



Mathematics and Information in the Philosophy of Michel Serres

Vera Bühlmann



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Preface

There is noise in the world before we raise our voices there, before the crowd makes its grumbling cries. Lightning writes its forked inclination in the sky; birds trace their flight there, in direction and meaning. There is meaning in space before the meaning that signifies. Taking auguries is believing in a world without men; inaugurating is paying homage to the real as such ... What's incomprehensible is that this meaning, one day, became comprehensible. The physicist is an augur who succeeded.

Michel Serres, *Rome*¹

Michel Serres was a polymath thinker who has written more than forty books, who had been a member of the Académie Française for more than twenty years, who had been a professor in Stanford, California, for many years but whose work has yet, due to reasons that are doubtlessly *no simple* reasons, hardly been received in scholarly discourses. This does not mean that it is not widely read, as the growing number of translations testify. That Serres's work is so little—or so privately, perhaps—engaged with is only consequential, I have heard people say, to what he apparently sought to achieve with his books. They are written in an original style, largely without technical jargon and in a poetic prose; and then again, they treat eminently technical and hugely authoritative subjects like mathematics, religion, history, physics, communication, as well as literature, sculpture, and painting. Serres engaged with these subjects in a somewhat idiosyncratic way—we only seldom find commentary or critical appreciation of the work of other contemporary scholars who engage with similar questions. Serres himself called his discourse one “in Exodus,” one that can never take place “at anyone’s home terrain.” It is a discourse that keeps its distance from epistemologies that are primarily interested in the (subjective) history of the development of ideas. It is as if, where discourses on the history of ideas today place “epistemology” as their organizing principle, Serres positions geometry. His concern is with history in its “objectivity.” I read Serres’s entire oeuvre as a contribution to our contemporary concerns with the Anthropocene: human life has turned into a natural force that manifests on the geological scales of the earth. The “objectivity” Serres talks about with regard to history is constituted geometrically, and hence it is ideational, but it is entirely committed to an architectonic realism (or a realist classicism, as Chapter 7 will argue) for which the guiding question is: “If it is not a miracle, then can we build it?” Serres relates the role of geometry in the tradition of idealist philosophy with that of physical forces in the materialist tradition. Both, the mechanics of the heavens (and its projected Harmonics, cosmology) as well as that of the earth (and its projected harmonics, technology) are constituted by linking theory and geometry. We will see how this particular gesture of attending to geometry is profoundly informed by a part of the natural disciplines in classical and pre-classical antiquity that has been largely



neglected in modern science and philosophy, namely, the branch that studies what antiquity named “meteora”: phenomena *above* the surface of the earth (but below the spheres of the heavens) and their connection with phenomena *below* the surface of the earth. Both of the two motivic keys above (the epigraph) help us to unpack the implications of this.

Let us look at the first one first: “There is noise in the world before we raise our voices there … [T]here is meaning in space before the meaning that signifies.” Serres is not directly asking the same kind of questions as the ancient meteorologists used to ask—questions like “why is the sea salty,” or “how are we to explain the semi-circular shape of rainbows,” or “why is there so little hail in higher geographical regions”; but he is deeply committed to their tradition of attending to natural phenomena because with respect to the meteora, it is as if any directive factor of causality (teleology) is being suspended within a cyclical kind of motion and change. The so-called *meteora* phenomena are treated in terms of polar cycles (cycles of evaporation and condensation, the cyclical path of the sun between the equinoxes, all sorts of recycling of matter into different forms). Serres’s writing seeks to establish a natural philosophy that continues this tradition, and information theory plays a central role therein. Thought and knowledge in Serres’s philosophy are relative to domains that must count as *objective*, and yet these domains manifest in a *heterocline* manner, with reappearing regularity (globality) but irregularly inflected (locality). What Serres calls “objective” is *multiplicitous*, and cannot be added up smoothly, or be integrated into a larger whole easily. Phenomena in their objectivity need to be articulated, and pronounced. Their objectivity asks to be “bridged” with the objectivity of other phenomena. Serres’s notion of objectivity is constituted categorically—it is not a property of classifications; it is what makes classification possible. This is another aspect of the meteora tradition and the study of natural phenomena in their cyclical polarity: it achieved such bridging by operating with what Aristotle called “commensurate universals.” Commensurate universals are properties of which one seeks to prove, by demonstration, that they are coextensive with the subjects to which they belong. An eminent example for such properties is the triangle in geometry. A triangle has the sum of its interior angles equal to two right angles, and this property ought to be attributed to all triangles and not, for example, only to isosceles triangles. While the property certainly belongs to the latter as well, it does not belong to them by virtue of being specifically isosceles triangles (what is specific to an isosceles triangle is that it has two equal sides). The important aspect about the concept of commensurate universals is that it asks us to think a *mediate* relation between a given subject and its theoretical formulation *as* a given subject (by means of attributing properties to it). This mediacy constitutes in Serres what he calls the “objective transcendental.” The mediacy of this relation can only be *modelled*, but at stake therefore is a notion of a model that *realizes* “objectively,” not one that *represents* objectively. The realization at stake in this notion of the transcendental is to be conceived in the cyclically polar terms of the meteora tradition. Models realize objectively only insofar as they make the “realization” as well as the “de-realization” of their objects conceivable. For example, before Aristotle wrote his treatises on meteorology, the discipline was already well established but had actually been in decline, due to the novel theories that attended to change through the very general

