

# SERRESIAN XENOBIOPHILOSOPHY

or, How To Think (the) Alien Life of(f) the Planet  
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[...] our science is at last on the way to becoming a physical science since it has to finally accept the autonomy of things, and not only of living things.

– I. STENGERS, “The Re-enchantment of the World”, 1997, page 56.

It is the problem of the degree to which life can be through in the absence of man.

– CLAIRE COLEBROOK, *Deleuze and the Meaning of Life*, 2010, page 56.

INCREASINGLY, 20<sup>TH</sup>-CENTURY continental biophilosophy (Heidegger, Canguilhem, Foucault, Deleuze), but also original trends in the newest fields of biological research (the study of extremophile organisms, astrobiology, exobiology) have sinuously turned, in their search for answers, towards meta-theoretical introspection on their intrinsic conceptual and methodological limitations in addressing, historically, the problem of the living. The question posed by the nature of the “living” could be reformulated, following Gilbert Simondon’s theory of transduction as ontogenetic im-

manent processuality,<sup>1</sup> into a question of overcoming human epistemology: whether one can and should reach an understanding of “life” through the diversity of its particular instantiations in the same way as one grasps a mathematical rule through its range of applications. Simondon, despite his concern with individualization and not with livingness as such, was positively appalled at the thought of inferring from a limited spectrum of particulars an *a priori* ontological principle acting with the force of a law of particular-

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<sup>1</sup> See Gilbert Simondon. (2009). “The Position of the Problem of Ontogenesis.” In *Parrhesia*. No. 7: 4-16.

ization: “What is postulated in the search for the principle of individuation is that the individuation has a principle” (2009, p.4). Consequently, positing a processual ontology of “life” understood as a principled enactment of “life” in the “living” fosters anthropomorphic rationalism together with its extremely limited possibilities for rethinking life outside historical paradigms.



In *Life Explained*, molecular biologist Michel Morange invites the reconsideration of specific philosophic and scientific traditions – 18th-century vitalism, the informational paradigm of the “genetic program,” the “ultra-Darwinian” adaptive selection model – that have actively participated in the extinction of an imaginary of the living free from epistemological Chauvinisms privileging the anthropocentric conceptualization of life as inherently organic, or carbon-based. Indeed, Morange designates the work of biologist Jack Cohen and mathematician Jan Stewart in “xenobiology” (an uncanny biology of

unimaginable life-forms) as a non-“terracentric” or non-DNA-centric model (2008, p.92) for approaching the problematic posed by the being and becoming of life from a perspective that obliterates us as the subjects of biophilosophy and bio-research. The problematic of an unworldly-life can gain extremely pragmatic dimensions in the course of planetary missions bent on testing, with the tools of physics, in/organic chemistry, molecular biology, ecology, geology etc. local manifestations of activity (from landscape color modification patterns, to thermal variation, to liquid trace detection) assimilable to possible life-configurations. The scientific question, in this case, becomes “how to think life in the absence of both a history of knowledge about life, and of incoming palpable, recurring evidence of something that we currently identify as life?” In a sense, the crux of the matter is not an epistemological obstacle, or at least not only an epistemological obstacle: how to know bios outside of ever-sedimenting and ever-eroding historical processes of rationalizing and imagining it, through both ratifying and rectifying, recursive and

original elements? Instead, meta-reflexivity seems to be as much part of the problem in rethinking life, as it is part of its solution: what are the conditions of possibility of a thought able to conceive bios through the erasure of the conceptualizing process itself, thus through its self-annulment as instrument?

Xenobiophilosophy would be the kind of thought that, while necessarily viscerally intertwined with its object, could forget its own distinctness from the object – a thought that, in trying to think life beyond the range of modalities imposed by the variables of humanism, would have to become inhuman itself, would have to move in tandem with, yet differently from, both the object of thought and its past thinking trajectories with respect to it. Michel Serres calls this thought “a fractal meander”: both a fermentation of logics and a logics of fermentation, the acknowledgement of a sub-terranean quiver always threatening to re-absorb the living being into its informing “life<sup>2</sup>” - a quiver

philosophically intelligible not through a dialectics of differentiation<sup>3</sup>, but through a mobilization of the multiple under the direction of a kind of “opacity that thought can never incorporate or master” (Colebrook, 2010, p.7).

