of life on Earth. “The genetic code adds, sums, totalizes the time of the biota and reveals that of each person. Thus our genome contains the entirety of evolution.”⁷⁰ In this respect, does the synthesis not bring all the times together into one whole? Serres, rather, suggests a Leibnizian interpretation with each singular being condensing all times

in a unique way. The Grand narrative does not provide God's synoptic view, but each monad combines the universe in a unique way.

CONCLUDING REMARKS

Serres has shaped an idiosyncratic philosophy of time along a long journey that took him across many sciences ranging from topology and geometry, thermodynamics, information theory, fluid dynamics to geology, astrophysics, ecology, genomics, and cosmology. His journey was nothing like a tourism trip. Serres immersed himself in the theoretical framework of each scientific discipline, picking up a number of notions—such as homothetic space, order out of noise, vortex, etc—that he used as conceptual tools in the construction of his anthropology. As a result, he did not come up with a solid, monolithic and rigid notion of time. He ended up with a fluctuant notion expressing a deep tension between his inordinate fondness for the formalism of abstract structures and his passionate exploration of more concrete experiences of the world, of thinking with his body. Despite the tensions created by these two intellectual attitudes, they converge to build up an anthropology that breaks with the modern face-à-face of subjects and objects of humans and nature.

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NOTES

1. Many thanks to Elie During for sharing his views on Serres's philosophy of time and to David Webb for his careful reading of this paper and invaluable commentary on Serres's notion of rhythm.
2. Michel Serres with Bruno Latour, *Éclaircissements, cinq entretiens avec Bruno Latour* (Paris, François Bourin, 1992). English translation by Roxane Lapidus, *Conversations on Science, Culture and Time* (Ann Arbor: University of Michigan Press, 1995) 34.
3. Michel Serres, *Relire le relié*, (Paris, Le Pommier, 2019). English translation by Malcolm Bevoise, *Religion: Rereading what is bound together* (Stanford University Press, 2022).
4. Serres uses this phrase in *Conversations* "My goal is not above all to be right but, rather, to produce a global intuition, profound and sensible" (Ibid., 115). About Serres's notion of 'global intuition' see Chris Watkin, *Michel Serres. Figures of Thought* (Edinburgh : Edinburgh University Press, 2020), 26-29.
5. Michel Serres, *Pantopie ou le monde de Michel Serres* (Paris, Poche 2016), 360.
6. Serres mentions "complex surfaces with 'chimneys' of strong acceleration, 'passes' of arresting 'ascent', zones of stationary values and so on, like the surfaces conceived by Euler and Riemann", in *Hermès, La communication*, (Paris, éditions de minuit, 1968), 101. English Translation by Randolph Burks, (https://www.academia.edu/49277992/Hermes_1_Communication_40_by_Michel_Serres_translated_by_Randolph_Burks, 2021), 42.
7. Michel Serres, *Atlas*, (Paris : Julliard, 1994), 71.
8. The distressing perspective inspired by the second law of thermodynamics is reinforced by Serres's interpretation of Hiroshima as the end of human history. Serres and Latour, *Conversations*, op. cit., 4.
9. Nicolas Bourbaki, *Théorie des ensembles*, 1970 (Paris : Hermann). English translation, Nicolas Bourbaki, *Theory of Sets* (Berlin: Springer, 2004).
10. "D'où la constatation de l'infidélité du terme histoire, qui recouvre d'abord le schéma unilinéaire d'une évolution globale homogène dans un temps monodrome ; l'évolution mathématique suit au contraire une pluralité hétérogène de séquences temporelles distinctes, elle se développe le long de plusieurs temps." Michel Serres, 'Le matin des géomètres', unpublished manuscript of 90 pages mailed to Georges Canguilhem in March 1964. Archives Canguilhem, Caphès, quote on p. 2. My translation.
11. Michel Serres, « les anamnèses mathématiques », *Hermès ou La communication* (Paris : éditions de minuit), 78-112.
12. Michel Serres, *Les origines de la géométrie*, Paris, Flammarion, 1993. English translation by Randolph Burks, *Geometry. The Third Book of Foundations* (London: Bloomsbury, 2017), xxiv.
13. Erwin Schrödinger, *What is Life*, 1947.

14. See the dossier « Le groupe des Dix, des précurseurs de l'interdisciplinarité » *Natures, Sciences, Société*, 27, 2019, available online: www.nss-journal.org.
15. Michel Serres, 'Vie, information, deuxième principe', *op. cit.* My own translation.
16. Jacques Monod, *Chance and Necessity; An Essay on the Natural Philosophy of Modern Biology* (New York: Random House, 1972).
17. Michel Serres, *Atlas*, *op. cit.*, 126-127.
18. *Ibid.*, 99.
19. Michel Serres, *Genesis*. Trans. Geneviève James and James Nielson (Ann Harbor: The University of Michigan Press, 1995), 95-96.
20. Ilya Prigogine and Isabelle Stengers, *La Nouvelle alliance* (Paris, Minuit, 1979). English translation, *Order Out of Chaos: Man's New Dialogue with Nature* (Toronto, New-York: Bantam Books, 1984). On the reception of this book in France see Emanuel Bertrand, *Extension du domaine de la thermodynamique* (Paris: Classiques Garnier, 2023).
21. Michel Serres, 'Vie, information, deuxième principe', *Hermès III, La traduction* (Paris: éditions de minuit, 1974), 47-72.
22. Michel Serres, 'Betrayal. The Thanatocracy', from *Hermès III*, Trans. Randolph Burks, June 2011, https://issuu.com/randisi/docs/serres__betrayal, 14-15.
23. Michel Serres, *The Birth of Physics*. Trans. William Ross and David Webb (Rowman and Littlefield, London and New York, 2018).
24. Michel Serres, *The Birth of Physics*, *op. cit.*, 179
25. As Rick Dolphijn noted Serres used this term to refer to the coexistence of several dynamics rather than to what happens today. Rick Dolphijn (ed.), *Michel Serres Philosophy of The Contemporary*, (Oxford: Bloomsbury, 2019).
26. Michel Serres, *The Birth of Physics*, *op. cit.*, 165
27. *Ibid.*, 69.
28. See Henry Dicks, 'Physics, philosophy and poetics at the *Groupe des dix*: Edgar Morin and Michel Serres on the nature of nature', *Natures, Sciences et Société*, 27 (2019), 169-177.
29. Michel Serres, *Qu'est-ce que l'humain* (Paris: Le Pommier, 2003) 75. My own translation.
30. Michel Serres, *Hermès II*, *op. cit.*, 14-15.
31. Michel Serres, Gels, poem printed in 1977 ; reprinted in *Cahiers de l'Herne. Michel Serres*, Paris, 2010, 11-12. My translation.
32. Michel Serres, *Pantopie, de Hermès à Petite Poucette, entretiens avec Martin Legros et Sven Ortoli* (Paris, Le Pommier, 2014). In Poche-Le Pommier, 2016, 149.
33. Michel Serres, Le gnomon, in Serres (ed.), *Éléments d'histoire des sciences* (Paris: Flammarion, 1989).
34. Michel Serres, "Gnomon: The Beginnings of Geometry in Greece", in *A History of Scientific Thought: Elements of a History of Science* (Cambridge: Blackwell Publishers, 1995), 79-80.

35. Michel Serres, "Gnomon: The Beginnings of Geometry in Greece", in *A History of Scientific Thought: Elements of a History of Science* (Cambridge: Blackwell Publishers, 1995), 93.
36. In an interview from 1995 where he comments on Deleuze's death, Serres claimed that Deleuze and he were 'amis de vieillesse' because both of them shifted from history to geography when they started thinking in terms of flow. <https://www.harikunzru.com/michel-serres-interview-1995/>
37. Michel Serres, *Rome. The First Book of Foundations*, Trans. Randolph Burks (London: Bloomsbury, 2015) 66.
38. Michel Serres, *Rome, The First Book of Foundations* (London: Bloomsbury, 2015) 67-68.
39. Michel Serres with Bruno Latour, *Conversations*, op. cit., 138.
40. Michel Serres, *Statues. The Second Book of Foundations*. Transl Randolph Burks London: Bloomsbury, 2015) 169.
41. Ibid, 169.
42. Michel Serres, *Geometry: The Third Book of Foundations*. Trans. Randolph Burks (Bloomsbury London 2017), xxxiii-xxxiv.
43. Michel Serres, *Atlas*, op. cit., 90-97.
44. Michel Serres, Tempo: le compositeur, in *Cahiers de l'Herne*, op. cit., 56-59, on 57.
45. Michel Serres with Bruno Latour *Conversations on Science*, op. cit., 69-70. Chris Watkin, *Figures of Thought*, op. cit., chapter 1.
46. Michel Serres, *The Incandescent*. Trans. Randolph Burks (London: Bloomsbury, 2018), 21.
47. Michel Serres, Le concept de Nature, *Bulletin de l'Académie de médecine*, 186, n°9, 2002, 1683-1688.
48. In 1979 Jean-François Lyotard claimed that post-modernism meant the end of the grand narratives. See: Jean-François Lyotard, *La Condition postmoderne. Rapport sur le savoir* (Paris, éditions de minuit, 1979).
49. Michel Serres, *Branches. A Philosophy of Time, Event, and Advent*. Trans. Randolph Burks (London: Bloomsbury, 2020), 161.
50. Ibid. 14.
51. Michel Serres, *Hominescence*, Trans. Randolph Burks (London: Bloomsbury, 2019), 74.
52. Michel Serres, *The Incandescent*, op. cit., 2.
53. Michel Serres, *Statues*, op. cit., 169.
54. Michel Serres, *Relire le relié* (Paris: Le Pommier, 2019) 80. English translation by Malcolm DeBevoise, *Religion. Rereading What Is Bound Together* (Stanford: University Press, 2022), 58.
55. I thank David Webb for suggesting this alternative interpretation of Serres's unique rhythm which is in line with his emphasis on regularity in *The Birth of Physics*.
56. Michel Serres, *Branches*, op. cit., 14
57. Michel Serres, *Branches*, op. cit., 9.
58. Ibid, 98.

59. Ibid, 103.
60. Ibid, 127
61. Ibid, 88.
62. Ibid, 31
63. Ibid, 88
64. Michel Serres, *Récits d'humanisme* (Paris: Le Pommier, 2006), 116. My own translation.
65. Michel Serres, *Hominescence*, op. cit., 52.
66. Ibid, 107.
67. Pierre Léna, Michel Serres, *Tours du monde, tours du ciel*. Collection of 4 DVD (Paris: EDP Sciences, 2009).
68. Michel Serres, 'The Science of relations' interview with Peter Hallward, *Angelaki, Journal of Theoretical Humanities*, 8/2, August 2003: 227-238, on 233.
69. Michel Serres, *Hominescence*, op. cit., 113-114.
70. Michel Serres, *Adichats* (Paris: Le Pommier, 2020), 113.

his master's voice: michel serres and the ethics of noise

massimiliano simons

Meddling in the phenomenon, the receiver introduces or produces a certain noise there, his own, for no one can live without noise. The condition of his being a receiver, a subject, an observer, is, precisely, that he make less noise than the noise transmitted by the object observed. If he gives off more noise, it obliterates the object, covers or hides it.¹

INTRODUCTION

As with most philosophers, the work of Michel Serres is full of normative

judgments. For example, his work can be read as a plea for reviving a “virtue of sensibility”² or for a renewed cultivation of our relations with the world.³ Within his work we also find numerous positive assessments of the work of authors such as Georges Dumézil, Léon Brillouin, or René Girard. In turn, negative assessments are also clearly present, for instance of the work of Gaston Bachelard, Louis Althusser, and as recent posthumous publications have shown, Jules Vuillemin and Michel Foucault.⁴ Perhaps the most normative stance found in Serres’s work is his “critique of critique”⁵ and his broader negative assessment of the academic world and its mores.⁶

In this article, however, I want to focus on another strand of normative judgments found in Serres’s work. This concerns negative evaluations of the social world. In his books, Serres often expresses very negative views of society, politics, or language, all of which in their own way distract us from nature, science, and the world. My ambition is to argue that these critiques are not incidental, but a product of his broader philosophical work and its dialogue with information theory. I will call the resulting normativity Serres’s *ethics of noise*.

Let me start with some examples of these negative evaluations. The first example comes from *Détachement* (1983). In parts of this book, Serres tells the stories of Diogenes and Francis of Assisi. For Serres, both figures embody a rejection of the social in favor of a return to nature and things. For example, Serres recounts the famous encounter between Diogenes and Alexander the Great as follows:

Words are interesting, they whirl or rest between us [*inter-esse*]. Diogenes discards the coat, breaks the bowl, remains silent. He abandons interesting objects, and he asks the king to move away from the sun. Who is the king? Or Alexander? The most interesting object, the most interesting person in the world! Power is that much greater in that it intervenes everywhere. And if one becomes the greatest, then there is no place, no time where one does not intervene. Power is therefore what is most interesting. Diogenes forsakes power. He asks the king to allow the rays of the sun to bathe him

directly with heat and light. Diogenes tries to erase mediation. He bridges intervals. He turns off mediums. He attempts to push aside the parasites, with his hand, with his voice. He is disinterested.⁷

We find a similar rereading by Serres of the anecdote of Diogenes wandering about in the middle of the day with a burning lantern, looking for an honest man. For Serres, it becomes a story about Diogenes “looking for the lost object. Wandering haggardly in the streets with his lighted lantern in his hand, Diogenes is the ancestor of the seeker of science.”⁸

A second example can be found in *Les cinq sens* (1985), in which Serres revisits the senses through which we experience the world. In the book, Serres introduces the following anecdote about his visit to the ancient theater of Epidaurus, part of the sanctuary dedicated to the Greek god of medicine, Asclepius: “The silence within the theatre and in the surrounding scrub seeps into my skin, bathes and penetrates it, vibrates and drains it, in the hollow of the empty ear. I give myself to the world which returns me convalescent.”⁹ But this healing silence is shattered when a group of tourists arrives:

Horror. Here comes a group. I can hear it in the distance, coming this way. It projects itself across space as filthy noise. [...] What did they really see? They heard: cries, words, echoes. But certainly saw rather little—all the more so as their cameras saw for them. But what did they hear that they did not already know from their language-memory? Did they come to Epidaurus at all? They arrived ill, indisposed by the murmuring of their organs, surrounded by their collective noise, and they departed in that clamorous ship without ever really arriving. [...] Alone on this step, sitting in silence for the last two hours, little by little the world gives me its gods; immersed in the social ship, I would only have picked up stray bits of language from the people around me. The group carries its gods around in bags and walkmans. In its sects and libraries.¹⁰

A final example is found in Serres's *Le contrat naturel* (1990). In essence, the book asks us to reconceptualize the existing social contract into a "natural contract" in which there is room not only for humans and culture, but also for things and nature. Again, this book is full of critiques of the social, for example in his description of the traditional politician:

None of his speeches spoke of the world: instead they endlessly discussed men. Once again, publicity, as the rules for forming such a word demand, is defined as the essence of the public: thus, more than anyone else, the politician indulges in no speech or gesture without saturating them in publicity. [...] Closed up in the social collectivity, he could be splendidly ignorant of the things of the world.¹¹

More broadly, Serres formulates this as a general critique of modern culture, particularly modern media and television:

In the evening, at home, television's clamor silences any discussion. An old phonograph ad – 'His Master's Voice' – shows a well-behaved dog sitting with ears pricked up in front of a gramophone horn; we have become obedient puppies, passively listening to our masters' uproar. We never talk any more, that's for sure. To keep us from it, our civilization sets motors and loudspeakers screaming.¹²

By now it is hopefully clear that all these examples share a critique of the social, the political, and language. What is less clear is the basis on which Serres finds these phenomena problematic. What exactly is the argument at work behind these common critiques? The aim of this article is to argue that there is a logic behind these criticisms, which I call an *ethics of noise*. I will attempt to flesh out this ethics of noise in three steps. First, I will show how Serres's philosophy was deeply influenced by information theory, in particular by the opposition between information and noise. Second, I will draw on a number of ways in which information theory has been applied to biology within the work of the French

biologist Henri Atlan. Finally, I will show how this framework can then be applied to a number of social issues in order to demonstrate not only the systematicity, but also the fruitfulness of this ethics of noise.

MICHEL SERRES AND INFORMATION THEORY

The work of Michel Serres was deeply influenced by information theory, although this was until recently not always recognized.¹³ This is mainly because Serres is not always so explicit about his sources, especially in his later work. The influence of information theory on his thinking is particularly evident in the early Hermes series, as well as in his recently posthumously published notebooks.¹⁴ Let me therefore outline some of the central ideas of information theory and how they influenced Serres.

Information theory is often traced back to the work of Claude Shannon in the 1940s.¹⁵ In this early work, Shannon proposes a mathematical formalization of communication. Shannon's model has introduced us to the basic elements of communication with which we are now more than familiar: the source of information; a transmitter that translates that message into a signal that can be transmitted; a channel through which the signal is sent; a receiver that translates the signal back into a message; and the receiver. Most importantly, it introduces the notion of noise as a disturbance in this process.

Shannon was working at Bell Labs, so he thought mainly in terms of practical problems, such as under what conditions a telephone line could properly carry a signal.¹⁶ Shannon's perspective implies a certain reversal of our common way of thinking about communication. Communication is not so much a matter of breaking silence and beginning to speak. On a telephone line, the main issue is often not silence, but static. The challenge is to make sure that all the irrelevant sounds (the "noise sources") are excluded so that the one relevant source of information could properly convey its signal. This was typically done through the introduction of elements of *redundancy* and *robustness*. Redundancy refers to

how, in order to make sure that the signal comes across, the system transmits the signal in multiple ways (either through different paths or through repetition). Robustness refers to how the system itself must be able to withstand certain perturbations (e.g. the line would not break if it is raining, if you yell very loud, or if you have a very long conversation).

