IV ARCHÉ, ARCANUM, AND ARTICULATION: THE UNIVERSAL AND ITS CHARACTERISTICS

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This essay continues to explore the perspectival shift in cogitating the infrastructural genericness of our urban fabric, picking up from my contribution to the first volume of Metalithikum. This shift involves an approach to infrastructures that is based not solely on functionality, but predicated on capacities and capabilities depending upon, and varying according to, the mastership in intellection exerted within the symbolic: i.e. in the symbolic space of mathematics' universal "characteristics" (abstract algebraic symbols), and in the domains of the logistical orders which are articulated in such mathematical "scripting." Mastership in characterizing the universal has traditionally being reserved for the discipline of geometry alone. This article explores and meditates on Michel Serres's thesis of attributing such mastership to characteristics (mathesis) rather than to forms (geometry). He thereby rejects the paradigm of Platonic dialectics as anchored in recollection alone, and instead adopts an atomist viewpoint—with the atom as that which can only be thought. Serres's surprising claim is that *pure* geometry has never actually been born—that it does not manifest itself, in any immediate sense, in all things natural and physical. Precisely because it has never actually been born, he holds, pure geometry can continue to inform mathematical reasoning in its constitutive role for the domains of science. He regards the elements of geometry as arcane, and dependent upon mediation through the mathematical characterization. This perspective involves regarding the scene of knowledge in terms of its very fabric, namely as a stage of abstraction on which spaces of homothesis can be formalized and quantified in a manner that lives up to our contemporary state of the art in mathematics: category theory, sheaf theory, topos theory, and algebraic topology. This is what makes Serres's perspective so promising for thinking about infrastructures and technics in terms of capacities and capabilities.

> "The paradox of the enunciation of the universal. Historical experience and the history of philosophy have made us highly skeptical towards the very possibility of enunciating the universal, yet the universal can be said to have become a fact of contemporary life, and the attempt at enunciating the universal

> remains an inescapable demand, in politics and notably in practice. Not to enunciate the universal is impossible, but to enunciate it is untenable."[1]

Traditionally, the notion of the universal is the comprehension of *that which is the property of all things.* If Étienne Balibar raises the problem of the universal within a dedicatedly political setup (as is the case with the quote above), it is because the universal necessarily addresses problems of justice and judgment. As a philosophical problem, the question of *how to enunciate the universal* is usually raised in relation to secularized forms of power—Carl Schmitt, for example, famously declared "all significant concepts of the modern theory of the state are secularized theological concepts."[2] For Schmitt, the whole history of politics and law can be understood in relation to, and read indirectly through, the history of metaphysical systems. However we might think about his manner of making this postulate, the recent revival of "political theology" certainly expresses the relevance of his perspective: Alain Badiou, Slavoj Žižek, and Giorgio Agamben all consider themselves atheists, and yet they have given fresh attention to arguments from religious traditions, especially the writing of St. Paul, in order to formulate versions of universalisms.[3]

If we were to look for stages in the development of the concept (rather than what it is meant to comprehend and refer to), we might say that in ancient Greek philosophy, the universal was articulated in the philosophical categories, as that in which the systemic structure is given from which an order of natural kinds may be deduced by proper reasoning. Within the scholastic heritage of Greek thought, the Aristotelian and realist idea of natural kinds gave way to the idea of divine predication, and the universal was addressed in Christian terms as the Judgments of God. Against the background of this profile we can see how, as Schmitt points out, finding a way of dealing with the universal is a challenge at the very heart of the diverse modern processes of secularization. Against the legacy of conceiving identity according to a specifically general nature (antiquity) of how the universal is given in *natural kinds*, or according to an *individual nature* in scholastic theological philosophy, modernization began to pose the problem of the universal

1 Étienne Balibar, "Construction and Deconstruction of the Universal," *Critical Horizon 7,* no. 1 (2006): 1.

2 Carl Schmitt, *Political Theology: Four Chapters on the Concept of Sovereignty*, trans. George Schwab (Chicago: University of Chicago Press, 2006), 36. To briefly recall two of Schmitt's favorite examples, the modern concept of political sovereignty is a transformed and disguised concept of God, and the modem concept of juridical decision is a transformed and disguised concept of the Miracle.

3 See Alain Badiou, *Saint Paul: The Foundation of Universalism*, trans. Ray Brassier (Stanford, CA: Stanford University Press, 1997); Giorgio Agamben, *The Time That Remains: A Commentary on the Letter to the Romans*, trans. Patricia Dailey (Stanford, CA: Stanford University Press, 2005); Slavoj Žižek, *The Ticklish Subject: The Absent Centre of Political Ontology* (London: Verso, 2000).