*we must think on the side of the thinkable, [...] we must tack toward science, toward the same, toward the one and stability, but [...] we must then be ready to*

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conceptualizing “life.” In following a Deleuzian line of thought, she advances an original “non-organic”/“pre-organic” background plane of “pure” life-forces, liberated from material life-forms, whose interaction effects the emergence of historical modes of living. “A living being, as a being, must have its own membrane or border and a milieu; but as living must also be open to a life that can never be reduced to any single form” (2010, p.7); “There can only be an organized and bounded body (an organism) because of a relative stabilization of non-organic powers; the ongoing life of the organism requires both territorialization and deterritorialization” (2010, p.20). Nonetheless, I fail to grasp Colebrook’s explanation of the immanent workings of the “non-organic” plane unto which “organic” life emerges as merely one possible configuration among many.

<sup>3</sup> “Why should it a logic of resemblance and difference, of contradiction and identity, even of continuity and discontinuity, in short a naïve logic of two choices, such as true/ false, even if we set the two theses together so that they resonate through synthesis, ambiguity, paradox or the inexpressible, why should such a logic be able to account for anything at all?” (Michel Serres, 2000 [1977], p.162).

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<sup>2</sup> In Deleuze and the Meaning of Life, Claire Colebrook displaces the “organic” as the exemplary paradigm for

*think the unthinkable, [...] we must then change our tack, toward the pure multiple, we are continually tacking back and forth, the method being a fractal meander, to one side for safety, to the other for freedom, to one side for the regulation of our thoughts, to the other for boldness and discovery, to one side for rigor and exactitude, on the other side for mixture and fuzziness (Serres, 1995, p.114).*



It is here that inventiveness inserts itself as what could be either the only dehumanizing dynamics of thought available to human beings, or alternatively an aestheticizing Fata Morgana mirroring a distorted humanism staring blindly at its own image. Creativity could be either the brief emergence of alien life through the flickering of a human thought struggling to rid itself of its human condition, or – and we can suspect this in the light of the work of Francisco Varela on autopoiesis as the index of a non-human consciousness permeating living matter – the latest reappropriation of “life” within the limits of an aesthetic

anthropomorphism.<sup>4</sup> Michel Serres, in his interviews with Bruno Latour published under the title *Eclaircissements*, stages himself as the philosopher-inventor and almost as the inventor of philosophy.<sup>5</sup> Interestingly, Gilbert Simondon also regards creativity as the equivalent in the field of knowledge of transduction, by which he understands a “vital operation” (2009, p.11) through which “life” passes in its individual forms by means of a constantly structuring interaction between actualized and non-actualized forces that render the living being a bundle of becoming, always on the edge of becoming dissonant with itself.<sup>6</sup>

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<sup>4</sup> See François Duchesneau. (1974). “Du modèle cartésien au modèle spinoziste de l’être vivant,” for a parallel with Descartes’ “anthropomorphisme technologique” (pp. 550) as a norm of intelligibility for the animal-machine theory of the living.

<sup>5</sup> “[A]uthentic epistemology is the art of inventing, the springboard for the passing from the old to the new” (1995, p.104). See Michel Serres & Bruno Latour. (1995). *Conversations of Science, Culture and Time*. The University of Michigan Press.

<sup>6</sup> “[Transduction is] the correlative appearance of dimensions and structures in a being of *peindividual* tension, that is to say in a being that is more than unity and more than identity, and that has not yet dephased itself into multiple dimensions. [...] Transduction

Yet invention, as a resurgence from within the 'classical' sciences of mathematics and physics in the form of thermodynamics, non-linear system dynamics, chaos, complexity, self-organization, autopoiesis, etc. and as a resurgence from within philosophy, in the form of Bergsonism, Deleuzianism, Serresianism, etc. presages a paradoxical speculative neorealism that posits as fundamental truth the ultimate unknowability of the truth of life. Ambiguity, uncertainty, and paradox become inherently constitutive of an infinitely more accurate epistemic climate, capable in the end of some kind of truth. In Power and Invention: Situating Science, Isabelle Stengers identifies what I call "speculative neorealism" with the revival of classical scientism:

*What seems to happen is that themes of world crisis, and a questioning of the presuppositions that allowed us to underestimate*

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can be a vital operation; it expresses, in particular, the direction [sens] of the organic individuation [...] In the domain of knowledge, it defines the veritable process of invention." (Simondon, 2009, p.11).