This view of communication was adopted by Serres and became a central point of departure for his early philosophy. In the first volume of the *Hermès* series, not coincidentally called *Hermès I, la communication*, he captures this idea under the label of the ‘excluded third’. Communication must be understood not as a struggle between two actors trying to understand each other, but as a struggle between three. There are the two interlocutors, but there is also the third, the noise that is always there and must be kept at bay:

These interlocutors are not opposed, as in the traditional conception of the dialectical game, they are on the contrary in the same camp, linked by interest: they fight in common against the noise. [...] *To hold a dialogue is to pose a third party and to try to exclude him; a successful communication is this excluded third party.* The deepest dialectical problem is not the problem of *the other*, which is only a variety—or a variation—of the same, *it is the problem of the third man.*¹⁷

Although this is a central idea that Serres takes from Shannon, the latter’s influence is more extensive. The impact of Shannon’s work is primarily that it provides a formal theorem for conceptualizing the information/noise ratio of a system. The formal details are not our concern here. What is more important is how Shannon understood information in this context, namely as a question of probability: whether something is informative or not has to be understood in relation to all other possible messages. In other words, something is informative to the extent that it is improbable. While noise on the line is a statistical necessity, the transmission of any particular signal is highly improbable (since there are so many different possible signals that could be transmitted through the channel).

Intuitively, the following example might help. Imagine you were not familiar with the work of Serres and I asked you to guess his first name. If you ask for a clue, and I simply say that his first name begins with one of the 26 letters of the alphabet, this clue would be uninformative, since it does not eliminate any possibilities. The probability remains the same: everything is possible. If, instead, I were to say that it starts with the letter M, or that he shares his first name with Foucault or Callon, that clue would be informative because it eliminates many possibilities and thus makes it less probable.

Crucial to the history of information theory, and to Serres's fascination with it, is that this conceptualization of information in terms of probabilities creates an interesting link with physics, in particular statistical mechanics (or statistical thermodynamics) and related concepts such as entropy. Developed by authors such as James C. Maxwell and Ludwig Boltzmann, statistical mechanics was an attempt to conceptualize observed irreversible processes. This is often expressed in popular formulations of the second law of thermodynamics, stating that entropy in an isolated system will never decrease, but will spontaneously evolve to an equilibrium where entropy is highest. Entropy in this context is often understood as a form of disorder or randomness.

Statistical mechanics tries to capture these processes in terms of probabilities: the reason entropy tends to increase is that, within a closed system, states with highly evenly distributed particles are more likely, whereas states with highly uneven distributions—for example, when all the fast particles are concentrated in my warm cup of tea—are unlikely. Isolated systems thus tend to evolve toward their most probable state, which is one of high entropy. So, unless I bring in an external energy source, my hot tea tends to go cold, i.e. it goes towards room temperature and the room heats up a bit, because that is the most likely distribution of particles of that closed-off room.

The connections between statistical mechanics and information theory now become clearer. We have seen how entropy was defined as the most probable

state, whereas information was seen as implying improbability. For this reason, in information theory, information is often understood as “negative entropy” or, as Léon Brillouin calls it, “negentropy”.¹⁸ This connection is often illustrated by the infamous Maxwell’s Demon thought experiment, which seems to violate the second law of thermodynamics. The thought experiment goes like this: imagine a demon controlling a trapdoor between two gas-filled rooms. If the demon were able to open and close the door in such a way as to allow fast particles to pass through while leaving slow particles behind, the demon would seem to be able to reduce entropy in a closed system. This violates the second law. However, information theory provides an answer to this problem. Originally proposed by Szilard, but elaborated in terms of information theory by Brillouin, the solution is as follows: the thought experiment does not violate the second law because the demon must gain information about the state of the particles (whether they are going fast or slow).¹⁹ This act of measuring requires energy, and so the system is not closed, but brings in energy through the demon—the demon seems to convert energy into information. Since such interaction occurs, the system is not isolated, or must include the demon as part of it. In the latter case, the entropy caused by the measurement offsets the order created by the trapdoor, and the system as a whole still increases in entropy.

The work of Léon Brillouin embodies this crossover between information theory and physics. Like Shannon, he defines information in terms of improbability: “a function of the ratio of the number of possible answers before and after”.²⁰ At the same time, he embeds this definition in a broader physical framework in which our actions are understood along the lines of those of the demon: as expenditures of energy to gain, among other things, information. We can understand living systems, but also our social structures, as ‘real’ Maxwell’s demons. This is, for example, his interpretation of scientific practices in the later chapters of the book. What happens in a scientific laboratory is the expenditure of energy to create information about the physical systems being studied. Local negentropy is thus created at the cost of entropy within the broader system. Brillouin calls this “the

negentropy principle of information, which says that any information resulting from a physical observation must be paid for by an increase in entropy in the laboratory.”²¹ Or to give some examples of later in the book: “We need a source of light to read a book. The phonograph does not work without a motor to turn the record. [...] In all of these examples, the amount of negentropy taken from the external source can be demonstrated to be larger than the information obtained.”²²

These ideas are central to the work of Serres, who draws heavily on them to flesh out his own philosophy. In his third *Hermès* book he says this about Brillouin:

It is remarkable, for example, that Brillouin wanted his last book to be called *Science and the Theory of Information*. We find there a complete, descriptive, quantified, normative and foundational epistemology, expressed in the language of physics, of the notion and the fact of experimentation, of laws, of precision and of approximate knowledge, of the limits of what we can know (*que sais-je?*), that is to say, all the classical themes; but also all the ‘modern’: a theory of code, of language, of writing, of translation. Philosophers do not have to look for or write a manual for the epistemology of experimental knowledge: it is there.²³

For Serres, Brillouin provides a framework for thinking about information in terms of probability and applying this to all kinds of physical processes. Any existing complexity can be thought of in terms of information: every physical organization can be understood as an improbable state of matter that embodies information to the extent that it is an improbable state. For Serres, this leads to a worldview in which the whole of reality is understood as a vast communicative network exchanging information:

there is an incessant and continuous dialogue among things, which forms the historical fabric of events and laws, among which my intervention is exceptional [...]. The generalized informational language constitutes the fundamental and continuous relation between the objects. Even before

deciphering it, the certainty that it exists induces the certainty that the external world exists, in the mode of a communicating network, of which all the networks that I know and can constitute are singular, exceptional cases, approximating to imitating the real world.²⁴

Based on information theory, Serres thus develops a philosophy in which the world is understood as a process of information exchange. All objects exchange information, and their differences can be explained by the different kinds of information they exchange and store. This way of thinking has also proved influential among a number of scholars inspired by Serres, in particular Madeleine Akrich, Michel Callon, and Bruno Latour. What they originally called a “sociology of translation”²⁵, a term borrowed from Serres, would later become known as Actor-Network Theory (ANT). Similar to Serres’s philosophy, ANT focuses on a symmetrical analysis of humans and non-humans, where both have agency and constantly ‘translate’ each other’s actions.²⁶ While this legacy has been the subject of concern elsewhere, the focus of this article is on something specific to Serres, namely his ethics of noise.²⁷ To understand this ethics, we need to introduce some additional ideas from information theory, and in particular from Henri Atlan’s application of information theory to biology.

HIERARCHIES OF INFORMATION

In this part, I want to argue that what I call the *ethics of noise* of Serres is mainly a product of a set of ideas that apply information theory to biology, or more exactly, self-organizing systems. These ideas have best been articulated by the French biologist Henri Atlan. Atlan and Serres were both members of the Group of Ten (*Groupe de Dix*), an interdisciplinary group in France who aimed to apply new developments in physics and biology, in particular in relation to self-organizing processes, to contemporary societal challenges.²⁸ In his work, Serres explicitly mobilized Atlan’s oeuvre to understand biological phenomena through an information theoretical lens²⁹ while, in turn, Atlan saw Serres as an embodiment of a “new natural philosophy”³⁰ that overcame the opposition between vitalism

and mechanism, together with figures such as Cornelius Castoriadis, Edgar Morin, Jean Piaget, Judith Schlanger and Isabelle Stengers.

Atlan is interested in how Shannon's information theory can help us to understand processes of self-organization in biology. However, he is deeply aware that introducing information theory in the life sciences reveals a number of challenges for information theory. Atlan summarizes the three main challenges as follows:

1. Those related to the creation of information: Shannon's second theorem, of the channel with noise, explicitly states that information transmitted in a channel cannot be created, since it can only be destroyed by the effects of noise, or at best, preserved.
2. Those related to the meaning of the information: Shannon's formula can only be used to quantify the average information per symbol of a message if we neglect the possible meaning of that message.
3. Finally, those linked to hierarchical forms of organization: of the process of organization, it completely ignores the problems of nesting different levels of organization, more or less integrated, one inside the other.³¹

Returning to Shannon's model of a system in which a message is transmitted by a signal to a receiver, with the risk of interference from noise, we thus see three problems that are particularly pertinent when thinking about living systems. First, it is unclear how such a system is created in the first place, especially if noise is the eternal disruption of order. If, as we have seen, information is equated with negentropy, and systems tend to evolve to higher levels of entropy, how does new information ever arise? Are living systems not inexplicable in a universe governed by thermodynamics? This is a particularly pertinent question for biology, since biology deals with systems that are not created by an engineer, an external source of information and order, but have created themselves and seem to embody elements of genuine novelty.

Second, it is unclear how we can distinguish between *meaningful* improbable organizational states, such as those of organisms, and improbable but meaningless states. To take another intuitive example: a sentence of 22 words can be considered informative because it is improbable. However, many combinations of 22 words on a page can be equally improbable, without therefore necessarily also being considered as equally meaningful. I can write a book the same length as Albert Einstein's that is equally improbable, but that does not mean that both books are equally meaningful. This is where the formal definition of information shows its limits. Shannon defined it in quantitative terms of probability, but living things seem to require a qualitative criterion of meaningfulness.

Third, there is the problem of hierarchy. In Shannon's model, there is only one system in which information is transmitted. It is less clear how different systems can relate to each other, especially if they are related in a hierarchical way with one system being nested in the other (such as molecules, organelles, cells, tissues, organisms, populations, etc.). For Atlan, this question mainly concerns the issue of emergent properties: while it is easier to conceive of the influence of higher-level systems on lower-level ones, for example in the form of environmental constraints on the lower-level system, how can we conceptualize the reverse relationship, where lower-level systems influence the higher levels, such as molecules influencing the ordering of solid objects, or cells influencing the ordering of tissues or organisms? "How can we represent the effect of the molecular level on cells, of cells on organs, of organs on the organism, when this is the daily bread of biological observation?"³²

To respond to these three challenges, we can draw on two central ideas within Atlan's theory: (a) the *relativity of the information-noise dichotomy* (mainly as a response to the second concern); and (b) the *principle of complexity through noise* (as a response to the first and third concern). Let us have a closer look at both these ideas, since they will prove to be fundamental for Serres's ethics of noise.

The first idea concerns the question of meaning: if we define information in

terms of improbability, is any equal improbable state then equally meaningful? That seems absurd, as the example of writing suggests: though a specific order of words can be equally probable, they are not equally meaningful. To their credit, this is something that information theorists recognize. Brillouin, for example, explicitly states: “we define ‘information’ as distinct from ‘knowledge’, for which we have no numerical measure. We make no distinction between useful and useless information, and we choose to ignore completely the value of the information.”³³ Similarly, Atlan acknowledges that “the fact that messages have meaning is obvious, but remains implicit since this theory treats problems of coding and transmission efficiency without having to consider the actual meaning of the messages to be coded and transmitted.”³⁴

For Atlan, however, this must not be seen as a problem, but rather points us to the solution.³⁵ The issue is not that information theory is unable to think about meaning, but rather that it ignores the issue, because it assumes it already to be solved. “In fact, the problem of meaning and significance is still there, even though we think it has been eliminated.”³⁶ If we revisit Shannon’s work, this becomes clear. He does not consider the problem of meaning, because he considers it solved: the meaning is derived from the implicitly assumed sender and receiver, or from the external observer looking at this system. Whether equally improbable signals are meaningful information or useless noise is thus never given in any absolute way, but are relative to the perspective one takes. Serres captures this idea beautifully in an example from *Le Parasite*, which explores the topic of noise:

At the feast everyone is talking. At the door of the room there is a ringing noise, the telephone. Communication cuts conversation, the noise interrupting the messages. As soon as I start to talk with this new interlocutor, the sounds of the banquet become noise for the new ‘us’. The system has shifted. If I approach the table, the noise slowly becomes conversation. In the system, noise and message exchange roles according to the position of the observer and the action of the actor, but they are transformed into one another as well as a function of time and of the

system. They make order or disorder.³⁷

Whether something is thus information or noise depends on the frame of reference. This is an insight that is central to Atlan as well:

The meaning of the message [...] is never intrinsic to the message; the meaning is the relationship of the message to some reference point outside of the information borne by the message. Something or somebody has to 'read' the message. Meaning is referential and contingent.³⁸

This is what I call the *relativity of the information-noise dichotomy*: whether something is to be considered information or noise cannot be answered as such, but always depends on one's point of view. Typically, this frame of reference is the observer, the scientist trying to decipher the message or the engineer designing the system.

This, for example, is the basic point of a novel like *His Master's Voice* by Stanislaw Lem. The book deals with the subject of first contact, in which humanity receives an apparently intelligent message from the cosmos. But at the heart of the novel is the question of whether the signal contains real information or is just noise. As is typical of Lem's novels, the answer remains unclear, as Lem often aims to show how it is our own frame of reference that shapes our expectations about aliens.³⁹ As Lem states it pessimistically, "receiving the message from the stars, we did with it no more than a savage who, warming himself by a fire of burning books, the writings of the wisest men, believes that he has drawn tremendous benefit from his find!"⁴⁰ Deciphering the information of a received message cannot be solved by itself, but is always related to the frame of reference from which one approaches it.

Similarly, in one of his texts, Serres mobilizes this framework to reconceptualize the 'unconscious', not in terms of the subject, but in terms of information and noise:

All of information theory, and therefore all of noise theory, only makes sense in relation to an observer who happens to be connected to it. Who is this observer? The simplest answer would be to say that for our own organic system we are the observer(s) in question. And so we should perceive this noise.⁴¹

But, and this is Serres's fascination, we often do not perceive this noise from the world. If we did, we would be constantly bombarded with it, inundated. "Leibniz already said it in his language: the cloud of small perceptions, external and internal, should make us feel uneasy and dizzy, it should be unbearable. Yet, except in extraordinary circumstances, we see almost nothing of this intense chaos, which nevertheless exists and, as we have discovered, is experimentally proven to work."⁴²

Serres finds the answer in an image proposed by François Jacob⁴³, namely that of Russian dolls or nested objects: where a system produces information and noise, according to its own criterion, the next level integrates both information and noise in a novel way. "The next level, in the nested series, receives and manipulates, and generally integrates, the pair of information and background noise emitted by the previous level. How does this work? Some recent studies have shed some light on the answer to this question."⁴⁴ In fact, Serres is referring with these "recent studies" to the work of Atlan. The latter, for example, uses this framework to think about how new forms of order can emerge in evolutionary history. While mutations are to be considered as sources of noise, perfectly in line with Shannon's framework when thinking at the level of the cell, they can become sources of novelty at higher levels:

From the point of view of the organ or physiological apparatus, this same noise has the effect of creating variety and heterogeneity among cells, which allows them to be more adaptable. Therefore, up to a certain point, and provided that the redundancy of the cell is great enough so that these false proteins do not interfere with the function of the cell, the same

effects of noise on the channel within the cell that are considered harmful by the cell itself can be considered beneficial by the organ.⁴⁵

Similarly, as Serres summarizes, the information-noise dichotomy “changes its meaning when the observer changes location: when he is immersed in the level under consideration or when he examines the whole from the next level up. In a sense, the latter functions as a rectifier, and in particular a noise rectifier. What was an obstacle to any message on the track is reversed and added to the information.”⁴⁶

We thus end with a reinterpretation of the role of the observer and the relativity of the information-noise dichotomy. The observer can be understood as a *higher level* analyzing a lower system in terms of its own criterion of noise and information. Or, in Atlan’s words:

*This observer, external to the system, is in fact, in a hierarchical system, the higher (encompassing) level of organization in relation to the component systems that constitute it; it is the organ in relation to the cell, the organism in relation to the organ, etc. It is in relation to it that the effects of noise on a track within the system can, under certain conditions, be positive.*⁴⁷

This ultimately, leads to Serres’s reinterpretation of the unconscious: it is not so much a deeper layer, hidden beneath consciousness. Rather, it is to be understood as this noise of the world, that would otherwise bombard us, but filtered through many layers of information-noise distinctions. “It’s no longer a single black box, but it’s a series of nesting boxes, and this series is the whole organism, the body. Each level of information functions as an unconscious for the global level that encompasses it.”⁴⁸ While the top level is that of language and culture, the lower levels are undefined, but all share a similar pattern:

I know who is the last observer, the receiver at the end of the chain: precisely, the one who emits language. But I don’t know who is the first sender at the other end. It’s indefinitely a black box. A box of boxes, and

so on. I can go as far as I want, down to the cells, down to the molecules, provided, of course, that I change the observed object. All I know for sure is that they are all structured by the copula information-noise, chance-program, or entropy-negentropy.⁴⁹

We have now seen how to think about the relativity of information and noise, and how this can help us think about if and when information is meaningful. The answer is relative: it is always in relation to the perspective of the system and its criteria of relevance that something can be seen as meaningful. The reason why Einstein's book is more meaningful than my own, which is equally improbable, can only be understood by taking into account the broader culture that values Einstein's theories. Moreover, these systems can often be understood hierarchically, in the sense that they are nested: the noise from a lower level may turn out to be a source of information from a higher level. Again, we can understand this intuitively. Consider examples where we are trying to evaluate something, such as whether our written software code works, or whether a student has learned their lesson. How do we judge that? We observe their actions and see where they go wrong. But these errors, this "noise", are evaluated differently by the evaluator and the performer. While for the program or the student errors are annoying and to be forgotten or ignored, for the evaluator they become informative: the "noise" of errors "informs" their action to introduce new corrections to the system they are observing, be it a computer program or a student.