by seeking a *nonindividualistic identity notion* in the split terms of a scientific objectivity, to be determined by a political notion of subjectivity. Political subjectivity is natural subjectivity enveloped and predicated in the terms of the law in whose terms a national State is constituted. Within such constitutional terms, the universal is distributed according to a kind of political grammar. Objective is that which is controlled by political subjectivity; it alone can lay claims for its particular nature on a positive notion of truth. All things that cannot be controlled by political subjectivity, and hence can claim no positive truth status for the nature that they name, are bound to remain entangled within a logics of salvation (not one of scientific objectivity). This is how, through the status of political Law, the problem of articulating and formulating the universal rests at the very heart of political modernity. The search for a *positive* notion of truth remains indispensable, it seems, even if nature is understood as a book written in the language of mathematics. The universal may well be attributed to a notion of nonindividualistic and nonclassificational identity, and hence be formulatable in the language of mathematics. Yet with such formulation, the universal nature of such a generic identity is not yet enunciated or articulated. The issue at hand is the question of law and the question of how symbols are capable of contracting what is to count as truth. With this, the political approach to the universal culminates in the problematic status of mathematical symbols, problematic because they themselves appear to be either "free creations of the human mind,"[4] or must be considered as being of divine origin: "God made the integers; all else is the work of man."[5] Even if we refrain from attributing them any kind of positivity—and in that respect the immenseness (literally the *immeasurableness*) of the very fact that there is life, nature, thought, consciousness, and death—by maintaining that mathematical symbols are ciphers, the question of how we might reason the triad of *arché*, *arcanum*, and *articulation* into a properly meaningful fabric of *sense* remains the crucial issue. Jacques Derrida and Alain Badiou maintain, for example, that mathematics deals with ciphers of voidness and absence, neither properly negative nor positive. With this, they both hold on to respecting the mystery of Being. But with positioning law as the cipher of finitude,[6] politics is subjected to an economy of death as the only assumedly possible framework within which one might attend to life-in-general. In this manner, mathematics, universality, and with that the very condi-

4 Richard Dedekind, *Essays on the Theory of Numbers*, trans. Wooster Woodruff Beman (Mineola, NY: Dover, 1963 [1858]), 31.

5 Leopold Kronecker, cited in Eric Temple Bell, *Men of Mathematics* (New York: Simon and Schuster, 1986,) 477.#

6 See Alain Badiou interviewed by Adam S. Miller, "Universal Truths and the Question of Religion," *Journal for Religion and Scripture* 3, no. 1 (2005), http://www.philosophyandscripture.org/Issue3-1/Badiou/Badiou.pdf.

tions for politics, aspire to formulate *generic life.* And this shifts the concern with the universal in a political sense to another level: that of the forms of thinking according to which formulations of generic life formulate its (generic life's) "nature" as "universal nature." It is always systems of how to think about life in its "truth" that constitute the basis for Law and political Rights. While metaphysical manners of thinking seek such nature in qualities, and emphasize conceptual forms of thinking about qualities, modern scientific and critical philosophy seek to formulate the nature of generic life quantitatively, and emphasize mathematical forms of thinking. The implicit assumption is in both cases that "naturalness"—and hence the reference for how legal rights are distributed and articulated—be expressible primarily in either one of these symbolic forms: the conceptual or the mathematical. It is obvious how Schmitt's concern, that any purely secular understanding of politics and law must (1) either consist in a certain forgetfulness of its own conditions, namely the theological principles that politics and law unwittingly invoke and require, or (2) that they themselves must turn "religious" (at least in a formal sense) when demanding of their subjects the schematically conforming performance of particular methods that are meant to counter such forgetfulness—a demand which is, inherently, in contradiction with the acclaimed non-doctrinary character of experimental, critical, mathematical, and objective science.

The dilemma of secularized politics and law lies in how to conceive of the proper finitude necessary to define the mathematical form of thought: *method per se*, without being rooted in some sense of transcendent nature axiomatic of Euclidean geometry or any other set of axioms, seems ill suited not for particular, but for principle reasons: mathematics itself is the domain where methods are invented. As a form of thought, the mathematical is purely symbolic: the more rigorously methodical it becomes, the more abundantly inventive it becomes; we can observe this in the drastic evolution of mathematics since the sixteenth century. It constitutes a symbolic corporeality of *reciprocal* determinability. Mathematics is just as little a dead corpus as language is a dead corpus; it lives within the infinite as its very element. Algebra, as we will see in a moment, is generally understood as "providing with finite means ways of managing the infinite."[7] Like that, no particular body of reciprocal determinability ever exhausts the power of the infinite, of which mathematics captures, symbolizes, and appropriates more and more throughout its ongoing "genesis." Hence, every sentencing of its vivid corporeality into a *corpus* that is *stated* introduces artificially—arbitrarily and deliberately—economic conditions that are to determine what may count as possible or impossible, feasible or unlikely, and so on. These conditions are

7 See Vaughan Pratt, *Stanford Encyclopedia of Philosophy*, s.v., "Algebra" (2014), http://plato.stanford.edu/entries/algebra/.

almost inevitably fitted for supporting the particular political manners of governing that claim to find their legitimization in such a stated corporeality. If law and politics use mathematical forms of thought as their "secular" grounds of legitimation, they must necessarily anchor themselves within a *particular* body of reciprocal determinability, and hence face the dilemma of sentencing the mathematical body within which they root to rigidly conform to one particular symbolic regime. In effect, law and politics elevate themselves above science precisely *in* aspiring to conform to nothing else but the manifestations of that which counts as objective. This conflict indeed seems to be at stake in the so-called foundational crisis of the late nineteenth and early twentieth century, when it became bluntly undebatable that the elements of mathematics are *symbolically* constituted, and thus rest, at least to a certain degree, on the conventional grounds of notational systems.