*the crisis or to think of it as epiphenomenal, are inter-woven with the themes of a "new rationality." This is an eminently classical scientism, in that the renewal of the scientific knowledge that was initially critiqued is heralded as a solution to ethicopolitical problems.* (Stengers 1997, p.3; my emphasis).

Stengers urges the demessianization of complexity theory on the grounds that it does not "delineat[e] the characteristics of a "new science" that we were previously unable to imagine" (1997, p.4), but argues for the urgency of such original scientific poetics<sup>7</sup> as a kind of meta-reflexive enterprise, as the critique of past forms of thinking, obsessive-compulsive in their decontextualizing reductionism, a-historicism, and mathematical idealism. "[C]omplexity arises when [scientists] have to accept that the categories of understanding that guided their expectations are in question, when the manner in

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<sup>7</sup> "science occupies the singular position of a poetic listening to nature – in the etymological sense that the poet is a maker." Isabelle Stengers. (1997). Power and Invention: Situating Science. p. 45.

which they pose their questions has itself become problematic" (Stengers, 1997, p.12). Indeed, Stengers continues,

*"[t]he qualitatively new questions that eventually become possible [...] express the limited character of the conceptual tools that were appropriate for singularly simple cases but that cannot be prolonged with relevance"* (idem, p.11; my emphasis).

For Michel Serres, invention is not a policing of the past, a 'straightening up' of knowledges and histories of knowledge, a violent but utilitarian refinement of thought.<sup>8</sup> I would argue that Serres concerns himself also with the problem of relevant prolonging from the local to the global, and with the problem of relevant folding of the global into the local (which is also the problem of causality and determinism) as with a "science of relations [...] of conventions, assemblies, contests, coitus" (Birth of Physics 2000, p.123). Causality, reversibility, predictability – all historical forms of thinking the relation between elements as

"the repetition of a homogeneous law" (idem, 2000, p.191) rendering automatism the rational practice *par excellence* – can be countered by an inventiveness, a poiesis that comes from the guts of science, from the Ancient atomistic haruspicy of nature, a practice of thought half-focused on its own unfolding process, half-focused on life as that which could potentially be unfolded in the process.

In the two books that offer a most densely packaged yet thorough introduction to Michel Serres' genetic philosophy – namely, *The Birth of Physics* (2000[1977]) and *Genesis* (1995) – the author advances a two-tier system: (1) a fluid, relational physics grounded in material "turbulence" as a universally cohesive yet locally differential process of ontogeny of being, inspired by Ancient Lucretian atomism; (2) an "information" theory of "background noise" as framework of intelligibility for a version of material conscious-ness, immanent in the physical object whose material be-comings it registers in the form of a communicable and always revisable semi-cognitive life-history.

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<sup>8</sup> See Michel Serres & Bruno Latour. (1995). "The End of Criticism." *Conversations on Science, Culture, and Time*. p. 125-166.



The originality of Serres as historian of science lies with a mathematical philosophy of time that spatializes the flow into a temporarily crystallized plane of networked events (a phase) whose chronological significance is circumvented by the possibility of topological distortions in the linearity of the trajectories connecting those events, and in the linearity of their relations of determination. Such a “quantum” time moves intermittently both in a continuous manner and by jolts, thus occasionally violently separating events close to one another in a particular phase, or aggregating events previously far apart in a specific phase: “it’s simply the difference between topology (the handkerchief is folded, crumpled, shredded) and geometry (the same fabric is ironed out flat). As we experience time – as much in our inner senses as externally in nature – as much *le temps* of history as *le temps* of the weather – it resembles this crumpled version much more than the flat, overly simplified one” (Serres, qt. Clucas 2005, p.77). Climatic, non-linear time

allows Serres to behold in the 20th-century scientific paradigm of “thermodynamics”<sup>9</sup> the renaissance not of a crisis-in-knowledge, but the reinstatement of knowledge-as-crisis which hallmarkèd Ancient philosophy and science: “We are now closer to that nature which, according to the rare echoes that reach us, the pre-Socratics reflected on, and also to the sublunar nature whose powers of growth and corruption Aristotle described, to the inseparable intelligibility and incertitude of which he spoke” (Serres, qt. Stengers, 1997, p.37). As Ilya Prigogine & Isabelle Stengers convincingly argue in “Dynamics from Leibniz to Lucretius,” the “thermodynamics” revolution restored not merely an