We see how this line of thought also helps us think about the third issue, namely that of hierarchy. But what remains unclear is this third problem in light of the first: how is novel information created, and how can lower levels produce new information for higher levels, especially in biological systems? For this, it is helpful to turn to Atlan's second central idea, namely that of *complexity through noise*. This idea mainly concerns the following tension between information theory and biology, namely that of the different story of how order is created. Whereas in the case of Shannon the creation of order was derived from the engineer who built the system, it is much less clear how in evolutionary history such complexity as

we see in the living world can arise spontaneously.

Atlan tries to capture the creation of information in biology, leading to new forms of self-organization, through what he calls the principle of complexity through noise. Atlan builds on the work of the cyberneticist Heinz von Foerster, who introduced the principle of *order* through noise. Von Foerster was dissatisfied with the fact that within Shannon's information theory, noise was only thought of in a negative way, i.e. as something to be avoided, since it can only destroy order, never create it. Von Foerster disagreed, since "in my restaurant self-organizing systems do not only feed upon order, they will also find noise on the menu."⁵⁰ To illustrate the idea, Von Foerster introduces the following thought experiment. Imagine that "I get myself a large sheet of permanent magnetic material which is strongly magnetized perpendicular to the surface, and I cut from this sheet a large number of little squares".⁵¹ These squares are then glued to cubes, for example so that three sides are positive and three sides are negative. If you then put them in a box and shake the box, these cubes will "self-organize" into predictable figures when you open the box. Von Foerster concludes that "the entropy of the system has gone down, hence we have more order after the shaking than before."⁵² In this sense, a system can seemingly gain order through noise.

Atlan wants to build on this example, but is still unhappy with the details. For Atlan, this does not really create a new order, since it simply relies on the magnetic forces at work. The result is not surprising, once we take these forces into account: "The whole point of von Foerster's examples of cubes lies in the assumption that we don't know anything about their magnetization."⁵³ The example is closer, not so much to life, but to the growth of a crystal: the creation of order, yes, but an order that is predictable and repetitive. Living systems, on the other hand, are characterized by the creation of truly novel and surprising results that were not given at the beginning.

This is what Atlan tries to capture with this principle of complexity through noise, which "represents, let us say, a normal principle of organization for any natural

system endowed with the capacity for self-organization and adaptation through undirected learning.”⁵⁴ To understand this principle, it is important to keep in mind that complexity has a specific meaning here. Something is *complicated* when it requires many known elements and interactions. Something is *complex* when the presupposed elements or the principle behind their ordering remain unknown to the observer. Although one typically knows the constituents of the lower level—for example, that an organism is composed of cells—the specific principles by which they are ordered remain unknown to the observer. “In other words, *complexity is an apparent disorder where we have reason to suspect a hidden order; or complexity is an order whose code we don’t know.*”⁵⁵ The principle of complexity through noise thus refers to a process of self-organization that uses the noise of a lower level, but without it being clear to the outside observer what the exact rules are by which it redraws the distinction between information and noise. This code remains accessible only from within the system.

The formal treatment of this principle by Atlan does not concern us here. Rather, let me illustrate the logic by quoting two other authors that Atlan often cites in this context: Cornelius Castoriadis and Jean-Pierre Dupuy, two philosophers who are similarly fascinated by self-organization. Castoriadis captures the core ideas of this principle as follows:

What [...] characterizes an automaton—and living things in general—is that it establishes a system of partitions in the physical world which applies only to itself [...] and which, being only one of an infinite number of such possible systems, is completely arbitrary from a physical point of view. For example, the rigor of the reasoning contained in the *Principia Mathematica* is of no interest to the moths of the Bibliothèque nationale. Ambient lighting is irrelevant to the operation of a computer. [...] Obviously, it is only this system of partitions [...] that makes it possible to define, in each case, what is information for the automaton and what is noise or nothing; it is also this system that makes it possible to define, for the automaton, what is relevant information, the weight of an item of information, its

value, its operational ‘meaning’ and, finally, its meaning altogether. These different dimensions of information [...] ultimately show that the automaton, in the sense that matters, can only ever be thought of from within, that it constitutes its framework of existence and meaning, that it is its own a priori, in short, that to be alive is “to be for itself”, as certain philosophers have long maintained.⁵⁶

Dupuy offers another intuitive way to distinguish between von Foerster’s principle of order through noise and Atlan’s principle of complexity through noise. He illustrates the distinction through an imaginary game: let one player leave the room while the others agree on a certain story that they want to tell. But instead of telling the player this story when he re-enters the room, they let the player guess the story through yes-or-no questions. However, Dupuy continues, there are actually two versions of this game: one in which the others actually agreed on a predetermined story, and another in which they merely agree on a rule to follow in their answers to the player’s questions (e.g., “answer yes if the question starts with a vowel”). While in both cases a story will be the end product of the game, only in the second version there is a real novelty in the sense of Atlan’s principle:

In the first case, between the beginning and the end of the game, the range of possible stories narrows down on an ‘order’ that was always present: the story to be discovered. For the players who have chosen the story, there is a reduction of surprise as the game unfolds. In the second case, the same players go from surprise to surprise. For them, there is a real increase in complexity, even though the player who asks the questions thinks he is approaching a present and fixed form.⁵⁷

The key point of this example is that in Atlan’s principle of complexity through noise, there is no set of rules accessible to the outside observer. Order emerges through a combination of variation and a set of simple rules, accessible only from within the system. In the case of Dupuy’s game, it is a variation of questions and the rules to follow to answer yes or no. In biology, the equivalent could be genetic

or environmental variation and the rules of selection (survival, sexual, or other).

At the same time, and this is crucial, this also points to two fundamental conditions for this to work, according to Atlan. We have already encountered these two elements in Shannon's information theory, namely redundancy and robustness. Complexity through noise always requires, first, "sufficient initial redundancy" that can serve "as a reservoir, or potential for self-organization" and second, a degree of "inertia, i.e. its reliability or resilience must suffice to prevent small perturbations from immediately destroying it."⁵⁸

As we have seen, redundancy refers to the existence of repetition: the signal is not transmitted once, but (in) multiple ways. This guarantees that the original signal is still received despite noise. This is necessary because the original systems, which gain new functions through new sources of noise (e.g. mutations), already had relevant information to transmit. If there is no redundancy, and each signal is transmitted in only one way, there is simply no room for new variation, unless it is at the expense of existing information being transmitted. Similarly, robustness is needed to ensure that noise perturbations do not immediately destroy the system. Without some level of robustness and resilience, the system would not be able to incorporate and live with the noise that creates the new complexity.

Returning to our examples, we can see how they relied on redundancy and robustness. In the case of Dupuy's game, redundancy was present in the form of the player's ability to interpret the yes/no answers in multiple ways. When redundancy is removed, there is no room to connect and interpret the different answers in novel ways. This would mean that either the story is closed (everything is clear) or that it has led to clear contradictions. Similarly, the game needs a certain level of robustness, in the sense that the sometimes surprising answers to the questions must be able to be incorporated into the story or the game without rendering the story nonsensical, or without making it clear that there is in fact no agreed-upon story. Turning to biology, we see similar needs. Self-organization in biology requires that the living system has a certain amount of redundancy, in

the form of genes or cells that can take over functions that have been disrupted by noise. If there is no room for further mutations, there is no room for novelty. At the same time, the cell typically needs some robustness: it needs to be able to survive with new mutations or in new environments. So biological systems cannot be pure flux and change. They also need stability. Hence, the title of Atlan's most famous book: between crystal and smoke (*entre le cristal et la fumée*). For Atlan, this is how life is defined: "the two forms of existence between which living beings navigate, crystal and smoke."⁵⁹

SERRES'S ETHICS OF NOISE

Now that we have a better idea of how Serres's philosophy is inspired by information theory, we can return to Serres's negative evaluation of the social with which we began. The framework articulated above will allow us to better understand what is going on in these judgments. Throughout this article we have learned a number of things. We have seen how information theory can reinterpret the world as a network of objects that exchange information with each other. We also learned that this information-noise dichotomy must always be understood relative to a frame of reference. We are often confronted with a hierarchy of systems (such as cells, tissues, organs, bodies, ...) where at a higher level the distinction between information and noise can be redrawn in such a way that what is noise at a lower level can become information. This principle of complexity through noise is characteristic of living systems, but it always depends on the existing redundancy and robustness of the lower systems.

It is this framework that can help us see what is normatively at stake for Serres. The three examples I have given, but it is a common pattern throughout Serres's oeuvre, are cases in which the higher level reaches such a level of complexity that it threatens to overrun the lower level on which it depends. Or, in more technical terms, the higher level is in danger of completely consuming (and even exceeding) the available redundancy of the lower level. Metaphorically, the higher-level system is in danger of sawing off the branch on which it sits.

Let me illustrate this with a simple example. When people communicate, especially in a foreign language, they tend to do so with an accent. If we look at this form of communication through a frame of reference that, analogous to Shannon's, is primarily interested in the content of what is said, then the accent will be a form of noise. It would be similar to the grammatical errors you might find in this paper: something that is not informative, but rather a distraction from the content. However, if we shift our frame of reference to a higher level, say as an anthropologist interested in cultural differences, the accent can become a source of information. At that level, what was noise suddenly becomes informative about the speaker's nationality, class, or status. But as Atlan pointed out, this higher-level game of status can only be played within certain limits. The problem Serres is concerned with would be tantamount to having an accent so strong that the content is lost to outsiders, or a text written with so many errors that it becomes unreadable.

My argument is that the same issue is at play in the examples I cited *from* *Détachement*, *Le Cinq sens*, and *Le Contrat naturel*. The concern in these examples is that higher-level systems of communication, such as social prestige, politics, or language games, tend to overrun the lower levels on which they depend: science, nature, the world. In Diogenes's example, it was the problem of science: scientific research risks being overrun by systems of complexity built on its own noise, such as prestige, power, or financial incentives. Of course, these higher levels of complexity are inevitable, since every system produces noise that can produce forms of complexity at a higher level. The problem is when the scale of this noise complexity tends to overwhelm the original lower-level distinction between noise and information. This would lead to a complete lack of concern for scientific truth, but only for career or money.

In the case of the ancient theater of Epidaurus, the danger was similar but more general: the higher-level system of language threatened to overrun the world that was its original object. While at a lower level of complexity language served the purpose of describing and understanding the world, the noise generated in

that system served as the basis for new levels of complexity focused on social interactions for their own sake. We see a similar dynamic in the examples of the politician and the media in *Le Contrat naturel*. While politics served to find pragmatic solutions to coordination problems between people, its noise served as a basis for political careers, personal gain, or media spectacle. Again, the problem is not that these higher levels of complexity exist—they are inevitable—but that they threaten to exhaust the redundancy of the lower level: a science that can no longer make real discoveries, a discourse that forgets the world, a political game that is only about who gets in the newspaper.

Rather than delve deeper into some of Serres's texts, I would like to briefly build on some of these examples to highlight the power of this framework. As a first example, we can think of the way in which consumer goods tend to become *cultural signifiers* of prestige. This is a well-known phenomenon that has been extensively described by social theorists such as Jean Baudrillard or Pierre Bourdieu.⁶⁰ It is often associated with concepts such as reification or fetishism: while we adopt a technology as a means, it tends to become an end in itself. Andrew Feenberg illustrates this with the example of the automobile:

Automobile ownership involves far more than transportation. It symbolizes the owner's status. In poor countries, it has an even greater symbolic charge than in rich ones, signifying the achievement of modernity and its vision of a rich and fulfilling life. It cannot be said in such cases that the means are separate from the ends. Possession of the means is already an end in itself because identity is at stake in the relation to technology.⁶¹

Whereas a car was introduced as a means to an end, to go places, it tends to become an end in itself: I buy a car for the prestige of driving it. We can analyze these cases in terms of information theory. We can approach a car from different frames of reference: either in terms of utility or in terms of cultural signifier. But we also see how these levels are nested: cultural prestige could only build on the information-noise dichotomy of the lower level, and it can surprisingly redraw

this dichotomy. For example, the loudness of the engine or the size of the wheels, once a source of noise, can now become information about identity. Moreover, we can see how the same concern of Serres is at play here, namely when this system of cultural signifiers risks becoming so extensive that it erodes all the redundancy of the lower levels. The size and loudness of the car can only be a cultural signifier as long as it does not completely undermine the lower system, as when cars no longer fit into parking spaces or narrow streets, or keep residents awake at night.

A second example could be *political polarization*, in particular the current wave of populism in politics. Again, populist rhetoric can be analyzed on different levels. When we look at the actual content of populist rhetoric, we often see clichés or empty phrases ('the elite', 'Brussels', 'I hear you'). However, a more meaningful analysis takes place at a higher level, where populist rhetoric is analyzed not in terms of its actual practical content, but in terms of the signals it sends to the electorate. At this level, the making of certain political statements plays out according to a different information-noise dichotomy. Again, this is inevitable, but it risks becoming a real problem if the fixation on this level is at the expense of the lower level, where there is no redundancy left to actually come to practical political decisions.⁶²

A third example is ecology, a subject close to Serres's heart, not only in *Le Contrat naturel*, but also in *La Guerre mondiale* and *Le mal propre*.⁶³ Here we come closer to a case where it is not so much two different social systems being nested within one another, but more generally of how social systems are nested within natural systems, on which they depend. Often certain sources of noise in nature – such as natural landscapes, specific climates or ancient ruins – can become signifiers of information at higher levels. But the ecological crisis raises the question of whether we are not approaching tipping points for some of these elements, and risk putting too much pressure on the lower levels, where no redundancy is left. That is why Serres argues for rethinking the social contract in terms of a natural contract. We need to impose constraints on these higher levels in order to preserve the lower ones, we need to master our mastery:

Because, unregulated, exceeding its purpose, counterproductive, pure mastery is turning back on itself. Thus former parasites have to become symbionts; the excesses they committed against their hosts put the parasites in mortal danger, for dead hosts can no longer feed or house them. When the epidemic ends, even the microbes disappear, for lack of carriers for their proliferation.⁶⁴

In other words, Serres's ecological thought draws on his inspiration from information theory. This is particularly evident in his famous opening example of Francisco Goya's painting, *Fight with Cudgels*. "A pair of enemies brandishing sticks is fighting in the midst of a patch of quicksand. Attentive to the other's tactics, each answers blow for blow, counterattacking and dodging. Outside the painting's frame, we spectators observe the symmetry of their gestures over time: what a magnificent spectacle-and how banal!"⁶⁵ The first part of the book is a long analysis of this painting in terms of information theory: two interlocutors in conflict against the background of an excluded third, nature, a subordinate system on whose redundancy they rely.

So we see a similar pattern in all these examples. But what is the normative principle at work here? If all these examples show problematic cases of higher systems overwhelming lower ones, what is the alternative? Here Serres seems to rely on the model of symbiosis: instead of the parasite killing the host, we need an interaction in which host and guest can live side by side. More specifically, Serres's proposal seems to be that all levels in the hierarchy of information are worth preserving, since the higher levels will inevitably emerge from the noise, and the lower ones are needed by the higher ones, or else they will perish. In this sense, information theory for Serres leads to what I have called an ethics of noise.

CONCLUSION

In this article we have seen how Michel Serres derives a normative framework, which I have called an ethics of noise, from reflections on information theory.

From this perspective, the world must be understood in terms of a series of nested levels that distinguish between information and noise, typically relying on the noise of the lower levels. However, there is a danger that they may exhaust the redundancy of that lower level. This is where the ethics of noise comes in, requiring that sufficient redundancy be maintained at all levels, or else the higher-level systems will undermine the lower-level systems, and thus themselves.

We have seen, through a number of examples, how this framework is at work in many of Serres's normative judgments about the social, the political, and language in general. These tend to be higher-level systems that rely on lower-level systems, but run the risk of overwhelming them: science, nature, the world. A further elaboration of this framework could therefore also help in the interpretation of Serres's other works and claims. For example, it could help make sense of his infamous 'critique of critique':

Criticism is never fertile, and evaluation of the sciences is not even possible, since they fluctuate so rapidly. Although it is valued in academia, criticism is easy, temporary, fugitive, quickly out of style. If yesterday's truth is tomorrow's error, then in the sciences it likewise happens that the error condemned today will sooner or later find itself in the treasure house of great discoveries.⁶⁶

This critique of critique can be read as another example of how a higher-level system, critique that relies on the lower level it seeks to critique, exhausts the redundancy of the lower level. If all one sees in literature or science is ideology, capitalism, or patriarchy, then there is no longer any redundancy in the lower level to create truly new literature or science in the first place.