principle of locomotion (in response to Parmenides' refutations against change), or also from the point of view of ancient atomist theories.² From their point of view, mainly the highest level of generality (e.g., chaos, void) attracted scholarly attention, and the rich wealth of the common world meteora phenomena were only of subordinate interest. But while the highest level of generality provides the most authoritative explanations, interest in this level also conflicts with an empirical approach to physics and nature, and hence tends toward idealism. The empirical approach in the meteorological tradition is supported by a maxim of adequacy: a number of hierarchies must count as integral to "the greatest genera," and those hierarchies can be separated by applying a "more or less" scale. This method had motivated a notion of natural order in the terms of *scalae naturae* (natural scales). To a certain degree, Serres affirms this tradition of thinking in terms of scales, yet he replaces the method of classification in terms of "more or less" with one that operates in terms of "maxima and minima." This change in method is important, and it is also why I will be using quite abstract terminology at some points. This is not to defend the authority of a particular discourse, but simply to keep this distinction at work. I will refer to such *natural scales* that are subject to Serres's method of "maxima and minima" as "scalarity" rather than as "a principle of scaling," or simply as "scaling." This is to contextualize this method in the meteora discipline of natural science, but also to distinguish it clearly from the notion of scales that work as a representative model in the tradition of *scalae naturae*, insofar as it tried to make classifications where typically there was "naturalized hierarchy" among the different species. The "scales" in Serres's approach are models that "realize," not models that "represent." While no single species crowns the highest steps of the ladder in Serres's philosophy, there is a *greatest genus*. It is what organizes the commensurate universals of his notion of universal nature. This property that belongs to the greatest genus in Serres is that of intelligence, and the subject to which he attributes it is the universe itself. There is an intelligence that is not only coextensive with the universe, Serres maintains, it is also immanent to it. This *natural intelligence* (together with its equally valid, inverse formulation *intelligent nature*) is what lets Serres attend to nature through the lenses of information theory and quantum physics. They bring us the perspective of a manifold universality; namely, that all existing things (animate or inanimate, mineral or meteorite) receive, send, store, and process information. The natural scales in Serres do not facilitate the representation of a natural order, but the transversal passages (the "physical communication") by means of and within such an order. What I will call "scalarities" simply refers to such models that facilitate "passage" (the receiving, sending, storing, and processing of information) within the great genus of such multiplicitous universality. They provide the modules (the one over many relations) that constitute the transcendental objective in Serres's philosophy architectonically. They facilitate the passage of information—quanta of this massive natural intellect that communicates naturally; quanta that from a quantum physics point of view are capable of "traversing" or "communicating" (exchanging charges) between the orbits of various "energy niveaus."