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<sup>9</sup> “[Thermodynamics] constitutes a new paradigm, so significant, so global, that we haven’t so far clearly recognized it, despite our living, working, and thinking by means of it and in it, for over a century. [...] It is the producer of forces themselves, through accumulation, difference, and circulation, it can and knows how to built the engines. And, all of a sudden, everything is engine: this is how the world works, the sea and the winds, living systems and signal transmitters, everything that is in movement, from tools to the cosmos and from history to language. General philosophy of things which we’re still unsure of having left behind, having been unaware that we were in it” (Serres qt. Gendron, 2007, p.43).

epistemic (a human-centered perspective), but an ontological indeterminacy to cosmic processes of material self-directedness. Indeed, Serres does not deny self-directedness (the capacity inherent in matter to “move” from one state to another, from one condition to another, from one event to another in its constant self-differentiation that is its living), but he does deny a specific pattern in material self-directedness and directional relationality (no ultimate telos or ideal virtual condition that matter should/ would attain if it “moved” in adequacy with its own laws as actualized within different local configurations).

The “classical” episteme of physics (Descartes, Galileo, Newton) presupposed an inherent knowability of the functional patterns of a dynamic system over time, in function of (a) knowledge of a set of initial conditions to which the time-dependent differential activity of the dynamic system could be reduced; (b) knowledge of a set of rules homogeneously applicable as much to the dynamic system in its totality, as to its components, so that an algorithm could be specified for the ways in which those initial

conditions would unfold through the activity patterns of the dynamic system. In the 18th-century, the intelligibility of the functional history of such a dynamic system would poetically translate into Laplace's demon: close to the anthropocentric Archimedean injunction “Give me a place to stand on, and I will move the Earth” lies the demonic temptation of calculating the evolution of the Universe as a closed system in motion starting from knowledge of each single particle and its movement speed. The epistemological conditions unspoken by Laplace's evil spirit are determinism and predictability, “reversibility” by which we mean an instrument of thought, a “syntactic rule” (Stengers) allowing the mental exercise of unfolding forwards and backwards a dynamic situation, from causes to effects and from effects to causes in order to certify quantitative/ qualitative equivalence, also “integrability” by which we mean that a system's holistic behavior is seen to be analyzable as the sum of the behaviors of its component parts – a sort of mechanistic “organization” theory. Even as early as 1903, in *Science et Méthode*, Henri

Poincaré warned about emergentism - “small differences in initial conditions generating great differences in the final phenomena” (qt. Boi & Bois 2009, p.227) – and about the “natural indeterminism” (less than average accuracy in probabilistic prediction, diminishing over time) of a specific class of phenomena and dynamic systems, what Ilya Prigogine terms “dissipative structures.” These open systems are conceptualized through their flux of energy transactions with the environment, which has re-structuring effects within the inner milieu: thus the “irreversible” entropic movement of dis-organization (far-from-equilibrium condition) of specific natural systems sensitive to the history of their energy economy, “disorganization” signifying here only the disintegration of a specific functional milieu relative to a previous “organizational” state. A natural system of a specific type could be said to traverse a series of “organizational” states over the course of its lifetime, each thinkable as internally orderly (functional) at a specific time T yet disorderly (chaotic) from the perspective of its position within a holistic history of

temporal states, and by chaos one signifies, with Katherine Hayles, “extremely complex information rather than an absence of order” (qt. Gendron, 2007, p.164-165).

Excavating underneath the flattening formalism of idealist models “which exclu[de] chance and the uncontrollable, what today we would call hyper-complexity” (Serres, 2000[1977], p.68), Serres understands to locate the irruption of the natural, of “concrete experience,” in the Lucretian clinamen, the orderly disordered fortuitous atomic event of the vortical swerve. Within the extra-temporal and extra-spatial laminar flows of solid atoms, smallest angles are produced, here and there, simultaneously with their uncertain times and places, as deviations from the linear trajectories of strictly parallel fluid strings. An irregular interlacing of different atomic deviations, the clinamen is “the smallest imaginable condition for the original formation of turbulence” (Serres, 2000 [1997], p.6) and for the genesis of life as movement from and not movement towards.