Another important question is the extent to which this ethics of noise is unique to Serres. There is good evidence that many other scholars who were fascinated by self-organization in the 1970s and 1980s had similar thoughts, such as Cornelius Castoriadis or Jean-Pierre Dupuy, and especially those who were part of the Group

of Ten (*Group des Dix*), such as Henri Atlan or Edgar Morin. Atlan, for example, applied his information theory to the analysis of social crises. For Atlan, a crisis implies a kind of inversion of the principle of complexity through noise, where complexity produces noise for the lower level: “It is as if the different levels of organization within the same system no longer understand each other. What is information at one level is perceived as noise at another”.⁶⁷ Or to quote him more fully:

In the social organization in crisis, the individual’s code would be incomprehensible and untranslatable to the social code, and vice versa. The variety and absence of constraints observed at the global level would be a source of noise for the system itself at the individual level. In this case, the differences between individuals, instead of constituting a regulatory and adaptive capacity for the system, could only be disruptions—in other words, noise—in the communication between the individuals that make up the system. For the observer, it would be as if the information (complexity) contained in the system were transformed into noise, preventing communication within the system and thus only contributing to its destruction.⁶⁸

Other examples could be Castoriadis’s analysis of the “imaginary institution of society”⁶⁹ or the fascination of Serres, Dupuy, Atlan and others with the work of René Girard and his scapegoat mechanisms.⁷⁰ Castoriadis’ political philosophy is based on what he himself calls an ontology of magma, mapping how local islands of determinacy (information) are situated in a sea of indeterminacy (noise). This translates into a political project that aims to map the creative ways in which societies are instituted by imaginaries, echoing the theme of complexity out of noise. Similarly, Girard’s rereading of history through a logic of mimetic violence (noise) that leads to a new social order through a mechanism of complexity out of noise (the scapegoat mechanism) has many similarities to the analysis proposed above. This initial mapping of Serres’s ethics of noise could therefore be a further invitation to explore the way how within French philosophy information theory

and cybernetics have been translated into broader research programs with clear political and ethical stakes.⁷¹

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NOTES

1. Michel Serres, *Genesis* (Ann Arbor: University of Michigan Press, 1995), 61.
2. David Webb, “The Virtue of Sensibility,” in *Michel Serres and the Crises of the Contemporary*, ed. Rick Dolphijn. (London: Bloomsbury, 2018), 11–29.
3. Massimiliano Simons, *Michel Serres and French Philosophy of Science: Materiality, Ecology, and Quasi-Objects* (London: Bloomsbury Press, 2022).
4. Michel Serres, *Cahiers de formation: pages choisies* (Paris: Le Pommier, 2022). For remarks on Vuillemin, see 480–2; for Foucault, see 1003; 1009.
5. Bruno Latour, “The Enlightenment without the Critique: A Word on Michel Serres’ Philosophy,” *Royal Institute of Philosophy Lecture Series* 21(1987): 83–97.
6. This ‘critique of critique’ is not particular to Serres, but also found in the work of authors often associated with his work, such as Isabelle Stengers and Bruno Latour. See Ilya Prigogine and Isabelle Stengers, “Postface: Dynamics from Leibniz to Lucretius,” In Michel Serres, *Hermès: Literature, Science, Philosophy*, eds. Josué V. Harari and David F. Bell (Baltimore: The Johns Hopkins University Press, 1982), 135–58; Bruno Latour, “Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern,” *Critical inquiry* 30, no. 2 (2004): 225–48.
7. Michel Serres, *Detachment* (Athens: Ohio University Press, 1989), 73.
8. *Ibid.*, 69.
9. Michel Serres, *The Five Senses: A Philosophy of Mingled Bodies* (London: Continuum, 2008), 85.
10. *Ibid.*, 85–86.
11. Michel Serres, *The Natural Contract* (Ann Arbor: University of Michigan Press, 1990), 43.
12. *Ibid.*, 8.
13. Though see N. Katherine Hayles, “Two Voices, One Channel: Equivocation in Michel Serres,” *SubStance* 17, no. 3 (1988): 3–12; Massimiliano Simons, “The Parliament of Things and the Anthropocene: How to Listen to ‘Quasi-Objects,’” *Techné: Research in Philosophy and Technology* 21, no. 2 (2017): 150–74; Vera Bühlmann, *Mathematics and Information in the Philosophy of Michel Serres* (London: Bloomsbury, 2020). Massimiliano Simons, “Self-Organizing Life: Michel Serres and the Problem of Meaning,” in *Canguilhem and Continental Philosophy of Biology*, eds. Giuseppe Bianco, Charles Wolfe, Gertrudis Van de Vijver (Cham: Springer, 2023), 209–32; Lilian Kroth, “Entropy and Entropic Differences in the Work of Michel Serres,” *Theory, culture & society* 41, no. 2 (2023): 21–35. In June 2024, there was also a workshop on ‘Michel Serres, la cybernétique et l’information comme grandeur physique’ at the ENS in Paris, organized by Bernadette Bensaude-Vincent and Roland Schaer.
14. See Michel Serres, *Hermès I, La communication* (Paris: Éditions de Minuit, 1969); *Hermès II, L’interférence*. (Paris: Éditions de Minuit, 1972); *Hermès III, La traduction* (Paris: Éditions de Minuit, 1974); *Hermès IV, La distribution* (Paris: Éditions de Minuit, 1977); *Hermès V: Le passage du*

nord-ouest (Paris: Editions de Minuit, 1980). For the posthumous manuscripts, see Serres, *Cahiers de formation*.

15. See Claude E. Shannon, "A Mathematical Theory of Communication," *Bell System Technical Journal*, 27 (1948): 379–423; 623–56; Claude E. Shannon and Warren Weaver, *The Mathematical Theory of Communication* (Urbana: The University of Illinois Press, 1949).

16. Bell Labs, originally called Bell Telephone Laboratories, is an American industrial research and scientific development company in New York. The lab has been credited with many inventions and developments throughout the century, including radio astronomy, the development of the transistor, the laser and the photovoltaic cell. Work at the lab has resulted in ten Nobel Prizes and five Turing Awards.

17. Serres, *Hermès I*, 41. All citations from French sources are translated by the author.

18. Léon Brillouin, *Science and Information Theory* (New York: Academic Press, 1956), vii.

19. See Leo Szilard, "Über die Entropieverminderung in einem thermodynamischen System bei Eingriffen intelligenter Wesen," *Zeitschrift für Physik*, 65 (1929): 840–66; Brillouin, *Science and Information Theory*.

20. Brillouin, *Science and Information Theory*, x.

21. *Ibid.*, 229.

22. *Ibid.*, 261.

23. Serres, *Hermès III*, 45.

24. Serres, *Hermès II*, 110.

25. See Madeleine Akrich, Michel Callon, and Bruno Latour, *Sociologie de la traduction: textes fondateurs* (Paris: Presses des Mines, 2006).

26. Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford: Oxford University Press, 2005).

27. See Simons, *Michel Serres and French Philosophy of Science*; Simons, "Self-Organizing Life".

28. See Brigitte Chamak, *Le Groupe Des Dix, ou les avatars des rapports entre science et politique* (Paris: Éditions du Rocher, 1997); Edgar Morin, René Passet, Franck-Dominique Vivien and Henry Dicks, "Edgar Morin et René Passet: Les passeurs du Groupe des Dix," *Natures Sciences Sociétés* 27, no. 2 (2019), 225–37; Simons, *Michel Serres and French Philosophy of Science*, 152–4.

29. Serres, *Hermès IV*, 265.

30. Henri Atlan, *Entre le cristal et la fumée: Essai sur l'organisation du vivant* (Paris: Seuil, 1979), 26.

31. *Ibid.*, 65.

32. *Ibid.*, 68–9.

33. Brillouin, *Science and Information Theory*, 9.

34. Henri Atlan, "Self-Creation of Meaning," *Physica Scripta* 36, no.3 (1987), 563.

35. See Simons, "Self-Organizing Life".

36. Atlan, *Entre le cristal et la fumée*, 73.

37. Michel Serres, *The Parasite* (Baltimore: The John Hopkins University Press, 2007), 66.
38. Henri Atlan and Irun Cohen, "Immune Information, Self-Organization and Meaning," *International Immunology* 10, no. 6 (1998), 713.
39. See Massimiliano Simons, "A Philosophy of First Contact: Stanislaw Lem and the Myth of Cognitive Universality," *Pro-Fil – An Internet Journal of Philosophy, Special Issue* (2022) 65–77.
40. Stanislaw Lem, *His Master's Voice* (Evanston: Northwestern University Press, 1999), 26–7.
41. Serres, *Hermès IV*, 264.
42. *Ibid.*, 264–265.
43. François Jacob, *La logique du vivant: une histoire de l'hérédité* (Paris: Gallimard, 1970).
44. Serres, *Hermès IV*, 265.
45. Atlan, *Entre le cristal et la fumée*, 179.
46. Serres, *Hermès IV*, 266.
47. Atlan, *Entre le cristal et la fumée*, 70.
48. Serres, *Hermès IV*, 268.
49. *Ibid.*, 270.
50. Heinz Von Foerster, "On Self-Organizing Systems and their Environments," in *Self-Organizing Systems*, eds.. Marshall C. Yovits, Scott Cameron (Oxford: Pergamon Press, 1960), 31.
51. *Ibid.*
52. *Ibid.*, 32.
53. Atlan, *Entre le cristal et la fumée*, 85.
54. *Ibid.*, 91.
55. *Ibid.*, 78.
56. Cornelius Castoriadis, *Les carrefours du labyrinthe* (Paris: Seuil, 1978), 181.
57. Jean-Pierre Dupuy, "Mimésis et morphogénèse," in *René Girard et le problème du mal*, eds. Michel Deguy, Jean-Pierre Dupuy (Paris: Grasset, 1982), 115.
58. Atlan, "Self-Creation of Meaning," 565.
59. Atlan, *Entre le cristal et la fumée*, 9.
60. See Jean Baudrillard, *The Consumer Society: Myths and Structures* (London: SAGE Publications Ltd, 1998); and Pierre Bourdieu, *Distinction: A Social Critique of the Judgement of Taste* (Cambridge: Harvard University Press, 2007).
61. Andrew Feenberg, "Ten Paradoxes of Technology," *Techné* 14, no.1 (2010), 10).
62. See Ernesto Laclau, *On populist reason* (London: Verso, 2005); and Cas Mudde and Cristóbal Rovira Kaltwasser, *Populism: a very short introduction* (New York, NY: Oxford University Press, 2017).
63. Michel Serres, *La Guerre mondiale* (Paris: Le Pommier, 2008); *Le mal propre: Polluer pour s'approprier?* (Paris: Le Pommier, 2008).
64. Serres, *Natural Contract*, 34.

65. Ibid. 1.
66. Michel Serres, and Bruno Latour, *Conversations on Science, Culture and Time* (Ann Arbor: Michigan University Press, 1995), 52–3.
67. Atlan, *Entre le cristal et la fumée*, 91.
68. Ibid., 92.
69. Cornelius Castoriadis, *L'institution imaginaire de la société* (Paris: Seuil, 1975).
70. René Girard, *La violence et le sacré* (Paris: Bernard Grasset, 1972). See also Simons, “Self-Organizing Life,” 224–6.
71. This would concern the way how French philosophers use information theory and cybernetics in their political philosophies. There is a separate question of how information theory and cybernetics itself were inscribed into broader political projects. For a good first attempt to map this, see Bernard Dionysius Geoghegan, *Code: From Information Theory to French Theory* (Durham: Duke University Press, 2023).

**‘of a functional value of the
idea of god’: michel serres,
religion, and the beauty of
mathematics**

henriette korthals altes

Relire le relié, completed a few hours before Michel Serres left this world for a final journey into the unknown, reads like a testament that reflects his last wishes. Propelled by the urgency of an imminent final passage, *Relire le relié* forms an epilogue of sorts, a retrospective glance at his own prolific body of work, which he rereads one last time and, in a way, recapitulates. While the book is propelled by a desire to make sense, this process of sense-making does not set any ultimate stamp on his work; rather, it showcases how Serres’ idiosyncratic poetic use of language, as it reflects on the question of religion in relation to the sciences, creates transcendence. But what are the implications of both the retrospective and prospective gaze that are inherent in any ‘testamentary’ work? The title,

Relire le relié, which plays on the notions of rereading as much as binding, provides some clues: what is at stake is to make sense of his legacy without ossifying into a single fixed meaning, so that death does not have the last word; to transmit a legacy by suggesting keys to what makes for an often complex reading so that new connections may be made between one work and another, between one concept and another, and between one field of enquiry and another. *Relire le relié* forms undoubtedly one of Serres's most personal works, and the author's subjective voice emerges in more intimate confessions: "I believe in God, I don't believe in God," he confides (*Rel*, 141).¹ This admittedly puzzling contradiction between a *credo* and a *non credo* is at the heart of *Relire le relié* and poses the question as to how Serres reconciles faith, which underpins all religious sentiment, and doubt, which drives all scientific and philosophical enquiry.

Relire le relié, translated into English as *Religion: Rereading What is Bound Together*, is unmistakably about religion and its variegated and unexpected manifestations. Serres re-examines the resurgence and ramifications of religion in a world where the waning of faith has given way to atheistic sentiment. From the modern era through to the Enlightenment and the digital revolution, faith has been channelled into a belief in reason and science. The book presents in a tripartite structure: the first section entitled "Vertical Binding" muses on the links between the heavens and earth. The second, entitled, "Horizontal Binding," focuses on human bonds and how Christianity ideally overcomes the contingencies of family, culture, and nation. The last section broaches the question of evil in Girardian terms, those of the scapegoat mechanism, and ends on a prayer that the sacrificial economy will continue to self-regulate war and aggression in less violent ways.

What is at stake in *Relire* is not an attempt to see the world as the incarnation of an immanent God, as Spinoza proposed. Neither does Serres revisit the Pascalian wager or Descartes' ontological argument. Nor does he take up the argument of a first cause or an originating principle. Serres's originality consists in rereading the 'Great story' of the universe (*Grand Récit*) as a palimpsest of religious texts, taken mainly from the Christian but also the Greek, Roman, Eastern and Mesoamerican

traditions, which thus form a swift comparative anthropology of sorts. Religion has been one of Serres's longstanding preoccupations, even if from an ancillary perspective: the question was broached in *The Natural Contract*, but so it was in *Musique*, *Pantopie*, *Hominescence*, *Le Tiers-Instruit*, to name only these. In that respect, the *Cahiers de Formation* sheds some valuable light on the subject. A nostalgia for religion occasionally surfaces as early as the 1960s: "You will convert me to my mother's religion, and to the incredible trust in a god that her own people have disfigured" forms the opening line in a gripping poem written by Serres during the summer holidays.² The *Cahiers* also reflect his preoccupations with religion in relation to the ontological question of God, to Pythagorean mathematics, the unknown of a mathematical function, or to the character of Dom Juan, who believes only in numbers: all are topics that are elaborated upon in *Relire le relié*. But perhaps more ambitiously, Serres seeks to reconcile science and religion and reconceptualize the 'Galilean moment', the emblematic moment at the end of the Renaissance that sets science and religion, as an institution, at odds.

Superseding the opposition between the religious and the secular in French thought has a long tradition that can be traced back to Georges Bataille through to Jacques Derrida, Jean-Luc Nancy and Quentin Meillassoux, to name only a few. My aim here will be to tease out Michel Serres's radical originality within this larger contemporary trend, by bringing to the fore the continuities he draws between mathematics and religion, in particular with the mysteries of incarnation and the trinitarian unity. Serres does indeed re-interpret the *Grand Récit*, prior to it being appropriated by the memory of humans, against both Christianity and the history of sciences. I will critique the *rapprochement* he operates between mathematics and religious incarnation, which echoes Alexandre Kojève's position in *L'Origine religieuse de la science moderne*, showing how it represents a fallible argument. What then is the validity of drawing parallels between religion, mathematics, and applied physics? What purpose does it serve? I will showcase how in so doing, Michel Serres revisits and complicates his own conceptualisations, namely, of

the parasite, of quasi-objects, and of time as being inchoative, thus giving them a new ethical edge. If the proof of God's existence is dodged and hovers as an unresolved mystery, Serres almost obsessively draws parallels and establishes connections between various phenomena belonging to the natural, cultural and scientific spheres. For him, the question is no longer whether there is a God and how to prove it, but rather how language, scientific, ordinary, philosophical or poetic creates transcendence.

A FEW PREFATORY REMARKS ON THE POLARITY BETWEEN THE SECULAR AND THE RELIGIOUS

To start with, I would like to place *Relire le relié* in the broader context of the deconstruction of religion in the late twentieth century which has sought to undo the traditional polarity between the lay and the religious. Arguably, although pronounced dead, God continues to haunt our discourses and practices, however lay they may be. In the debate about the haunting presence of religion, Serres holds his very own idiosyncratic position. Let us return to the *credo/non credo* mentioned in my introduction and analyse it in its context.

I believe in God, I do not believe in him. I believe, heads; I do not believe, tails. Heads and tails are sides of the same coin, and I am this coin. *Credo, non credo*, recto and verso, two sides of the same sheet of paper, and I am this sheet. A coin that, thrown in the air, sails, spins, and falls back to earth; a thin leaf sewn in a book, or a delicate leaf on a tree that, alive, quivers in the breeze and that, dead, detached from its branch, floats and tumbles through the air until finally it is laid down on the ground.

No, neither the coin nor the leaf falls at random, for if doubt can lead to faith, faith cannot survive without doubt. They act in concert, just as inhalation and exhalation produce respiration. (*Rel.*, 141)

This dichotomy between *credo* and *non credo* is repeated and progressively amplified throughout a long development only to be surreptitiously transformed into two

opposites that are no longer mutually exclusive but have become complementary by virtue of a series of metaphors. *Credo* and *non credo* are the two faces of a same coin, the recto and verso of the same sheet, the inspiration and expiration of a same breath. They have become inextricable, doubt being the very condition of faith. This repeated assertion of opposites, of both an affirmation and its negation, forms an apophatic gesture, akin in its structure to the oft-cited words of Pseudo-Dionysius, ‘there is no speaking of it, nor name nor knowledge of it. Darkness and light, error and truth—it is none of these. It is beyond assertion and denial.’ Serres likewise asserts his faith only to negate it and this movement of saying and unsaying, which, according to critics such as Hent de Vries, forms one of the topoi of the *via negativa*, negative theology. Moreover, de Vries continues to argue, the topos of the ambiguous double affirmation of opposites that are no longer mutually exclusive but complementary, echoes the aporia and the double bind that are the defining trait of deconstruction. De Vries, following Michel de Certeau’s analyses of mystical texts, has drawn parallels between the textual practices of deconstruction and those of a negative theology, the apophatic tradition which goes back to Plato’s *Parmenides* via Plotinus, Gregory of Nyssa and Dionysius Areopagite. De Vries thus establishes similarities between two traditions, one mystical and the other secular. This in turn allows him to identify a return to religion among thinkers who, like Jean-Luc Nancy or Jacques Derrida, would otherwise identify with secular thought. The textual practice of saying and unsaying, which informs deconstruction when it seeks to tease out the aporetic structures in the philosophical canon, would thus imitate the *via negativa*. It is in this context that de Vries speaks of *theologemes*, i.e. the basic units of meaning modelled on Lévi-Strauss’s mytheme, which refer to the argumentative, metaphorical or rhetorical structures that imitate those found in negative theology.³ In Serres’s text it is the extended metaphor of the intrinsic relations between both sides of a leaf, of inspiration and expiration, that reenforces how faith and doubt are conjoined in a chiastic structure: “No, neither the coin nor the leaf falls at random, for if doubt can lead to faith, faith cannot survive without doubt. They act in concert, just as inhalation and exhalation produce respiration.”