Serres not only affirms that "There is noise in the world before we raise our voices there ... [T]here is meaning in space before the meaning that signifies." I chose also another motivic key for this preface, to clarify the relevance of Serres's philosophy for

the Anthropocene. It is more concerned with the position of subjectivity rather than objectivity in his thought (although it also illustrates that with respect to the cyclical polarity according to which meteora phenomena can be associated, the two always entail each other). This second motivic key is that “Tables of numbers have replaced tragedy. Chance no longer has a project, but only combinations.”³ With this statement, Serres takes a stance of considerate distance to one particular and ethically important narrative that accompanied twentieth-century industrialization and progressivism, that of the tragic human nature as proposed by psychoanalysis. Sigmund Freud nominated the tragic king, Oedipus, as the common persona that lets us recognize the human in each other. It has been an eminently important idea for twentieth-century social and cultural theory (and political philosophy), to identify with each other through the persona of Oedipus as the embodiment of (tragic) humaneness-in-general. The distance that Serres keeps from this narrative is that the world in which one is a subject, for him, is a world “of objects among objects.” Objects are to *model* the central position for collectively subjective identification, which Oedipus provides for psychoanalytic accounts. With this turn to the objective, we ought to respect Oedipus, not only as tragic but *also* as intellectually adventurous—adventurous not in how he seeks to bypass the prophecy, but in how he “actively-statically” seeks to “keep” (maintain) peace with the Sphinx. Serres’s twist to the narrative is to direct attention to how both, Oedipus and the Sphinx, actually place their lives in each other’s hands (see Chapter 0, “Instead of a Conclusion: The Static Tripod” which cites Serres from *Statues* at some length). This is not to dethrone the idea of affirming a certain kind of castration as a cultural prerequisite for social coexistence; but it reshuffles the cards. It is the background against which Serres affirms, in *Hermaphrodite* (1987), the intellectual “neutralization” of one’s sexual body (castration). But for Serres, neutralization works by a dissolution of concentrated power into a distributive plenitude of it. This neutralization reconnects the sexes with a universal genitality rather than introducing a moral abstinence with regard to “giving in” to biological sexuality. There is space for an intellectual kind of eroticism that does not find fulfillment in reproducing the same (thoughts), but in a novel idea of intellectual joy—“lovemaking in the age of the pill” as Serres also calls it.⁴ He treats neutrality and castration according to a categorial method of maxima and minima (not “more or less,” or “either/or”): “Neutral expresses well enough the inclusion of the excluded middle: neither ‘neither one nor the other’ nor ‘both one and the other’. Castration plays the role of the neutral element, here, for every operation that brings alterity into play.”⁵ For Serres, as we will see, myth (Oedipus) and algebra (identity statements, equations) are two poles of such scalar polarities which “cycle” the “universal commensurables” of his proposed (anthropocenic) meteora wisdom. In contemporary algebra, the neutral element is what makes it possible to factorize a relation between apparently tautologous terms (an equation) in variously articulable and balanceable ways (by relating to the terms through code). With his twist to the Oedipus plot, Serres proposes to introduce such a level of “coding” also to discourse as well. With it, discourse cannot only be about “being right”; it needs to take into account also its other pole of a modelled symmetry. There is always a “being left” that accompanies notions of righteousness. Discourse still is about truth; and it is about value, and about usefulness. But it needs to be so on *any* scale. This is how

Oedipus is intellectually adventurous; epic without being in the classical sense a hero. The intellectual neutralization at stake involves a likening to, a becoming familiar with what one is not (yet) “naturally” so (here “natural” in the biological sense of “according to one’s nature’s specific sex”).