*This idea goes to the heart of philosophy, that is, metaphysics.*

*If we had only the principle of identity, we would be mute, motionless, passive, and the whole world would have no existence: nothing new under the sun of sameness. We call it the principle of reason that there exists something rather than nothing [...] it says: exist rather than. Which is almost a pleonasm, since existence denotes a stability, plus a deviation from the fixed position. To exist rather than is to be in deviation from equilibrium [...] We do not exist, do not speak and do not work, with reason, science or hands, except through and by this deviation from equilibrium. Everything is deviation from equilibrium, except Nothing. That is to say, Identity.* (Serres, 2000[1977]: 21)

*Nature runs, indefinitely, down the river of its heavy elements, towards an equilibrium. [...] Here or there, yesterday or tomorrow, deviations appear stochastically. Or differential angles of inclination. Here is something rather than nothing, here is existence, here are vortices, spirals, volutes, all models out of equilibrium. They are brought back to zero by deterioration, ruin, and death. But, temporarily, they form.* (Serres, 2000[1997]: 22)

Serres introduces a universe where the differentiations between the human/ nonhuman and the organic/ inorganic dissolve into non-linear fluctuations between perpetually dissipative “stabilizations” of material (the vortex, the cloud, the turbo, turbulence) and perpetually deviating, perpetually clotting background flow of un-formed matter (the laminar, the turba, the fluxion). His cosmic biology is a “physics of immanence” (p.54) concreted into relational events (the almost-simultaneous collision, entanglement, and separation of a multiplicity of movements and temporalities as the life of matter) best captured into the vortex as formative happenstance. The concept of life itself is, in this context, de-anthropomorph-ized, no longer understood through the “vitalism” of the organism – implying particular forms and teleological modes of functioning of closed material systems – but through homeorrhesis, a material energetism that rethinks materiality and organicity as a non-linear struggle between some kind of in-forming and other kinds of in-forming forces:

“The soul is a material body, the body is a thing, the subject is just an object, physiology or psychology is just physics” (Serres, 2000[1977], p.49); “Every object, naturally, emerges like Aphrodite from a flux of elements [...] Born from this and, as soon as it is born, complex, twined, twisting its long thick hair, it begins to transmit, in floods and in all directions, a star of flow: its wear and its time [...] In the same way or inversely, it receives the flow emitted around it, from the vicinity and the edges of the open universe alike, whether it be rock, harvest, horse or woman. The world, in total, flows in itself and through itself” (Serres, 2000[1977], p.50).

David Webb discusses in the article “Michel Serres on Lucretius: Atomism, Science & Ethics” Serres' methodology in terms of a “general’ account of flow” as

*itself susceptible to the same patterns of emergence, variation, and dissolution that it describes. As such, it proposes the mutability not only of physical order and physical law, but also of the philosophical basis for such a conception of mutability.*

*It is a way of thinking that welcomes its own transformation.* (2006, p.126, emphasis mine).

Serres could be said to argue that “the introduction of an irreducible ambiguity into the relation between the determining and the determined elements opens not just on to the problem of time, but also on that of **sensibility**, in the guise of **our affection by things**, and even on to the **relation between the sensible and the intelligible**, in the guise of **our conceptualization of what is given through sensibility**” (David Webb, “Introduction” to Birth of Physics, 2000, p.xiii-xiv; my emphasis). Michel Serres' “chaos and complexity” framework – the creative language of 21st century science – is not teleologically oriented neither towards the concrete regeneration of rationality through the criticism of its pathological history, nor towards the approximation of a truth-of-life epistemologically superior precisely through its fuzziness. But, circumstantially, both processes could be triggered even in the absence of foreseeable finalities. Serresian xenobiophilosophy (as both a

philosophy of strange life and a strange philosophy of life) has the potential to reconfigure simultaneously the predominant organo-centric conceptualization of life within the life sciences, and the logocentrism of human thought. The figure of “turbulence” as an ensemble (system) of non-teleological and non-linear transformative movements within matter grounds a cosmic abiogenesis no longer fetishizing an organized and membrane-bounded organism, for which the human body and then the cell have been the privileged icons.<sup>10</sup> Instead, it takes change, or difference itself, as that which – beyond the human/nonhuman and organic/inorganic divides – constitutes both the possibility of life, and the possibility of thinking it. Anne Crahooy, in her 1988 book *Michel Serres. The Mutation of the Cogito. Genesis of the Objective Transcendental*, writes: All engine functions through difference [...] Spatial difference, distance between two volumes,

*difference between a high and a low point, between a positive pole and a negative pole, a hot source and a cold source. From the instant there is difference, there is movement. This is it: difference is a minimal structure. Or, to consider the structure or the difference as already given means cheating. The true problem of the engine is the production of a force which isn't already there, consequently the production of a structure or of a difference.* (qt. Pierre-Marc Gendron, 2007, p.48; my translation).