The symbiosis between faith and doubt runs of course through the history of Christianity, which since its origins has survived while constantly being called into question from within and outside. This echoes Nancy's deconstruction of religion in *Disenclosure* where he defines Christianity as a perpetual self-reinvention:

Christianity itself, Christianity as such, is surpassed, because it is itself, and by itself, in a state of being surpassed. That state of self-surpassing may be very profoundly proper to it; it is perhaps its deepest tradition—which is obviously not without its ambiguities. It is this transcendence, this going-beyond-itself that must therefore be examined.⁴

The very essence is this capacity of self-transcendence. And as Christopher Watkin has pointed out, Nancy's deconstruction of Christianity is a double genitive, objective and subjective, which makes religion both the object and subject of deconstruction.⁵ If doubt is indeed consubstantial with faith, Serres suggests so poetically, it is by virtue of shifting images rather than by dint of argument.

In *Relire le relié*, Serres's concerns echo several topoi of the deconstruction of Christianity, the ontological question of God, the calling into question of a fixed origin and linear temporality, the problem of Evil, but also the question of subjectivity in relation to the other. The repeated identifications with the coin, the page and the dead leaf—"I am the coin," "I am the leaf" that still shivers, hovers and is moved by the wind, before falling on the earth and breaking down into humus—point to a form of self-effacement. Renouncing agency and subjectivity, Serres lets himself be carried by natural elements with this image. Is this self-effacement a mystic fusion with nature? Or can it be compared with the notion of *kenosis*, the self-emptying of Jesus who becomes a mere vessel for the word of God? In Serres's text, if there is *kenosis*, it is a surrender to the forces of nature that ultimately return humans to the earth. Kenosis, as a Christological notion has been appropriated to rethink the subject, as always being traversed by otherness.⁶ In this instance, if there is a form of self-effacement or dispossession, it consists in giving into the power of natural elements and laws of nature that move all

things earthly.

Another important chapter of the deconstruction of religion undertaken by Nancy and Derrida addressed the need to reformulate our relation to the Other, which in the wake of Emmanuel Levinas's legacy, was consigned to radical unknowability. The Other, for Levinas, was locked into infinite alterity, remained irreducible to sameness and commonality, which in turn placed the subject under an infinite responsibility towards the Other. Serres, I will argue, positions himself rather differently. He could hardly bring himself to read Derrida, as he admits in the *Cahiers de Formation*: "I have never managed to go beyond the first fifteen pages when reading Derrida" as he then goes on to cite rather flippantly "his wait-and-see masochism." (*Cah.*, 1173-4) This flippancy may be seen as merely anecdotal; but it may also betray two incompatible affective dispositions that reflect two different intellectual and ethical stances. In that respect, the problematic relation to the Other would gain from being historicized. In the aftermath of the Second World War, the relation to the Other took on pressing urgency, in the light of the unfathomable evil of the atrocities committed and the millions of deaths that begged to be mourned individually but could not. It is in this historical context that Levinas posited that our responsibility towards the Other is infinite. And it was in his wake that Derrida's and Nancy's ethical turn hinged around the infinite demands of the Other. By contrast, Serres's ethical awareness led him to lay aside the sciences and leave a career in the Navy to pursue philosophy. As he notoriously explained in *Conversations*,⁷ Hiroshima was for him the turning point, which marked a conversion from the sciences to philosophy and the history of sciences. So at the risk of simplifying, one could say there are two affective and intellectual dispositions at stake here. The former, Derrida's, which is turned towards a traumatic past and the demands of memory, and the latter, Serres's turned towards the future and the immediate urgency of social, anthropological, and environmental challenges. Serres at heart remains a historian of the sciences, a keen observer of reality and how a hidden originating principle—be it called God or not—manifests and is readable in the empirical world. In *Relire le relié*,

Serres deconstructs religion in his own way, by rereading religious texts of various traditions, in order to tell once more the ‘Great Story’ of the universe, before humanity came to inhabit it. And he does so to better understand the radical otherness of nature, what Serres calls ‘Biogea’ and for which mankind is responsible.

***RELIRE LE RELIÉ*: VERTICAL BINDINGS BETWEEN HEAVEN AND EARTH**

What, then, is Michel Serres’s originality within this philosophical practice which breaks up the polarity between faith and doubt, the religious and the secular? One of his most salient characteristics is his ambition to reconcile the sciences and religion, particularly mathematics and religion. The dichotomy that has opposed them may be traced back to Galileo’s trial, a historical moment that emblemizes a divide between, the Church as an institution, and physical mathematics that dislodged earth as the centre of universe. Since Spinoza’s *Tractatus* the argument has been that religion aims to have primary causes align with final causes and in that sense forms a superstitious illusion. For that reason, State and Church must be held in check, as the latter is keen to exploit the superstition of the masses. Religion aims to maintain the servitude of its worshippers and is by nature doctrinaire; the state, by contrast, is tasked with protecting freedom of thought which finds expression in mathematical and scientific observation. This argument survives today and has been reworked by biologist Richard Dawkins, who argues that religious dogmatism is a source of conflict and evil because it justifies beliefs that are not grounded in any evidence.⁸ Likewise, Serres has always been aware that, historically speaking, religion and the Church as an institution, have long thwarted scientific progress. This is reflected early on in the *Cahiers* in a section titled ‘Methodological/functional value of the idea of God’ (‘Valeur méthodologique/fonctionnelle de l’idée de Dieu’):

Theological meditation has long been an obstacle to the rational progress of scientific thought. As Pascal would say, this needs to be reasserted out loud. It is true indeed, historically speaking, that epochs long bogged

down in scholastic disputes have been little or only insufficiently mindful of rational thought that is independent of metaphysics. It is true also, when it comes to society, that churches and sects have had more than their fair share in thwarting this independence, out of fear or hatred, out of fanaticism and perhaps out of charitable motives. (*Cah.*, 63)

One can see here how Serres, as of the early 1960s, is critical of the ways in which religion has always shackled the progress of the sciences. So how does he attempt to reconcile the sciences and religion and more precisely mathematics and religion? In *Relire le relié* he does not do so by deploying an ontological argument—i.e. proving the existence of God—nor by dint of logical or analytic argumentation. This reconciliation is aimed at a narrative that incorporates biblical vignettes, quotations, poetic meditations, the reinterpretation of classical myth and wisdom as well as personal recollections. The text's opening passage conjures up a school memory that allows him to extrapolate a more generalisable truth—an abstraction of a mathematical formulation, the variables of an equation, also called unknowns, point to a virtual order that is verifiable in day-to-day reality:

Ever since a benevolent teacher initiated me into the mystery of the *unknown x*, and, in doing this, introduced me to mathematical abstraction, ever since he taught me its many and often incredible practical applications, I have believed in the existence of a virtual world—invisible, formal, and, what is more, multiply layered—since later I found it in various forms, not only in law, medicine, and the fine arts, but also in private and public life. I should not say merely that I believe in this virtual world: I see it, like everyone else; what is more, I have lived a part of my life in it, I have immersed myself in it. (*Rel.*, 1)

This incipit seems to gesture towards a principle of immanence that rests essentially on an *unknown x* that will take up variable values, a principle that spans the full gamut of disciplines, from law and medicine to the fine arts. A close reading of these opening lines highlights how Serres constantly shifts and

superimposes registers: the abstract to the practical, a multi-layered virtual reality and its varied expressions in the concrete world, belief, which belongs to the performative realm of faith, and observation, which belongs to the realm of the concrete and the indicative. The paragraph then concludes with an oxymoron of sorts, which Serres wants to be a tangible reality, as he calls upon the haptic—the virtual does not exist by virtue of a belief, it is to be seen, experienced and even touched: “I have lived my life in it [the virtual], I have immersed myself in it” (*Rel.*, 1). Serres thus asks his reader to think of the virtual as an embodied, tactile, skin-deep experience. The *unknown x*, that transforms from abstraction into concreteness and vice-verse, is a signifier with a very shape-shifting signified that cannot be mapped into reality. One may read into this call for meaning created by an absent signified a Spinozian immanence, Platonic idealism or the hidden god of the mystics. This micro-reading sheds light on how the Serresian text functions far from philosophical demonstrations, how it is written poetically, i.e. through associations of ideas and meanings that are vicarious and on the move. Language, he reminds us, is like that unknown *x* that is recharged with a new meaning as it circulates through, first, the sentence, then the paragraph, then the chapter, and finally the book in its entirety. It is undoubtedly this extreme variability of meaning that makes both for the difficulty and the pleasure of reading *Relire le relié*. Serres’s poetic chain of associations functions in the same way as the unknown *x* does, referring to a changing virtual, hidden, invisible order and perhaps mystical order. So should there be a God, it is a rhetorical side-effect of language.

Once its principle has been posited, the unknown *x* becomes the vehicle of multiple meanings and the concrete manifestation of a virtual order that evolves throughout *Relire le Relié*. Serres sets out with retelling the ‘Great Story’, starting with a first cause, the Big Bang, and maybe even the cause of the Big Bang. Unsurprisingly so, as for Serres there is no fixed point of origin, no set beginning, but rather an originating yet enduring energy that survives in an inchoative temporality. Time is a process with no beginning or end; a state of permanent birth and rebirth, of durations that mesh and mingle. It is for that reason that

Serres dismisses temporal periodization as being scientific, academic, or cultural illusions. The first section of *Relire le relié*, entitled ‘Vertical Binding’ therefore attempts to replace God in a narrative that predates biblical times and has Him sit next to Empedocles, who thought of the universe as a combination of the four elements. In the beginning, Serres muses, there was a state of chaos and entropy and God brought forth the big bang out of a nebula of fantastic heat. Heat is in the heavens, in the sun and the stars, as well as in the Chthonian forces that make up the bowels of the earth. But it is one single inchoative energy that drives these manifestations. And so meteorites land on the Earth, while tectonic plates move and volcanoes erupt, very locally so, in Etna, Vesuvius or the volcanoes of La Réunion. “I call ‘hot spots’ those places where, at a given moment, another world manifests itself in ours, those concrete images of contact with another reality, be it virtual, intelligent, spiritual, inspirational—perhaps dangerous as well” (*Rel.*, 5). In Serres’s narrative, the unknown x, the manifestation of a virtual order—be it God or an originary force—manifests in the thunderbolts hurled down by Jupiter perched on Mount Olympus. The Romans feared that energy would be uncontrollable where lightening had struck, so they would construct a well of stone and bronze to contain it. This construction, Serres recalls, was named a *puteal* and “marked the spot where heaven and earth came together in a blazing short circuit” (*Rel.*, 5). Hot spots therefore are loci where the virtual, or the unknown x, manifests in the corporeality of the world. Serres’s reasoning is at times dizzyingly swift, jumping from reference to metaphor. He calls on the image of thermodynamics which, according to Serres, inspired Bergson’s theory of open and closed morality, and brings it into dialogue with his own theory of information. “My dream, in relation to religion, is to speak of two sources as well: energy flanked by entropy and information, both born of the same science of fire” (*Rel.*, 28). Serres’s approach to religion here is similar to his approach to law in the *Natural Contract*: the laws of nature that organize the physical world are those that give their authority to a natural contract; likewise, the virtual, or superior order that manifests in the physical world gives its authority to religion.

Serres's poetic rewriting of the 'Great Story' draws unexpected parallels. The idea of God, he suggests, and the advent of religions, stem from a capacity for abstraction and could only come into being with humans withdrawing from worldly business. The same is true for the development of Pythagorean mathematics, argues Serres, an idea that he already formulated in the 1960 leaflet quoted above.

“When the Greeks, for example, miraculously gained access to the fields of mathematical science, it is undeniable that the religious atmosphere of their meditations was an effective aid to the development of their results. Religious thought was the first driving force behind abstract thought. Leaving the world, leaving experience, forgetting the life of the senses and taking refuge in the life of the mind was first and foremost a religious idea. The realm of pure mathematics begins as a divine refuge. This is true morally, for the common life of men who withdraw from everyday quarrels. But it is also true aesthetically, so to speak. For the idea that we form of the divine being, no human production is beautiful enough, pure enough, pared-down enough; the abstract elaboration starts with an aesthetic paring down as far as human action and intelligence allow.”
(*Cah.*, 63-4)

Serres here spells out how mathematics and religion have developed hand in hand. He goes as far as to claim that religious practices of meditation propelled the development of abstract and therefore mathematical thought. But it is also the abstraction from mundane embodied life that religious practices entailed which allowed mathematics to flourish. And what abstraction, mathematics and the idea of the divine have in common is precisely the beauty that resides in their pared-down, almost austere aesthetics. Serres here is ahead of Michel Foucault's and Pierre Hadot's works published in the 1980s as he pre-empts the ways in which they construed ancient philosophy as a spiritual exercise.⁹ I will use Foucault's definition here: “I call spirituality all those [...] practices, such as purifications, asceticism, renunciations, modifications of existence etc. which constitute [...] the

price the subject has to pay to access the truth.”¹⁰ As we know, spiritual exercises were often performed in the presence of a teacher (Socratic maieutic, or the master-disciple relationship of Epicurus and the Stoics). This is not the case for Serres who has always cut an independent and lonely journey. But these spiritual exercises may also take the form of a physical and intellectual asceticism, such as the paring down into abstract language that Serres sees as the ultimate goal of mathematics. This is undoubtedly where Serres breaks new ground: the practice of mathematics is scarcely mentioned among his spiritual exercises, which Foucault explains, are aimed at a transformation of the self, a spiritual transformation—“In truth and access to truth, there is something that fulfils the subject himself or transfigures him.”¹¹ With his aesthetic ideal embodied in the simplicity and purity of the mathematical formula, Serres once again sets himself apart from a more classical interpretation of spiritual exercises. “One enters rigor and beauty, as one enters religion”,¹² he writes in *Adichats* (2020) many years later. But what can be seen playing out during the notes he took in the summer of 1960 is a unique way of thinking synoptically and establishing parallels between the religious, the divine and the beauty of abstract mathematical language. Serres writes, “God’s attributes are functionally the best possible epistemological requisites for science in general: simplicity, uniqueness, etc. This question deserves a special study in its own right.” (*Cah.*, 67) He then continues to establish further equivalences—“geometrical necessity is divine predictability” (*Cah.*, 67)—and this linguistic copula seems to posit an identification between the laws of geometry and the laws of God, or of nature for that matter.

Serres elaborates on the parallel he draws between mathematical abstraction and meditative practices, first by drawing on examples from the pre-Socratics, then the Platonic and Aristotelian schools, and then Christianity. He does so throughout the grand narrative he weaves from the Big Bang to the exo-darwinist manifestations to be seen in the anthropological revolution brought about by the digital age. His narrative is studded with biblical vignettes which allow him to establish comparisons with the great mathematical and scientific discoveries that

have marked the course of history, including those by the Pythagoreans, Thales, Copernicus, Pascal, Auguste Comte, Darwin, Bergson and many others. With these novel rapprochements Serres suggests that there would be a fundamental continuity between what is commonly called the Greek miracle—when abstract laws find expression in the concrete world—and the advent of religion. Serres goes on to cite the story told by Diogenes Laërtius, Pliny the Elder, and Plutarch, which holds that when Thales visited Egypt, he measured the height of the pyramids by their shadows at the moment when his own shadow was equal to his height. It represents an emblematic moment when the virtual manifests in the concrete and illustrates as such the short-circuit or the abstract unknown x that finds expression in the corporeal and empirical. Establishing such continuities comes naturally to Serres who has always wanted to overcome temporal and epistemic breaks, aiming instead to establish continuities between epochs that have been artificially periodized, from the classical age, the Christian era, the dark Middle Ages, the Renaissance and through to the modern era since the Enlightenment. To do so, he casts an anthropological gaze on the advent Christianity, which he recalls, came into being around the Mediterranean, the very cradle of Western civilization which also saw the birth of mathematics after a slow progression towards abstraction. The shift from Greek and Roman polytheism towards monotheism represents another instance of such movement towards abstraction, even if the Christian God is trinitarian.¹³ For Serres this shift takes place together with three other shifts towards the abstract: the shift from a bartering economy to coins, from communication through drawing to a combination of letters belonging to a progressively pared-down alphabet, the sciences and mathematics. These four abstract networks—money, sciences, languages and religion—continue to organize contemporary societies even if they have rapidly evolved.

RELIRE LE RELIÉ: INCARNATION AND MATHEMATICAL ABSTRACTION

If Serres starts out by foregrounding how the human capacity to step back from reality defines both religious meditation and mathematical practice, he then goes on to argue that the beauty of mathematical physics is to reveal the invisible laws

of nature, themselves organized by an invisible force, be it God or any originating force. But how does he further articulate the push towards abstraction that defines Christianity and the abstraction operated by the sciences, when both have always been seen as two incompatible pursuits, one seeking docile belief in and abidance by a fiction, the other seeking freedom to discover the truth of the laws of the world? Serres enlists the argument made by Kojève, namely that Copernicus' revolution corresponded to an epistemic change or "discursive transformation."¹⁴ It meant the end of geocentrism, which Kojève saw as the defining trait of paganism, and the advent of heliocentrism. Heliocentrism, Kojève further argues, could only be possible after the doctrine of religious incarnation, which holds that the Word of God takes human form in the body of Christ. Serres write that "Kojève suspected that mathematical physics emerged—perhaps could only have emerged—in the context of the doctrine of the Incarnation" (*Rel.*, 22). Before reaching such a conclusion, Serres unfolds his argument as follows:

The philosopher of science Alexandre Kojève grasped what was really at stake in Galileo's famous trial. Galileo invented mathematical physics, which is to say he brought a concrete experiment carried out in this world into contact with an equation that had been known for centuries, suspended in a virtual world, pure and abstract. His invention, which Einstein called a miracle and which I call a hot spot, showed that only mathematics, however formal, virtual, and absent it may be, is capable of decoding reality, of writing the great book of nature, as Galileo put it, in its own language.