This has important implications for all philosophies that either privilege difference and alterity, or sameness and identity—in the light of such meteora wisdom, the two need not be regarded as being in binary opposition. According to the notion of modelling that Serres promotes (not models that represent but models that realize in “castrated” manner, if we may say so; a realization that is not the reproduction of the same because it factors in a neutral element) difference and identity can be viewed as poles (relative to cyclical models) that provide for scalar degrees of both to coexist. In all consequentiality, Serres maintains that we need to think about identity in terms of complex “*appartenance*” (multiplicitous relations of belonging-to, belonging-with and belonging-among). His philosophy, hence, is a positivism (it affirms the progressing levels of abstraction and degrees of power science achieves, and hence history as a power), but one in which oppositions “need to keep their peace” like Oedipus and the Sphinx. Oppositions are poles relative to models that are to realize a great plurality of universal and continuous cycles in which there can be coexistence. Unlike the positivism of Auguste Compte (whom Serres greatly admired), it is a positivism that does not declare spirituality to be a private matter; like rationality, spirituality here is an integral part of the intellect that coextends with the universe (the “one,” universal intellect). Serres’s view amounts to an ethics according to a paradigm of “positive code” that accepts only “givens” but no (particular) original reference order for how the “givens” come to be “given”; code gives us the “ladders” (*scalae*), but not the endpoints where those ladders straddle (heaven and earth). Meteora refers to phenomena that involve both cosmology (eternal mechanics of the heavens) and “stuff” (substance-matter that knows no change but only continuous transformations among its elements, fire, water, earth, and air). The two mingle in the domain of the meteora, where they are both coefficient with each other. This is also how the meteora domain accommodates change (not only continuous transformations). All the variable ways in how the heavens and earths are coefficient with each other is what this positivism of code (with its polar models, the scalarities) “model” (realize). It is important to say that these models “realize,” because it is how Serres’s proposed return to the meteora tradition provides a valid philosophical context for the Anthropocene (with its key insight that human beings have turned into a veritable natural force with regard to the economical and ecological balances of the earth). The perspective of his communicational physics allows us to think about how there is discontinuous transversality to these different scalarities. Code facilitates the import and export of values to factor-in together in constellations of complex, multilateral valorization: his positivism accompanies a certain economy of thought, and it naturalizes this economy; but it also pluralizes such economy into natural economies that are *local* and *contracted* across various scales. What Serres’s physics of communication, which is at the same time a communication of physics, aspires to respond to is how to think “transit,” “traffic” across such heterogenous scales. It is a probabilistic notion of reason, in which chance must be thought to factor in; and it is why chance needs to be considered as “objective.”

One must not forget that Michel Serres was, primarily a mathematician. In mathematics, the aim is to formulate something as objectively, clearly, and in as elegantly beautiful a manner as possible. It is very often impatience that makes the texts by Serres somewhat difficult to access, and so dizzyingly fast in the pace at which they proceed. But this impatience is coupled with his style of writing about mathematics (and evidently thinking in terms of mathematics) in a fashion that goes much against the grain of twentieth-century philosophy. I want to suggest that this “strangeness,” in how Serres knew, loved, and utilized mathematics to formulate his ideas, came from his interest in this neglected tradition of meteorology. It may be helpful to name and list some of the obstacles that might stand in the way of appreciating Serres’s views, such that they can be bracketed and embraced productively. For example, one hardly recognizes in the Leibniz of Serres’s thesis *Le système de Leibniz et ses modèles mathématiques* (1968) the same philosopher whom Bertrand Russell has written about. In like manner, when Serres speaks of “la théorie des ensembles” (set theory), one hardly recognizes the discourse on set theory in contemporary philosophy of mathematics. The same goes for his attention to cybernetics, biology, chaos theory, information theory, algorithms, computation, and artificial intelligence. Over the last decades, the clarity and beauty Serres found in the ideas that fertilize those scientific fields has even grown more obstructed by the fact that some of his recognized intellectual guides, like Jacques Monod especially, developed a “reputation” in the specialized communities that make them stand, as influential fathers of novel fields in science (molecular biology), for something quite opposite of what they initially gave rise and credit to. Monod has come to stand, for example, for a branch of doing molecular biology in a crudely deterministic-mechanical manner, and this despite the fact that his initial book, *Chance and Necessity* (1971), was celebrating how biology is just about to begin to attend and explore—quantitatively yet philosophically—the genuine strangeness of its subject matter (i.e., life). Monod’s affirmation of stereometry and stereospecificity in biochemistry is capable of and, by Monod, arguably also meant to do entirely without a fixed coordinating reference frame. To unsettle such a point of originality, arguably, is exactly what Monod aimed at with his notion of invariance; the point of origin, if we read Monod with instructions by Serres, is *noisily restless*.⁶ The counter reputation he has come to stand for today is, very likely, due to an extraordinarily performative manner of handling chance calculations computationally within a logicist, formalist paradigm of Turing Computing—a paradigm that was neither thought adequate for biology by Turing himself (after his “On Computational Numbers” [1937] he attended to, and was much fascinated by, computation in relation to chemical morphogenesis [1953]⁷), nor by Monod or Serres. A similar fate as that of Monod’s and Turing’s has also happened to George Boole, who today stands for an interpretation of algebra (so-called Boolean algebra) that is decidedly what his book *The Laws of Thought* (1853) was *not* about.⁸