Pierre-Marc Gendron similarly argues in his dissertation *The Extraordinary Voyage. The Method and Discourse of Michel Serres*, that more than the relation of difference between the elements of a system, or structure in the mathematical – not linguistic – sense, it is the historical processes of production of relations of difference that interest the philosopher. “Xeno-” as difference operator for the alienation of life and thought as currently known works simultaneously as a historical bond – xenia – that brings differences into circumstantial conjunction. Xeno/ia names the Serresian relation (hospitable parasitism, parasitic hospitality)

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<sup>10</sup> See Claire Colebrook. (2010). “The Problem of Vitalism: Active/Passive”; “Vitalism & Theoria”; “Inorganic Vitalism.” Deleuze and the Meaning of Life. p.1-28; p.43-66; p.99-108.

of bios and logos, life and philosophy, and their differential sliding along and into each other. □

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## REFERENCES

- Assad, Maria. 1993. "Portrait of a Nonlinear Dynamic System: The Discourse of Michel Serres." *SubStance*. Vol. 22, No. 2/3, Issue 71/72: Special Issue: Epistémocritique. 141-152. Accessed via JSTOR.
- Boi, Luciano & Bois, Eric. 2009. "Mathématiques créatives, physiques significatives et le livre ouvert de la nature: quelques remarques sur les systèmes dynamiques, le chaos, le déterminisme et la nature du temps." *Eikasia. Revista de Filosofía*. Ano IV 27: 215-247.
- Colebrook, Claire. 2010. "The Problem of Vitalism: Active/Passive"; "Vitalism & Theoria"; "Inorganic Vitalism." *Deleuze and the Meaning of Life*. Continuum Studies in Continental Philosophy. 1-28; 43-66; 99-108.
- Gendron, Pierre-Marc. 2007. *Le Voyage Extraordinaire. La Méthode et le Discours de Michel Serres*. MA Thesis. University Laval, Quebec.
- Harris, Paul. 1997. "The Itinerant Theorist: Nature and Knowledge/Ecology and Topology in Michel Serres." *SubStance*. Vol. 26. No. 2, Issue 83: An Ecology of Knowledge: Michel Serres: A Special Issue. 37-58. Accessed via JSTOR.
- Hayles, Katherine. 1988. "Two Voices, One Channel: Equivocation in Michel Serres." *SubStance*. Vol. 17, No. 3, Issue 57: 3-12. Accessed via JSTOR.
- Morange, Michel. 2008. *Life Explained*. New Haven & London: Yale University Press & Paris: Editions Odile Jacob.
- Prigogine, Ilya & Stengers, Isabelle. 1982. "Postface: Dynamics from Leibniz to Lucretius." In Harari & Bell (eds.) *Hermes: Literature, Science, and Philosophy*, by Michel Serres. Baltimore and London: The John Hopkins University Press. 135-155.
- Serres, Michel. 1995[1982]. *Genesis*. Trans. Geneviève James & James Nielson. USA: The University of Michigan Press.
- Serres, Michel. 2000[1977]. *The Birth of Physics*. Trans. Jack Hawkes. Edited, introduced and annotated by David Webb. Manchester, UK: Clinamen Press.

Serres, Michel. 2012. "Differences: chaos in the history of the sciences." Environment and Planning D: Society and Space. Vol.30: 369-380.

Simondon, Gilbert. 2009. "The Position of the Problem of Ontogenesis." In *Parrhesia*. No. 7: 4-16.

Stengers, Isabelle. 1997. Part 1: Science and Complexity: "Complexity: A Fad?"; "Breaking

the Circle of Sufficient Reason"; "The Reenchantment of the World"; "Turtles all the Way Down." In *Power and Invention: Situating Science. Theory out of Bounds* Vol. 10. University of Minnesota Press: 2-74.

Webb, David. 2006. "Michel Serres on Lucretius: Atomism, Science, and Ethics." *Angelaki: Journal of Theoretical Humanities*. Vol. II, No. 3 (December): 125-136.