Now, the Church of Rome taught the Incarnation of Jesus Christ, which is to say a short circuit, blindingly luminous and charged with a unique truth, between the real, incarnate world, on the one hand, and, on the other, a kingdom utterly separate from it—hot spot, if ever there was one. Did Galileo discredit the doctrine that the earth is at the centre of the universe by an analogous gesture? Did the importance of his trial

derive from a similarity between this dogmatic *puteal* and the short circuit brought about by mathematical physics? Were these two hot spots, these two points of contact between the immanent and the transcendent, unforeseeable and unimaginable, themselves somehow related? (*Rel.*, 22)

This long quotation shows once more how Serres argues his case by harnessing a chain of associations. It starts out with the trial of Galileo, who not only discovered heliocentrism but also invented mathematical physics. The latter, in Serres's own words, embodies a short-circuit between a mathematical equation and the concreteness of an experiment, and is nothing short of a miracle. Now Serres identified this same phenomenon of short-circuiting in the Christian doctrine of incarnation, that is to say, the short-circuit between a life embodied on this earth, the life of Christ, and a transcendent, abstract reality, that is God. By extension, this phenomenon of short-circuiting defines any invention, in which the virtuality of an invisible mathematical order manifests in an observable phenomenon, in the concreteness of the corporeal world. It is therefore by virtue of this associative chain that Serres, following Kojève, proposes that mathematical physics could only have emerged as a result of the Christian doctrine of the incarnation. And he thus concludes: "That there exists another world than ours should therefore be plain; that one should turn out to be older than all the others in no way proves that it is the cause of them, their stock or trunk—*post hoc sed non propter hoc*" (*Rel.*, 12). With the Roman adage he cites, Serres seems aware of the fragility of his argument: parallels, comparison or precedence are not to be confused with causality.

The argument proposed by Kojève and enlisted by Serres is of course problematic, not least because defining the start of mathematical physics with Copernican heliocentrism is a moot proposition. Archimedes could also be seen as a mathematical physicist, while the contributions of Islamic and Indian thinkers to the development of arithmetic, chemistry, and optics are beyond dispute. And what about Kepler and Huygens who belonged to a Protestant tradition that rejected the doctrine of incarnation? Kojève's argument, and Serres's too, suffer

from a conflation between mathematical physics and heliocentrism, even though the latter represents a complete reversal of an anthropocentric worldview. Serres of course does not posit a radical discontinuity between the ‘Greek miracle’ and the ‘Galilean moment.’ But he seems oblivious to the complex cultural context that curbed the technological and experimental applications of the mathematical laws that the Greek discovered. Samuel Sambursky, in his landmark study, recalls how the sciences and philosophy were bound, and how the philosopher’s aim was not so much to change the world but rather to understand it and live in harmony with it. It is for that reason too, that experiments cut off from natural conditions did not develop.¹⁵ A further argument that may be opposed to Kojève and Serres is that continuities have been traced between the Platonic Ideas, which informed Greek science, and Monism, the Neo-Platonism that ultimately led to the doctrine of incarnation.¹⁶

It is perhaps to make up for these shortcomings that Serres feels the need to multiply instances that showcase a shift towards the abstract that can be observed since the Greek miracle, beside the previously mentioned examples of money, alphabet, science and religion. Serres recalls how a sacrificial economy, which is intended to mark off objects and practices as sacred to obtain forgiveness and clemency, becomes more and more abstract. Sacrifices in primitive religions were human or animal. To illustrate the transition towards the abstract, Serres retells the story of Abraham, recalling how at the supreme moment when he holds the knife to Isaac’s throat, it slides when an angel appears to save his son.

Just as he was about to kill his son Isaac, Abraham turned away his knife and sacrificed instead a ram caught in the nearby thicket (...) The account involving Abraham and Isaac is a snapshot, capturing the precise moment, the tragic hesitation, the holy decision when the hand of the sacrificer is diverted from the son to the ram. (*Rel.*, 118-9)

Serres harnesses here the ekphrastic and allegoric powers of storytelling as he captures a moment of drama, i.e. the moment before reality irreversibly sets in

one form rather than another, thus intensifying allegorical meaning. He makes the scene an emblem of a sacrificial culture that henceforth is becoming more abstract, transitioning from the human to the animal sacrifice, and then from the animal to ‘vegetarian’ foods such as the bread and wine of the Last Supper. The latter as we know become metaphorical versions of the sacrifice. On the eve of Christ’s sacrifice, his words take on a performative value: “Take and eat, this is my body”; “Drink of it, for this is my blood of the covenant.”¹⁷ The Eucharist, according to the doctrines of Real Presence and transubstantiation, posits an identity between signifier and signified, between bread and body, wine and blood. The successive doctrinal interpretations of the Eucharist, Serres comments, form “an anthropological drama” which “the Eucharist brings to a close through a short circuit between a blood-drenched sacrifice of a man—the Passion of Jesus Christ—and the manducation of foods derived from floral species, grape and wheat” (*Rel.*, 123). The last supper as a moment that inaugurates the Eucharist and the various doctrines of con- or transubstantiation therefore all accomplish this shift towards the abstract that Serres endeavors to retrace.

***RELIRE LE RELIÉ*: TRINITARIAN UNITY, QUASI-OBJETS AND INCHOATIVE TEMPORALITY**

Serres does not only see continuities between the secular and the religious in the similarities between mathematical physics and the incarnation that dovetail for him in the ‘Galilean moment.’ He also identifies such continuities in conceptual thinking. *Relire le relié*, as I mentioned is a ‘testamentary’ opus in which Serres revisits with hindsight his own work. I therefore propose to tease out how Serres appropriates biblical passages in order to complexify his own secular notions. Serres, in the section entitled “Horizontal binding,” which focuses on human relations within the community, uses biblical episodes as vignettes that illustrate his own concepts. The parasite and the quasi-object as well as his conceptualization of an inchoative temporality, with multiple tempi, are salient examples of this. Let us return to the Holy Trinity which is celebrated in the rite of

the Eucharist. The unity of Father, Son and Holy spirit has often been compared to linguistic structures, namely the triangular relation that unites signifier, signified, and sign. In the doctrine of the Trinity, however, this triangulation is all but stable and the constant interchangeability of each term finds resonance with Serres's quasi-object. Serres develops this concept that is exemplified by the button that circulates in the game of the furet or by the rugby ball on the pitch that is passed around by the players. The quasi-object is also a subject and exists only by virtue of those around it. It is telling in that in *Rome: Le livre des fondations*, Serres redefines the quasi-object as "the common glass out of which one drinks during the unanimous last supper [*cène*]"¹⁸ The quasi-object allows Serres to conceptualize the relationship between subject and object as a nomad-dyad in which passive and active roles are no longer polar opposites and point instead to a relational ontology. The object therefore is as much a subject: he is both agent and agented.

Serres also recalls how the rugby ball that is passed around the team provokes exaltation and exultation, a feeling of community and perhaps communion not only between the player but also the public: "No one can understand what togetherness means if they have not experienced that kind of ecstasy."¹⁹ The kinship between ecstasy and communion through the rite of the Eucharist is of course a prime example of what the quasi-object does. In *Relire le relié*, Serres comes back to the notion of communion and the quasi-object in relation to the *Credo in Unum Deum* when he discusses the various possible syntax for the verb *croire* in French. As he points out, it can be transitive or constructed with the preposition *à* when it refers to an empirical reality. But when *croire* describes faith, like in *je crois en Dieu*, it imitates the Latin syntax of *Credo in Unum Deum* with the preposition *en*, suggesting a relation of immersion.

The second secret plunges *me* into a medium, or milieu, a new habitat, God himself: the air that I breathe, the water in which I float and swim, the earth that supports and nourishes me, the roof over my head, my

neighbors, others whom I meet. When I say ‘my house’, ‘my neighbors’, I refer to the Synthesis that creates an overarching self. I am in other words a Synthesis that inhabits a Synthesis. Being *of* the world—another way of saying: being *in* God.’ (*Rel.*, 157-8)

This section is an example of Serres’s rhetorical deftness where the virtual and the empirical, the heavenly and the earthly, the spiritual and the embodied, the individual and the community dovetail to signify how a subject is always in the midst, intrinsically relational. The utterance of the *Credo*, which celebrates the trinitarian unity and the mysteries of incarnation, triggers a sense of communion and ecstatic belonging. This passage thus echoes the opening bid of the quasi-object theory as exposed in *The Parasite*, i.e. to understand “What living together is? What the collective is?” The pronouns *I* and *we* permute to form a larger community, just as in the epigraph of Plautus that opens “The theory of the Quasi-Object”.²⁰ And likewise, the floating body of *Relire* recalls that of Ulysses tossed about by the waves in *The Parasite*. Serres here rewrites himself with a difference: he gives a more religious underpinning to the quasi-object while tracing its continuities from Homer, via Plautus, to the contemporary rugby pitch.

The quasi-object thus reveals a will to belong and transcend the limits of the self. This may have a spiritual dimension, but it is also a very embodied experience. As Watkin has pointed out, the quasi-object is reminiscent of Heidegger’s *mitsein*.²¹ By contrast, however, the community the quasi-object creates is not based on an identity politics that excludes but rather includes. Watkin also opposes Serres’s community with the community described by Nancy in *La communauté désœuvrée*. The latter coalesces around ‘nothing’, a fetish, i.e., a signifier without a signified that disavows precisely the waning of unifying community narratives.²² Serres’s quasi-object, however, creates a community that is open, non-identitarian and free of fetishes. In *Relire le relié*, Serres revisits the trinitarian unity and reflects on how the permanent permutation of the three poles of the trinitarian relation defines a relational ontology. Subjectivity is always inter-subjective, community, whether religious or other, is always inter-communitarian and syncretic. And if

Serres telescopes the workings of the holy trinity and of the quasi-objects, it is to better warn us against the sham rallying forces of ‘false gods’, such as money, celebrity and other empty signifiers. Serres writes that “Societies fabricate gods, sculpted from politics, sports, theatre, media. We produce them in producing the ‘we’; we produce the ‘we’ in producing them. In earlier works, I have called these Gods “quasi-objects”. Our tradition, lucidly, calls them ‘false gods’” (*Rel.*, 102). This is another instance of a chiasmic structure that insists on how subject and object are inter-related, both passive and active.

The question of agency for Serres is intimately conjoined with the question of temporality. In *Relire le relié*, he revisits the question of temporality by deploying musical metaphors that describe in particular the various temporalities that drive the ‘Great Story’ of the universe. Rhythms and tempos are inherent in nature, he points out. Rhythm, i.e. the repetition of a cycle, defines the movements of the sea and the revolution of planets. But these rhythms have different tempi, that are measured in billions of years for geological time, in millions of years for the evolution of mankind, in thousands of years for the history of religions, yet all concur to write one single history of the universe. All things of the world are both agents and agented by a tempo that defines them. Time is not only relative for Serres; it is inchoative, in a state of perpetual beginning. He calls upon the ‘Gloria’ that starts off with celebrating the mysteries of trinitarian unity and posits how that principles and beginnings repeat in the present and times eternal: “*sicut erat in principio et nunc et semper et in sæcula sæculorum*” (*Rel.*, 70). The chant first praises the Trinity, which by virtue of a comparison, *sicut*, distributes the terms of the Trinity in the duration of the world, muses Serres: “God at the beginning, the incarnate Christ now, the Holy Spirit soon and forever more: *three individuals for a single person, three existences for a single being; three tempos for a single time*” (*Rel.*, 70). And so, by virtue of Serres’s linguistic analysis, the virtual and eternal, conjoined in the holy trinity, are immanent in the timeliness of the world.

CONCLUSION

By way of conclusion, I would like to come back to my opening question. To what effect does Serres reconcile mathematical sciences and the religious? It would be perilous to formulate any definite answer, all the more so because Serres's style is poetic, studded with metaphors, chiasmic figures, and unexpected equivalences that gesture towards a multiplicity of meanings and associations. It is telling in this respect that Michel de Certeau has identified how mystical discourses that address a hidden God flourished, historically speaking, when the doctrine of transubstantiation was called into question, or when the identity between signifier and signified was called into question.²³ In Serresian terms this would translate into a disruption of the short-cuts between the virtual and empirical orders that he endeavors to showcase throughout *Relire*. And, de Certeau continues to argue, the mystic re-invented a *modus loquendi* that allowed them to commune with a hidden God without the intervention of an institutionalized church. Taking my cue from de Certeau, one may say that Serres re-invents a language that calls both on the sciences and religion and that allows him to tease out the manifestation of a hidden God or an originating principle, or to use his own words, to tease out the virtual beyond, the unknown x of the equation in the empirical world.

In the *Cahiers de formation* Serres notes in a section entitled "mathematics", "science is a language that speaks without a mouth, it is a structure that thinks without a subject." (*Cah.*, 338) Serres does not explicate what this barred science would be. But it echoes perhaps Lacan's barred subject who disappears within a chain of signifiers that speaks in his stead. And in that sense, it also resonates with the larger *crise du sujet* that ran across the social sciences and the humanities in the sixties and seventies, a crisis of the subject that culminated with Foucault's death of man and Roland Barthes's death of the author. Serres's author and subject is far from dead. In that regard, when Serres revisits the mysteries of incarnation and invites parallels with his quasi-object, it is rather to empower the subject, a subject who has become relational, immersed in the elements and language of the world. The scientist, perhaps like the clergy, practices a form of self-effacement

that lets the world speak through them. And so what Serres's puzzling annotation on barred science seems to suggest is that scientific language is auto-poetic, self-sufficient, self-generating, thus creating its own reality able to reflect the physical world. For this barred science, if self-generating, does not entail that "there is no *hors-texte*" as Derrida would have it: to the contrary, the biblical vignettes that Serres weaves into his *Grand Récit* are tied to the empirical reality of scientific and mathematical discoveries.

By reconciling the sciences and religion, Serres also brings to the fore how the scientist and mathematician rely on images, metaphors, and fictions. *Se non è vero, è ben trovato* ("even if it is not true, it is a very good fabrication"): Serres dizzying and at times puzzling text no doubt leaves his reader with that impression. But it recalls how poetic language, just like mathematical language, creates transcendence, a transcendence that can be translated back into the empirical world. Man is always 'in the midst', *in medias res*, and Serres would agree with this all the more so since there is no fixed point of origin, no fixed beginning in a world pervaded by entropy. To quote Frank Kermode, "Men in the midst make considerable imaginative investment in coherent patterns which, by the provision of an end, make possible a satisfying consonance with the origins and with the middle."²⁴ The beauty of mathematics, like the beauty of religion, myth, or story-telling is to provide us with a coherent narrative that rests on a tension between sameness and difference, between concordance and discordance, as Paul Ricoeur's theory of narrative identity has it, however fragile and provisional that identity may be.²⁵ And *Relire le relié* showcases just that: the pleasure of identifying coherent and returning patterns, of seeing a single unknown x manifest and play out in the myriad diversity of reality.

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Derrida, Pierre Michon and Pascal Quignard. Her work on melancholy mourning has extended into cultural studies, notably on the cultural mourning of traumatic events, such as the Vichy period, the Algerian war, the migrants' crisis, or the Paris 2013 attacks.

NOTES

1. Michel Serres, *Religion: Rereading what is Bound Together*. Chicago: Chicago University Press, 2022 [2020]. Hereafter referred to as *Rel.* followed by the page number. In-text references will use the French title, *Relire le Relié*, which is less generic than *Religion*.
2. Michel Serres, *Œuvres Complètes vol. 1, Cahiers de formation*. Paris: Le Pommier, 2022, 135. Hereafter referred to as *Cah.* Followed by the page number. My translation.
3. Hent de Vries, *Religion and violence: philosophical perspectives from Kant to Derrida*. Baltimore: Johns Hopkins University Press, 2002, XIV. “No thinkers, I suggested, have gone so far as Derrida in probing the limits of the modern discourse on religion, its metaphysical presuppositions, and its contemporary transformations in the linguistic, structuralist, narratological, pragmatist, and culturalist turns of twentieth-century thought. No author has more consistently foregrounded the unexpected and often uncanny alliances that have emerged between a radical interrogation of the history of Western philosophy and the religious inheritance from which it sought to set itself apart. In order to demonstrate this, I sought to push beyond formal analogies between the textual practices of deconstruction and the *via negativa* (apophatics, or negative theology) to address the necessity for a philosophical thinking that - like Derrida’s work - itself at once close to and at the farthest remove from traditional manifestations of the religious and the theological. This paradox is captured in the phrase *adieu* (à-dieu), which signals at once a turn toward and leave-taking from God and is also a gesture toward and departure from the other of this other, namely, the demonic and the possibility of radical evil.”
4. Jean-Luc Nancy, *Dis-Enclosure: the Deconstruction of Christianity*. Trans. Bettina Bergo, Gabriel Malenfant, and Michael B. Smith. New York: Fordham University Press, 2008 [2005], 141.
5. Watkin, Christopher. *Difficult Atheism: Post-Theological Thinking in Alain Badiou, Jean-Luc Nancy and Quentin Meillassoux*. Edinburgh: Edinburgh University Press, 2011, 39.
6. de Vries, ‘The discourse of Kenosis’, 305-358.
7. Michel Serres with Bruno Latour, *Conversations on Science, Culture and Time*. Ann Arbor: Michigan University Press, 1995 [1990], 15. See in particular the section on how the nuclear bombing of Hiroshima and Nagasaki caused him to abandon the sciences for the humanities.
8. Richard Dawkins, *The God Delusion*. London: Bantam Press, 2006.
9. Michel Foucault, *L’Herméneutique du sujet: cours au Collège de France (1981-1982)*. Ed. François Ewald, Alessandro Fontana and Frédéric Gros. Paris: Seuil/Gallimard, 2001, 16; Pierre Hadot, *Les exercices spirituels et la philosophie antique*. Paris: Albin Michel, 1987.
10. Foucault, *L’Herméneutique du sujet*, 15.
11. *Ibid.*, 17.
12. Michel Serres, *Adichats*. Paris: Le Pommier, 2020. My translation.
13. This shift was also of importance to Auguste Comte and in this context it is worth recalling

that Serres edited the first volume of the *Cours de Philosophie Positive* that appeared with Hermann in 1975.