On a less historiographic level, I have found a few dominant ideas regarding contemporary science and philosophy in today’s discourses that pose peculiar obstacles for tapping into the rich imaginaries Serres’s thinking has to offer. Despite their counterintuitiveness, they are imaginaries that can put us in touch again in novel ways with the very ordinary world in which we live—beyond what Serres once called

“the world’s reduction to black ink on white paper.”⁹ With regard to these ideas, the reader will have to grant the credit of placing the dominant theories within brackets as hypothetical, in order to reconsider them anew. What Serres’s philosophy teaches us more than anything else perhaps, is that the best way to deal with obstacles is to learn how to embrace them, and not in trying to overcome them. The obstacles I want to mention are the following:

1. Computation cannot be reduced to the dominant paradigm on computability today, which is Turing Computing. Computation is arithmetical, yes, but algebra is more abstract than any one calculus in particular.
2. Mathematics is not a system of rules; while linguistic language would provide the means to make sense of these rules. Mathematics itself behaves like a language. It provides a lexicon of indexical concepts. Of course, it can also provide for systematic frameworks or support structures (in a great plurality of manners and fashions). There is an *objective mentality* at work in mathematics, an anonymous intelligence that is capable of and knows many ways of how to *discern*, make *distinctions* and *relations*, and be *concerned*.
3. In real nature, generative as well as generational, no system is ever closed. Combinatorial games are not opposed to a generative processuality in nature—they are a kind of ship in a bounded space that is noisy (*massively* noisy, hence a bounded space that is “leaking”) before there is a humanly imposed significance. The investment in play is a serious, and existential matter.
4. Philosophy does not lend itself well for giving a retrospective legitimization of facts. There is always a prescription that precedes any lawful statement (particularly, to name a striking example, while there is a decision for tradition in Common Law, there is one for systematicity in Civic Law). At the core of philosophy is law and nature, but we ought to refuse to make a categorical distinction between physical and juridical law. Philosophy *anticipates*. (Serress’s difficult relation to epistemology—in the paradigms of phenomenology as well as those in so-called analytical philosophy—results from this).
5. Information is a formal, mathematical notion. We have a *quantitative* concept for it today. Consequently, there is an aspect on which information is *not* something different for electro-engineers and linguists, journalists and biologists, physicists and lawyers, or artists. Information, as a mathematical quantity, is categorical (universal). This categorical sense is, arguably, what philosophy today needs to come to terms with.
6. Consistency and exhaustiveness of knowledge about something cannot be integrated together in a nonarbitrary system. Structure and system, as epistemological paradigms, provide for a certain *convertibility* of their objects. They provide for models that are inevitably *reduced* models. We need to let go of the claim to exhaustiveness in order to preserve local, but objective, criteria of consistency.

All of the above-mentioned points require one particular skill: how not to feel at home in one’s thoughts; how to exercise thinking in *daring to invert habitual ideas*. By invert



I mean neither to affirm, nor to negate. To invert entails cultivating a neutral stance—and more than anything else, modern mathematics can help us to do so. Mathematics, per definition, remains indifferent to the contents it deals with. This is of course also what has brought mathematics in such close contact with theology in the past. But there is one mathematical idea especially that is key for a veritable modernization of mathematics: that of groups. Groups give us a way of doing mathematics categorially, and thereby they equip us with the necessary means to prevent any (one particular) joining of forces between dogmatic ideologies and mathematical reason. There is a particular maxim that orientates Serres's interest in science and technology, namely, that philosophy needs to maintain (actively and precariously so) compatibility with science. If we want to deal responsibly with the power of contemporary technology, we find ourselves "condemned today" (as Serres puts it) "to become intelligent and inventive." Dealing responsibly means in a manner so that neither does science dominate social orders, nor the other way around (that the customs and traditions of social orders dominate science).