14. Alexandre Kojève, *L'Origine chrétienne de la science moderne. Précédé de 'Mathématique et Incarnation' par Julien Corbin*. Paris: Hermann, 2021 [1964], 10.
15. Samuel Sambursky, *The Physical World of the Greeks*. Princeton: Princeton University Press, 2014 [1954]. See notably the last chapter "The Limits of Greek Science", 222-44.
16. Arthur Bradley, *Negative Theology and Modern French Philosophy*. London: Routledge, 2004.
17. Matthew 26: 26-28.
18. Michel Serres, *Rome: Le Livre des fondations*. Paris: Grasset, 1983, 128. My translation.
19. Michel Serres, *Les Cinq sens*. Paris: Grasset, 1985, 358-9. My translation.
20. Plautus, Stichus 731: "ego tu sum, tu es ego, unianimi sumus" which I would translate as follows: "I am you, you are me; we are like-minded."
21. Christopher Watkin, *Michel Serres: Figures of Thought*. Edinburgh: Edinburgh University Press, 2020, 319.
22. Ibid. See also Ian James, "Naming the Nothing: Nancy and Blanchot on Community" in *Culture, Theory and Critique*, 2010, Vol.51 (2), 171-187. The interpretation of this 'nothingness' as a fetish and therefore a process of disavowal is mine.
23. Michel de Certeau, *La Fable mystique*. Paris: Gallimard, 1982, 219.
24. Frank Kermode, *The sense of an Ending: Studies in the theory of Fiction*. Oxford: Oxford University Press, 1966., 17.
25. Paul Ricoeur, *Time and Narrative 1*. Trans. Kathleen McLaughlin and David Pellauer. Chicago: University of Chicago Press, 1984, see the chapter "Emplotment: a Reading of Aristotle's *Poetics*", 31-50.

**de-escalation, reserve and
invention: michel serres on
the natural contract and law**

david webb

THE NATURAL CONTRACT

In *The Natural Contract*, Michel Serres argues that as the founding act of a political order, the social contract excludes nature and by this exclusion has exposed it to violent exploitation.¹ Serres calls on us to realise our connectedness to the nonhuman world and to devise a new politics consistent with this. In concrete terms, he proposes that the social contract be revised to give nature rights and democratic representation through a transnational institution to advocate on behalf of Water, Air, Fire, Earth and Life.² In this paper I propose that the natural contract as an initiative in law can be supplemented by drawing on Serres's

characterisation of processes that lead to and sustain states of near equilibrium, and on the account of ‘contract’ developed through his reading of Lucretius in *The Birth of Physics*.³ The possibility of translating between the formation of order in nature, politics and ethics relies on Serres formalism according to which a structural invariance can be realised in a series of different models. In de-escalation, reserve and invention, I identify three such invariances or principles that can guide an understanding of the natural contract and its translation into political practice.⁴

In *The Natural Contract* Serres traces the long and convoluted history by which law in a juridical sense has been implicated in science and in turn knowledge of the laws of nature has informed our conception of justice. The connection intimates that somehow law might be put to work in both settings to bring knowledge and justice closer together, but there is no quick fix. One of the founding assumptions of modernity is that human society and culture stand apart from nature, and the division cannot be overcome just like that. By the same token, simply reverting to a pre-modern position is unrealistic and in any case ultimately undesirable. Nonetheless, there are straightforward pragmatic reasons to focus on law: the language of law and rights is widely recognised and is supported by existing institutions, which should in theory make it easier to implement reforms that are urgently needed. The Rights of Nature movement has grown rapidly in recent years, and legislation to give legal protection to rivers, lakes, and the Earth itself have been introduced in many countries, including Ecuador, Bolivia, New Zealand, India, and the United States of America.⁵ But again, the approach is not without its problems.⁶ The focus on rights appears to enshrine individualism and seems to be at odds with Serres’s views on the co-implication of the human and the nonhuman, mingled bodies, and complex and convoluted forms of order. Moreover, the social contract relies on a conception of law that is formally and historically connected to the modern idea that knowledge is a condition for mastery. From this perspective, which can be called naturalism, nature is other to human culture. Where human society is historical, nature is governed by laws

that are universal and timeless and which therefore do not themselves arise from or belong within nature. Unless there is a change to this perspective, an extension of the social contract to include nature will risk reproducing both the good (legal protection against harm) and the bad (a condition for inflicting harm) in the conception of law on which the social contract depends. However valuable it may be today, there is a danger that an appeal to law and rights may achieve short-term gains at the expense of more far-reaching change over the longer term. It is therefore worth reconsidering the relation between law and the natural contract, the presentation of which passes by way of law, without being restricted to law in either its scientific or legal sense. Going back to Serres's account of the idea of contract in Lucretius may helpfully modify our approach to law and inform its use in relation to the world, both human and nonhuman.

In spite of his focus on the problem of law in *The Natural Contract*, Serres came to be equivocal on its importance to our relation to nature. In an interview given in 2008, he underlines that only law can protect the environment against exploitation by the free market, and in the same interview he underlines that law can not only help to save nature, it may be the primary means of doing so.⁷ Yet his endorsement of law is not unequivocal and he concedes that law may be “a bad solution for saving the environment” but one that in the absence of others we have no choice but to adopt: “The economy and politics are not enough.”⁸ His reservations are voiced more strongly again in an essay published in the same year in which he questions his own proposal for a legal contract between human society and nature.⁹ The idea of a new contract, he writes, assumes a basic division between nature and culture and as such it adheres to a naturalism that has largely been taken for granted in science and in thinking aligned with science. Referring to the work of Philippe Descola, Serres acknowledges the limitations of naturalism and the damaging consequences it has brought in its train, not least by impoverishing the resources at our disposal to understand the world.¹⁰ While naturalism has been a defining characteristic of Western modernity, it is not universal and there is no reason to accept it as a default position. Alongside naturalism, Descola

identifies three alternative ontologies in animism, analogism and totemism, each of which stands as a different way of inhabiting the world and making sense of it.¹¹ On his part, Serres supplements his naturalism with animism, insofar as all things participate in the same play of relations (e.g. receiving, processing, storing and emitting information), while refusing to remain bound by any one set of ontological commitments: “Neither a sectarian nor a sectator, I now need an animism for help in understanding science, work, and the contemporary world. I turn to it for help, shamelessly.¹² This is by no means an eccentric position to take up since, as Serres points out, naturalism has been superseded by changes in the sciences themselves. What Serres has in mind here is that the sciences, and especially the climate sciences, have moved away from the insularity of different disciplines and have begun to speak “together, more concretely, ... about the world as a global partner”,¹³ and as a consequence “our knowledge disciplines, albeit unwittingly, have abandoned naturalism.”¹⁴ In view of this he no longer believes that we have to sign a natural contract, the idea of which has come to seem “extremely insufficient” to him.¹⁵ But if Serres steps back from the legal interpretation of ‘contract’ according to which two previously unrelated parties enter into a formal agreement, a view consistent with naturalism, he does not abandon the idea of contract altogether. For a contract does not have to be a written document at all. As Serres writes, “a set of cords is enough”¹⁶; that is, a system of relations and exchanges. Importantly, such a variation on the idea of contract does not simply replace the legal interpretation, which continues to play its part, only now without being taken as primary. One is therefore led to ask: how else can contract be understood, how does such an understanding break with naturalism, and how can it inform an interpretation of the natural contract in terms of law?

Drawing on Leibniz and mathematical formalism, Serres developed the idea that a structure can be realised in models that are formally invariant but which vary in their content.¹⁷ While certain relational characteristics in the models remain invariant, because different terms are involved the relations themselves are not perfectly identical and need to be worked out in the vernacular of each model.

Moving from one model, or instance of order, to another is a work of translation by which one both elaborates something new and refines an invariance that never appears as such. Importantly, no original version provides the key to all the rest. As Serres puts it, a theme composed as the point of departure for a series of variations may itself be heard as one variation among others.¹⁸ Relations of priority between different instances of order are therefore evened out, or rather alternative orders of priority are possible, depending on one's starting point or chosen perspective. The formal invariance of 'law' is what allows Serres to outline the history of the relations between scientific and juridical law without settling on one final correct version. It also means that juridical law and the human world for which it legislates can be approached as variations within a series that includes scientific law and the natural world. The idea of 'contract' itself is no different, in the sense that no one variation has priority over all others. Since features in his reading of Lucretius in *The Birth of Physics*, we can reasonably turn to this text to enrich our understanding of the natural contract as Serres presents it in the book of that name. In doing so, the point is not to make 'contract' as it appears in *The Birth of Physics* the source from which its political and juridical sense is to be derived directly, any more than it is simply to extend human law to the 'persons' of nature. In short, Serres is not proposing to cross the border just once, either from politics to nature or from nature to politics, as if one could tell us how the other must be ordered, but rather to move back and forth in a series of translations. The idea of contract as it appears in *The Birth of Physics* and the natural contract as a legal, political and ethical initiative are variations on each other through which runs a formal invariance, and it is for this reason that the conception of contract that Serres finds in Lucretius may tell us something about the natural contract and its relation to law without imposing a solution to be replicated exactly.

THE FOEDERA NATURA

The Birth of Physics (*La naissance de la physique dans le texte de Lucrèce: fleuves et turbulences*), published in French in 1977, thirteen years before *The Natural Contract*, puts front and centre a vision of our relation to the material world that

has been eclipsed in much of modern philosophy and science. In a reading of *De rerum natura*, written in first century BCE Rome by Titus Lucretius Carus, Serres laments the fact that Lucretius has mostly been treated as a poet rather than a scientist and elicits from his work a rigorous account of the material world that is, for us, strikingly contemporary in prefiguring non-linear dynamics (the physics of turbulence) and the thermodynamic concept of entropy.¹⁹ Crucially, the physics Lucretius proposes is expressly opposed to violence: it is a physics of Venus, not Mars, of love not war. For Serres, it demonstrates an alternative to the classical science of modernity and to the philosophy of Francis Bacon and René Descartes, for whom knowledge made possible our mastery of nature. Instead, a different physics emerges based on a conception of law not as universal and necessary but as the outcome of local combinations and regularities. As Serres puts it, at the foundation of objective knowledge lie “a series of decisions or preliminary choices that often pass unnoticed. Here is one of them: either the contractual pact or military strategy.”²⁰

Lucretius imagines a state in which across the universe atoms rained down in parallel lines. This represents a state of perfect equilibrium in which there could be no change, no combinations of matter, and nothing could exist. However, spontaneously and without cause, here and there an atom swerves just slightly from its path and collides with other atoms. The swerve, or *clinamen*, sets off a chain reaction of collisions, creating turbulence. Atoms begin to combine, and in the turbulence vortices form as the combinations create constraints that lead to settled patterns of movement. Dynamic quasi-stable forms of order emerge contingently, survive for a time, and eventually break down to release their atoms back into the wider flow. Although the tendency is towards dissolution, the path that any local instance of order follows, and therefore how long it takes to reach equilibrium, will vary. Serres’s example of eddies in flowing river water suggests two ways to think about the conditions that determine how long a local instance of order will survive, how quickly or slowly it will breakdown. Up to a point, the regularity of the vortical flow depends on the strength of the bonds between its

elements: in Lucretius's terms, atoms that link tightly will stay bound together longer. But the path that any flow takes on its way to maximal equilibrium (dissolution) also depends on how it is bounded. Serres reminds us that there are no fixed borders and that "the stream is its own dyke, the river its own wharves,"²¹ which is to say not only that a flow is constrained by other flows (as Serres notes, "*the vessel itself is a flow*, but thicker and more complex"²²) but also that the regularity, and therefore survival, of a local instance of order will depend on its interaction with the flows by which it is bounded and with which it interacts. To exist at all is to be in disequilibrium, and a local instance of order exists by virtue of being sustained in disequilibrium by regularities that comprise both its 'own' movement and its relations with the flows that run around it and through it.²³ In fact, the two are so closely related as to be inextricable from one another: the survival of a system depends on a degree of internal consistency that requires an engagement with the mix of order and disorder flowing around it and through it. As Serres often notes, achieving this calls for variation and invention.

Lucretius borrows the term '*foedus*' from Roman law. Although its meaning is associated with contract and treaty, it is often translated as 'law', yet this can be misleading for us today because the modern conception of law does not align well with what Lucretius calls the *foedera naturae*. Although the laws of nature are said to be binding, Lucretius states that those of fate (*fati*) are broken by the clinamen, and therefore the *foedera naturae* that structure the universe are indeed more akin to contracts or political treaties that set constraints for what exists without determining movement or behaviour in every respect. The distinction is clearly there in Lucretius, but Serres turns it into the thread that connects each element of *De rerum natura*. It's only fair, then, to ask whether the appeal to a notion of 'contract' projects a language of politics and human society onto nature where it does not really 'belong'. Is the idea of the *foedera naturae* just a figure of speech? Serres broaches the question and concludes that "Far from a political convention being projected upon nature, it is on the contrary the natural constitution that, in the final instance, accounts for every other federation."²⁴ On

the face of it, this appears to contradict Serres's view of structure, models and variation outlined above, where no one instance of order takes priority. However, he is simply recognising that Lucretius's account begins with a description of the movement and conjunction of atoms, without making this account foundational in the sense that it determines everything that follows.

In most science and philosophy of science it is assumed that law precedes causality, which is to say that every event (of a given kind) is determined by the same laws; the collision of A with B leads to Y happening because the laws governing this situation dictate that it must happen that way. Following Lucretius, Serres reverses this reasoning to say that causality precedes law:

In a sense, the pre-model of the fundamental physics has no laws. ... As soon as a phenomenon appears, as soon as a body is formed, a law can be expressed. The laws of nature are those of conjugation, there is only the nature of composites.²⁵

As combinations form, regularities emerge and only where they remain especially stable can we perhaps then speak of laws. Therefore, laws do not precede the system they describe or govern. Initially, there are no laws that determine how an atom *must* move and how it *will* combine with others. When laws do appear, they are not imposed on the nascent order from outside, as are the fixed laws that Lucretius calls the *foedera fati*, the “laws of destiny” in which “Cause repeats cause *ad infinitum*” and “Chains of reason pour down like rain.”²⁶ Serres associates the *foedera fati* not only with the conception of laws as universal that we find in modern science, but also with the cycles of violent sacrifice by which cultures throughout history have sought to impose order on the world. When the world tips out of kilter and events do not run their ‘true’ course, a sacrifice to the gods restores order for a period of time, but the solution does not last and soon the violence must be repeated.²⁷ Adherence to the *foedera fati* and the practice of sacrifice both involve a belief that the world is fundamentally in equilibrium, either as determined by fixed laws or by virtue of winning favour through sacrifice. Yet as Serres points out

often, a steady state is in reality a state of decline, moving inevitably towards its dissolution (death), a descent interrupted by the clinamen: “the angle interrupts the stoic chain; it breaks the *foedera fati*.”²⁸ What were regarded as fixed laws of nature no longer hold, and in their place arise *foedera naturae*, the regularities in conjunction and movement that codify local, temporary, and scale-specific conditions of existence. Moreover, unlike the *foedera fati*, the *foedera naturae* are not imposed on states of perceived disorder, and do not aim to restore equilibrium. As Serres underlines, disequilibrium is necessary for anything to exist at all, and the *foedera naturae* arise with, or more precisely as, the order that constitutes things and their relations. Disequilibrium is therefore the condition for the *foedera naturae*, and in this sense the contract is struck not to eradicate disequilibrium but to regulate it, to keep it from spiralling too quickly into disorder, and to preserve the conditions from which pockets of order can arise. In thermodynamic terms, it makes possible negentropic variations. Without reducing other forms of order to physics, Serres sees in this an example from which it is possible to translate political and juridical versions of contract. However, this is only possible at all because *De rerum natura* itself models a formal structure that recurs in multiple variations, each of which can be seen as a translation of others. In looking to atomism for inspiration, the aim is not to translate it into human law *per se* but to see in atomism formal characteristics that recur in multiple instances and which might be elaborated also in the way law is framed with respect to nature.

THE IMITATION OF INITIAL CONDITIONS

If we wish to deepen our understanding of the entanglement of the human and nonhuman worlds with one another and to revise our laws explicitly to include the nonhuman world, then we can do worse than to return to the contracts that matter strikes with matter, and to think again about the emergence of order. In itself, this can now be done quite easily, as a great deal has been written about the emergence of order from chaos and complexity. The challenge is to work out what we can take from this in terms that speak to the nature and scale of events that

concern us. What lessons are we to learn, and how? Serres is absolutely clear that no direct translation is possible between the behaviour of matter and our history, law and political institutions, which are not coded for us in advance. There is no straight line from nature to human society, and therefore no way to re-make law on the basis of a determination of nature, even if this were thought to be a desirable thing to do. Yet it's also the case that in his reading of Lucretius Serres states that in making and remaking our history, laws, and institutions we 'imitate' nature.

The laws of nature are not federal as imitations of our own laws, but the reverse. Our writings, our memory, our histories and our times are negentropic; they go back to the initial conditions, preserve them and maintain them, *as* nature has shown them to us.²⁹

The passage introduces three striking ideas: our laws, or contracts, 'imitate' those of nature; our writings, our memory, our histories, our times, and let us say also our laws, can be negentropic; and to be negentropic they must return to 'initial conditions' as we find them in nature.³⁰ But what are these initial conditions, how are they imitated, and what can we expect to follow from this?