But this pronounced "condemnation" to become inventive and intellectually adventurous is actually an invitation. It is an invitation for everyone to start caring about the vulnerability of the earth, the world, the incredible diversity of life forms, biological as well as cultural ones. It is an invitation to be amazed, and to feel awe at the miraculous—but not unreasonable—*objective* reality in which we find ourselves. The universe is *secretive*, literally so: It "sets itself apart," as the Latin word *secretus* reports the tradition of Proto-Indo-European heritage, from the root *krei-*, for "to sieve," thus "to discriminate, distinguish." When "secrets" play an important role in Serres oeuvre, it is not in the sense of enigma, of a "statement which conceals a hidden meaning or known thing under obscure words or forms." Serres does exactly *not* seek to speak in obscure sayings, to speak in riddles. This is why he insists that the universe itself is "secretive": it sets itself apart, as it literally *expands*, at least according to the models of contemporary astrophysics. Contemporary science may have a good idea about the age of the universe, but this does not make its *fact* any less miraculous. In fact, by attributing a secretive character to the universe itself, as a property of its nature, Serres actively refuses to accept a mysticism around a kind of intelligence that would be "artificial" (as opposed to "human"). Rather, we need to think from an *objective* point of view—with regard to an "objective sense of intuition" as he puts it—about the conditions of observations. These conditions need to apply to the anonymous (impersonal) reality of experience, as well as the fact that there is "mens," "mentality" in experience (it is possible to learn from experience). Such natural "mentality" is the mentality mathematics can grow conscious of. It is the mentality embodied in all things that exist, also in objects, techniques, and instruments. It is the natural mentality of an intellect that coextends to and is immanent within the universe. This is something we can maintain scientifically (quantitatively treatable, rather than merely by animistic or spiritualistic projections) only today, with the mathematical notion of information in information theory. But regardless of our novel capacity of acknowledging it scientifically, Serres relativizes any claims to superiority, *nature has always been "intelligent."*

Now a preliminary word perhaps on Serres's relationship to history within such a conception of universal nature. We have been overly preoccupied with personal,

individual subjectivity, on the one hand, and timelessly homogenous, generic, objectivity on the other. It is in this spirit that many of Serres's books engage with the history of ideas, and with the history of science. But when engaging with his work, it is crucial to acknowledge that he is not writing a kind of *counter-history* to dominant approaches. Rather, there is a sense that every present is—radically, materially so—“con-tingent” to (literally “in touch with”) every other present. History and contemporaneity are brought into communication in Serres's “anthropocenic meteora approach” to nature in its universality. What he is proposing is to train our thinking in a retrograde kind of movement that interiorizes the said modernization in mathematics; hence the importance of his view that history applies to mathematical ideas themselves, objectively. This is what he calls “mathematical anamneses” (in the plural). *Retrograde* literally means a thinking that takes one step back, a thinking that does not *immediately* seek to proceed, to judge, act, or be critical. To move in a retrograde manner is to move away from the object of interest *as a means to get in touch with it*—with greater subtlety, with more finesse. Every present “banks” on an abundant past, as I will call it in Chapter 7. There is a relation hence between such mathematical anamneses, technique, and sophistication (not only sophistry). In order to acquire such perceptiveness, to obtain such skill, it is necessary to affirm a radical kind of solitude as the condition of possibility to find commonality by developing, sharing, and culturally interiorizing novel social imaginaries that are adequate for a contemporary human condition that is not without hope, that does not give in to misology (the loss of esteem for reason and argument).