One way to understand how our laws may imitate those of nature without returning to a version of natural law is considered in Serres's account of the code inscribed in all order. He takes information theory as a modern day translation of the Lucretian idea that atoms are letters, and therefore "Language is born with things, and by the same process."³¹ Through a composition that is at once material and linguistic: "things appear bearing their language."³² For Serres, this means that our written history, laws, and culture are late and brief additions to a much longer history coded in things that stretches beyond the human to paleontological, geological and cosmological time. These "pre-texts" constitute what Serres calls "prescription" and in a passage reminiscent of the account of the *foedera natura*, he concludes: "always anterior, this prescription founds law and founds it in nature; if peace prevails over war, it owes it to this natural code."³³ One might

therefore say that law is founded in the prescription that can be discerned in things, for example by the sciences working in collaboration. Law would then be an institutional translation of the code written in nature itself, or at least, as a first attempt or iteration, within those things to which the law is intended to apply. This seems to be a good fit with the Rights of Nature: for example, the transnational organisation Rights for Rivers declares that rivers should have the rights to flow, to feed and be fed by sustainable aquifers, and to perform essential functions within their ecosystems—all of which describe processes we take to be constitutive of what a river is.³⁴ Yet this may place too much emphasis on single instances of code or prescription at the expense of many other variations that extend beyond river systems to countless other possible examples, from scales of time and space, to geology, the formation of the earth, and cosmology. The invariance to look for in such a mass of examples lies the process by which they came to take on a form sufficiently stable for us to find them at all. At least as important as what is prescribed (e.g. what it is to be a river) are the conditions of prescription, which is to say the features of the dynamic processes by which order arises and persists in states of disequilibrium. Such features will be repeated not only across different instances of a particular kind of order, or of order on a particular scale, but also across different kinds of order at different scales. This recalls Serres's adoption of the Leibnizian notion of structural invariance across a variety of models, but it's there, too, in *De rerum natura*, where Lucretius describes the emergence of order in the material world in terms of the *clinamen*, disequilibrium, and flow before going on to use the same terms to account for the emergence of life, of society, and even of laws and morals. In Serres's words:

Whether we look at atoms, at species and, later, at society, the same model is always at work. That is, first an equilibrium and, here, there, tomorrow or yesterday, a deviation. Here is isonomy; here is the *clinamen*, differential deviation, flow and fluctuation, which initiates the slope.³⁵

This is why the *foedera fati* cannot hold always and everywhere: different scales

and localities of order exhibit their own regularities, which is to say that they have their own laws that are irreducible to any single foundational law or body of laws from which they are derived. Yet there is still a consistency between them. The cosmologist Lee Smolin argues for a similar arrangement:

Our universe should not be seen as a vast collection of elementary events, each simple and identical to all the others, but the opposite, a vast set of elementary processes, no two of which are alike in all details. At this level fundamental principles may be discerned but there are no general laws in the usual sense.³⁶

There are no general laws because no two elementary processes are exactly alike, but dispensing with general laws does not mean embracing a chaotic free for all because certain fundamental principles are repeated through the variations in law. For Smolin and his co-author Roberto Mangabeira Unger, these fundamental principles include the idea that laws change along with the phenomena they describe and that there is an inevitably historical and narrative character to explanations of the universe. For Serres, following Lucretius, the principles, or initial conditions, are those which enable the formation of the *foedera naturae* through conjugation, and the emergence of regularities in vortical movement; namely, the conditions of laminar flow becoming turbulent and then vortical, each flow being bounded by other flows. In short, the initial conditions to which Serres proposes we return are those implicit within the processes by which order emerges and lasts through a play of repetition and deviation. As such, they also provide the principles by which variations from the present order can be made without triggering catastrophic change.

What Serres would have us imitate are the codes ‘prescribed’ in things, but also the principles that set the boundaries for the emergence of these codes, and for any future variation from them. Serres notes that Lucretius was marginalised not for being a materialist but because “his physics was a complex evaluation of open models” and that for this reason it was “unthinkable.”³⁷ The physics of closed

systems was, Serres writes, reflected in institutions that were similarly closed. While Serres may have been thinking above all of academia, the open systems to which he refers already cross the boundaries between nature and culture or society, and therefore our understanding of them might one day be reflected in novel institutions of other kinds, including political institutions. To connect the idea of the *foedera natura* to the legal interpretation of the natural contract is to call into play the invariant features that recur as systems move through varying states of near equilibrium. It follows that a consideration of the natural contract in terms of law should acknowledge this by aiming to imitate how order emerges and persists at multiple levels and scales, in addition to the human. To put this another way, treating the earth, life, and humanity as iterations of connected and formally similar processes is a pathway to thinking about the entanglement of the human and nonhuman worlds, which is ultimately what is at stake in the idea of a natural contract.

However, it's one thing to say that law can be regarded as a variation on the emergence of order at a material level, but quite another to know what we are to do with this insight to 'improve' our political engagements, laws and institutions. An understanding of this will call for a translation from one instance to the other, from the formal characteristics that can be read off from the Lucretian account to the framing of law. To make a start, it's helpful to consider whether the *foedera naturae* exhibit features that we can imitate by translating them, and more specifically their relation to the conditions from which they arise. Translating such features of the *foedera naturae* into terms that we can incorporate into politics and law will show that the natural contract and the institutions that come with it can usefully be supplemented by an understanding of the formation of order in different localities and scales.

Order emerges first through a minimal deviation and then later it will break down unless something happens to reverse this. For states of near equilibrium to arise the conditions must be there for the deviation to lead to new combinations and for these combinations to settle into a regular pattern. This means achieving a

state of near equilibrium strong enough to survive but supple enough to vary without always returning to the exact same state as before: connections need to be resistant but mutable. In Serres's work, one can find three such features characteristic of systems capable of sustaining themselves in states of near equilibrium: de-escalation, reserve, and invention.

DE-ESCALATION

De-escalation is related to the Epicurean principle that one should avoid appetites that feed on themselves and only increase as they are satisfied. It's a familiar story, most usually told with regard to rich food, wine, or power, but the ethical model can be generalised to other forms of dynamic process: or rather, the management of our appetites models a more general structure.³⁸ As such, an insatiable appetite really describes any system that in order to survive must acquire or consume ever increasing amounts. In the end, it will tear itself apart or use up all the resources available to it; either way, it cannot last. Like the boat that Serres describes bobbing on the water, near stability is achieved by moving around within a range without ever being in perfect equilibrium.³⁹ Exceed the range and the slope to dissolution (equilibrium) steepens: the boat overturns. The principle here is that each movement beyond a point of equilibrium must be compensated or countered by another. It is an image of dynamic equilibrium that Serres associates with justice,⁴⁰ and the first step toward achieving it is to identify the variables at play. A feature of systems that tend toward continual escalation is their narrow focus on one or two such variables; e.g. quantity of food or economic growth. This leads to the second principle. In *De rerum natura*, Lucretius criticises those who endlessly pursue new pleasures and distractions⁴¹ and in a discussion of virtue and vice Serres follows suit, pointing out, for example, that a personality dominated by vanity seeks compliments everywhere, and the individual consumed by anger 'asks every situation for reasons to rage.' Such people, he concludes, "all suffer from a single ill: growth."⁴² Here we see that escalation is damaging for a different reason, as it elevates a certain kind of relation to the world over

others; e.g. economic growth is more important than measures of human well-being or capacity, or creativity, or shared collective activity. Escalation crowds out plurality and restricts the range within which the world ‘makes sense.’ It makes the world less nuanced, less complex and reduces the scope for invention. If, as Serres writes, our humanity depends on our capacity to disobey and to diverge from the norm, we are therefore diminished not only by escalation, but also by any response to it that aims simply for a reduction according to the same metric, since that, too, limits plurality and reduces the scope for invention.

RESERVE

If escalation leads to narrowing the terms in which the world makes sense, reserve denotes the inverse tendency to allow a plurality of relations co-exist. In *The Troubadour of Knowledge*, Serres presents several examples of what happens in the absence of such reserve: an excess of heat reduces a landscape to desert and an excess of cold leads to a frozen wasteland; rising waters flood, swallowing “every detail beneath the flat level of the silky waters; a single species proliferates to the point where no other form of life is possible; humans arrange the world for ourselves alone.”⁴³ The common feature is the imposition of a single universal law, the consequence of which is a uniformity equivalent to death. Reserve avoids this fate by allowing for plural relations and processes to arise and to persist. And because laws then do not hold always and everywhere, reserve is the condition both for history and for life.⁴⁴ As Serres writes:

We ... owe life to all the gaps left by the other living things, the Earth, the atmosphere, the waters, and the flames that, in return, owe their existence to the marginal reserves that we leave them.⁴⁵

In thermodynamic terms, to exercise reserve by leaving gaps is to contravene the second law that states all systems will move towards equilibrium. It is a negentropic tendency characteristic of living systems, taken not in isolation but in their multiple relations to one another.

INVENTION

Invention is a theme that features throughout Serres's work; for example, in the account of a 'negentropic' time in *Hermes V*, in his encouragement in *Variations of the Body* to leave the safe haven of a settled life, in the many variations of 'casting off' that we find in *The Natural Contract* and other works, and in the idea that humanity is 'hominescent', on a trajectory of exo-Darwinian evolution.⁴⁶ Invention is required in order, in Serres's terms, to branch off, to communicate, to link one locality to another, and so to establish new instances of order. Importantly, it is not a uniquely human characteristic. No example of order remains the same forever and while changes lead in general towards dissolution, or equilibrium, at times they may also give rise to new pockets of order that are not a simple continuation of what came before. In this way, the general drift towards higher entropy can be slowed. New contracts are possible codifying new relations, new tendencies or patterns, that may contain old forms of violence in new ways or even moderate new forms of violence. To invent, here is less to dream up the wholly unexpected through the power of imagination than to experience the world as composed of endless variations and, which is almost the same thing, to compose further variations, or at least to encourage them.

CODA

Wisdom, Serres writes, belongs to those who cultivate life in the smallest deviation, the angle between equilibrium and declination, a place "of the necessary and the natural" where everything comes down to "an evaluation of limits."⁴⁷ If Serres's notion of a natural contract calls for an extension of social and political ideas and their institutional counterparts to the nonhuman world, far from crossing a boundary between society and nature it invites us to acknowledge that any such notion of a clear boundary is a reductive imposition on the series of variations, and the multiplicity of series of variations, that make up both the world and its sense. Serres freely admits that there is a difference between the energy and matter of

the world on the one hand and the sense we make of it and feelings we have about it on the other, between the hard and the soft, but the two sides are not separate: the hard and the soft mingle with one another everywhere.⁴⁸ At the beginning of this paper I noted a concern that for all the pragmatic appeal of extending rights and legal protections to nature it may not be sufficient to meet the scale of the emergency that is rapidly overtaking the world. Serres's work shows how the conception of law on which such an appeal depends serves to promote states of ongoing dynamic near-equilibrium. To achieve this, legislation may be guided by the regularities, the codes, written into the constitution of things—what things are—but it should also follow the principles of de-escalation, reserve, and invention that characterise complex processes which avoid the extremes of stasis and rapid dissolution.

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NOTES

1. Michel Serres, *The Natural Contract* (Ann Arbor: University of Michigan Press, 1995).
2. Michel Serres, *Times of Crisis* (London: Bloomsbury Press, 2014), 51.
3. Michel Serres, *The Birth of Physics* (London: Rowman and Littlefield, 2018).
4. In a recently published paper Timothy Howles takes a similar approach to the one I propose here and shows that Serres's understanding of equilibrium and disequilibrium in a dynamic setting can be translated into initiatives in politics and ethics, thereby extending the idea of contract beyond its strictly legalistic sense. I agree with his analysis, including his account of homeostasis and homeorhesis, and in this paper I try to carry it further by identifying three principles that characterise the processes involved. See: Timothy Howles, 'The Concept of Equilibrium in the Work of Michel Serres: from philosophy of nature to human social order', *Angelaki* 29 (4) August 2024, 14-24.
5. Examples of such protection include New Zealand recognising the Whanganui River as a living entity with rights, the state of Uttarakhand in India according rights to the Ganges and Yamuna rivers, and the constitutions of Ecuador and Bolivia giving nature positive rights to regeneration and respect.
6. Calls for a transition from environmental law to more radical notions of ecological law and Earth Governance are growing louder. See Anker, Kirsten et al. (eds.), *From Environmental to Ecological Law* (London: Routledge, 2020). Also, the Oslo Manifesto produced by the Ecological Law and Governance Association. <https://elgaworld.org/oslo-manifesto>, accessed 22.11.23.
7. Michel Serres, 'Le droit peut sauver la nature'. *Pouvoirs* 2008/4 No.127, 5-12. Passages referenced, see 9; 8.
8. Michel Serres, 'Le droit peut sauver la nature', op. cit., 11.
9. Michel Serres, 'Feux et Signaux de Brume: Virginia Woolf's Lighthouse', *SubStance*, Vol. 37, No. 2, Issue 116: (2008), 110-31.
10. Michel Serres, 'Feux et Signaux', op cit., 125-127. Philippe Descola, *Par delà nature et culture* (Paris: Éditions Gallimard, 2005), 674-676.
11. Philippe Descola, *Par delà nature et culture*, op. cit., 666.
12. "Oh, that I might one day discover the ground on which these four ontologies rest, or better yet, the blank space, the virgin island, the dead center, motor, energy, exchanger, the point of departure from which I could direct my thinking life in new directions" (Michel Serres, 'Feux et signaux', op. cit., 130).
13. Michel Serres, *Times of Crisis*, op. cit., 40.
14. Michel Serres, 'Feux et Signaux', op cit., 127.
15. Michel Serres, 'Feux et Signaux', op cit., 126.
16. Michel Serres, *The Natural Contract*, op cit., 107.

17. “Formal laws are valid whatever the object may be, i.e. for any object. This is the precise meaning of the term *structure*; it is an ensemble of undefined significations, grouping together any number of elements (elements whose content is not specified) and a finite number of relations, whose nature is not defined, but whose function with respect to the elements is defined. We obtain a *model* (a paradigm) of this structure if we specify the content of the elements and the nature of the relations. What the whole of these paradigms have in common, analogically, is the structure in question” (Michel Serres, *Le système de Leibniz et ses modèles mathématiques* (Paris: Presses universitaires de France, 1968, 4).
18. ‘When you hear or compose variations on a given theme, don’t you sometimes ask yourself if the theme itself doesn’t develop like one variation among others, simpler, doubtless, purer, shorter, certainly, but why separate it from them? ... Yes, the theme is nothing but one of the variations.’ (Michel Serres, *The Troubadour of Knowledge* (Ann Arbor: Michigan University Press, 1995, 149).
19. Lucretius, *De rerum natura: On the Nature of Things* (Cambridge Massachusetts: Harvard University Press - Loeb Classical Library, 1924).
20. Michel Serres, *The Birth of Physics*, op cit., 139.
21. Ibid., 69.
22. Ibid., 91.
23. Timothy Howles describes this as a state of ‘differentiated equilibrium’ (“The Concept of Equilibrium’, op cit., 17), which captures its complex character very well. I address the concept of equilibrium in my paper ‘Michel Serres: the natural contract, narrative and law’ [provide full reference], where I link Serres’s view of the world in terms of multiple dynamic equilibria to his interpretation of the principle of sufficient reason and his use of the cybernetic notion of ‘steering.’
24. Michel Serres, *The Birth of Physics*, op cit., 146.
25. Ibid., 147.
26. Ibid., 136.
27. Ibid, 142-143.
28. Ibid., 109.
29. Ibid., 179.
30. The term ‘negentropy’ was coined by Léon Brillouin following Erwin Schrödinger’s use of ‘negative entropy’ to describe the local emergence of order from disorder and in Serres’s writing it is associated with creativity, invention, and work, and with the third of the three orders of time: Michel Serres, *Hermès V: le passage du nord-ouest* (Paris: L’Éditions de Minuit, 1980), 78-82.
31. Michel Serres, *The Birth of Physics*, op cit., 148.
32. Ibid., 149.
33. Michel Serres, *The Incandescent* (London: Bloomsbury Press, 2018), 111.
34. <https://www.rightsofrivers.org/#declaration>. Accessed 30.03.24.

35. Michel Serres, *The Birth of Physics*, op cit., 208-209.
36. Roberto Mangabeira Unger and Lee Smolin, *The Singular Universe and the Reality of Time*. (Cambridge: Cambridge University Press, 2015), 371.
37. Michel Serres, *The Birth of Physics*, op cit., 93.
38. Commenting on Lucretius, Serres notes that the soul follows general dynamic principles that it shares with everything else: “At its root, at its birth, the movement of the soul is differential: it is a flow, a fluctuation, the same deviation in equilibrium as that which locally changes the cataract of the atoms” (*The Birth of Physics*, op cit., 216).
39. Ibid., 42.
40. Michel Serres, *The Natural Contract*, op. cit., 87-88.
41. Lucretius, *De rerum natura: On the Nature of Things*, op cit., III 1076-1094.
42. Michel Serres, *Variations on the Body* (Minneapolis: Univocal Publishing, 2011), 47.
43. Michel Serres, *The Troubadour of Knowledge* (Ann Arbor: Michigan University Press, 1995), 116
44. Michel Serres, *The Troubadour of Knowledge*, op. cit., 116.
45. Ibid., 119.
46. *Hermès V* 78-82; *Variations* 46-52; *The Natural Contract* 97-124; Michel Serres, *Hominescence* (London: Bloomsbury, 2019), 27, 3.
47. Michel Serres, *The Birth of Physics*, op cit., 216.
48. “I see lakes of the soft in the hard and continents of the hard in the soft; yes, we scholars and thinkers are coming to discover a world that is hard, certainly, but also dense with codes and decoding, which practices, in its own way, writing, reading, memory, remembrance, and is endowed therefore with negentropy—yes, with thought, with soul, if you wish. Today our sciences unceasingly describe vaporous regions of the soft in the hard kernel of things” (Michel Serres, ‘Feux et signaux’, op cit., 126).