Lastly, perhaps, it is important to stress that with these ambitions, themes, and interests, Michel Serres has not been so solitary as this preface now might have made it seem. What Serres develops as *retrograde kind of positivist progress* articulates an idea that, for example, has doubtlessly also troubled Gilles Deleuze with his interest in what he called *vice-diction* (in *Difference and Repetition*, 1968), or, together with Félix Guattari, their rhizomatic method and the geophysical stratification of history (in *Milles Plateaux*, 1980), or their idea of “conceptual personae” (in *What is Philosophy*, 1991). Michel Foucault, who could never decide whether he wanted to think of himself as a historian or as a philosopher, was concerned with similar questions when he discoupled an architectonic vector from a genealogical one, in his early book on methods, the *Archaeology of Knowledge* (1969). In a different manner, Jacques Derrida also evidently found his own paths with regard to inventing a method (a formal and critical way of reasoning) that would neither get caught up in a circularity without direction, nor be committed to a particular path of progressive movement along a line. His *White Mythology* from 1974, as well as Roland Barthes essay “Le Degré zéro de l'écriture” (1953) obviously ponder the same transformation of writing as Serres did with his “white concepts” in *L'Incandescence* (2003). Paul Ricoeur, Maurice Blanchot, and René Girard along with many others who could be mentioned. How to survive with humane dignity between nonsense (absurdity, without direction) and paradox (dogma, uncriticizable, established by institutional power alone) has been a common struggle throughout the twentieth century.

And yet there is a strange kind of silence with regard to Michel Serres's ideas. This book is meant as a wide and open introduction to his thinking. A note perhaps on why



I chose to write this book in the way that I did, as a more obvious way to raise further academic interest in his work might well have been to begin a play of positions between his own articulations and those of others, with which more people are already familiar. But this is what I decidedly did not want to do: namely, to seek a broader reception and engagement with Serres's work by writing this introduction as "a Deleuzian reading" of Serres, as "a Whiteheadian," "a Derridean," or "Foucauldian," "a Kantian" or any other kind of comparative discussion. This book is to provide openings, not closures. I have been thinking a lot about what it is that I am doing here. The image that sits best is that of what in French is called the work of "*une ouvrière, un ouvrier*"—a worker-artisan interested in industriousness in a manner that only the French language conveys: not as a worker who strives to *open up* and *lay out* an object she seeks to reproduce, but one that builds models, each one inevitably reduced but with a peculiar finesse, of how something *may lend itself for openings*. Such "*une ouvrière*" must, together with her models, provide *instruments* for exercising oneself in building such models. This is what I have tried to do throughout my book. The key idea in Serres's philosophy is indeed that of an impersonal cogito, a cogito that thinks objectively in a world of objects among objects, but that does not seek to dominate, but rather the reverse; a cogito of an impersonal kind of subjectivity, that seeks instruction *from* its object. To say it plainly—for quite a few (if not all) of the lines of thinking which I develop throughout these chapters, there is not really one particular direction in which the reader might follow me. It feels like I was involved in a kind of intellectual dance, developing the ideas, following them just a little bit further, and calibrating their adequacy from step to step. I have taken the liberty of leading the movements at certain times, while at others (I would like to think) I have let myself be led by directions from the texts I have been working with. It has been written with great joy.

Accordingly, I have kept the bibliography to a minimum. I have only listed those books that had, explicitly, a guiding influence in this adventure. It goes without saying that a more exhaustive list of influences would quickly turn countless, as I am strongly convinced that even though thinking is a somewhat solitary business, one never thinks alone. Secondly, and for the same reasons, I have worked with a large amount of citations. The path I draw throughout Serres texts, and throughout the references he works with, are by no means intended to give an exhaustive discussion of his oeuvre. They are colored by my own journey on which I have, in the past ten years and through engaging with Serres's writings, learnt to appreciate the wit, the cunning, the beauty, and the amazing mysteriousness that coexists in technics as much as in nature, and of course in culture. It has been immensely inspiring with respect to imagining a basic kind of literacy in how to think about coding as an architectonic "alloy-praxis" that glues letters with numbers, physics with information, mathematics with language—and that resonates with the tempers of a "civic kind of anarchism" rather than with tempers tuned to militaristic (or militarized) information technology; be it Intelligence Services or Hacker Cultures or Corporate Industry-led Education Centers and their Coding Bootcamps (as for example 42, a private and radically industry-led school calls its tuition free program, in which young people are trained without content curriculum and in operational skills only, as if for an army of mercenaries). My hope is that the reader closes this book with a buzzing mind full of questions and ideas for things to

investigate and check, to look up and carry on, in whichever direction. For there is an energy for change and a transcending movement proper to any form of literacy, and in this sense coding literacy too aims at that same goal which Louis Hjelmslev had formulated in his *Prolegomena to a Theory of Language* (1953):

humanitas et universitas.