Around the 1850s, George Boole reformulated the legacy of syllogistic reasoning in such a manner that logics itself became the object "computable" by algebra's symbolic systems of reasoning—systems of reasoning being plural, importantly. For Boole, it was clear that thinking itself must be attended in its bursting nature, a nature that necessarily exceeds any one form of thinking in particular. Yet such a view cannot be accommodated within a purely secular understanding of science, as it puts at its very heart a "spiritual" nature. Undoubtedly, this is the background in which people like Edmund Husserl and Sigmund Freud considered a genuinely psychical quantity notion,[8] and developed proper phenomenological and psychoanalytical methods of how they ought to be dealt with. What we have experienced throughout the twentieth century is an unfortunate split in delegating all psychical aspects of reality to "soft" or "subjective" sides of sciences (the humanities), while maintaining an understanding of mathematical quantities largely untouched and nonresponsive to their algebraic "deliberativeness" for the "hard" and "objective" side of sciences (engineering and natural sciences).

It is with the popularization of computers and information technology at large that this division into distinct departments becomes increasingly less tenable, as they produce abundant artifacts that shape and condition our lived realities with "mathematical" power combined with "subjective" deliberation. The symbolic corporeality of reciprocal determinability has turned into a symbolic apparatus of objectivity, which can no longer be considered "natural" (as opposed to "artificial"). Thus, the dilemma that Balibar's paradox formulates reaches deeper than the levels that he himself (and many of the political philosophers who theorize universality in relation to questions of legal

8 Freud, by applying the mathematical methods of analysis and functions to psychical "content"; and Husserl, in his habilitation thesis entitled *Über den Begriff der Zahl: Psychologische Analysen* (1887).

rights, political subjectivity, and citizenship) usually addresses. The paradox at stake relates both strings of thought—natural belonging and mathematical truth—together. As such, enunciating the universal emerges as a paradox, because (1) when we claim to be objective, by the secular standards of scientific method rather than on grounds of a particular belief or ideology, we associate the universal with the mathematical; and (2) no one is, properly speaking, "native" to that realm of the mathematical. To put it in other words: anyone who wishes to enunciate a mathematical notion of universality must en-familiarize herself with it through intellectually appropriating the customs of this realm. Yet these customs lack an originality and pureness that could be restored, laid bare, or instituted in their proper rights. We might say instead that the realm of the mathematical is an abstract continent of ongoing origination, self-engendered through the symbolizations of its proper forms of thinking.

The problem again seems twofold. On the one hand, appropriating the customs of the mathematical comes at a huge cost: namely, to deliberately grow into a stranger to what we believe to be our native selves—the ways of everyday conduct into which we are all, in our singular ways, born and within which we are more or less well accustomed. That this is so, we learn from all the discourses around identity politics, postcolonialism, international law, and so on. On the other hand, such en-familiarization to an abstract symbolic "continent" requires an estrangement from ways of conduct which we feel to be native, and which are dear and valuable for that reason; this not only requires intellectual efforts for being achievable at all, but it also animates intellectuality to grow capable of developing mastership on the new grounds—that of the mathematical—*in an infinite variety of ways.* Hence, difference is again introduced into the realm of a common and generic nature. Proportional to how successful we are in en-familiarizing ourselves to mathematical truth as our origin, we learn to master its conditions to greater or lesser degrees.

Attempts to "state" the universal seem, inevitably, to corrupt the very intention behind doing so: namely, to establish and control living conditions that may count as truly just and unbiased. Tragically so, the "mathematical language" in which "the book of nature" is written has turned out, between Galileo Galilei and, let say, Alexander Grothendieck, *not* to be a hoped for quasi-original language that would relieve the people who speak it from all needs and power to interpret and communicate. This is, or so we can at least speculate, why Balibar speaks of enunciation and thereby makes reference to Émile Benveniste's linguistic theory of utterances. Benveniste had raised some structural problems of a general linguistics, which, I would suggest, extend no less over mathematical language than over the languages of mother tongues. With his theory of utterances, Benveniste sought to open up an intermediate condition between the formal space of statements in logics (in mathematical language this would correspond to algebraic sets and categories) and the morphological space of sentences in grammar (which would correspond to the diagrams in topology): "As individual production, utterance can be defined, in relation to language, as a process of 'appropriation,'" he writes. "The speaker appropriates the formal apparatus of language and utters their position as speaker by means of specific signs, on the one hand, and by using secondary procedures, on the other." As a consequence, he continues, "the individual act of appropriation of language places the speaker in their own speech. The presence of the speaker in their utterance means that each instance of discourse constitutes an internal point of reference."[9] To put it a bit drastically, it seems as if the language confusion, which is said, allegorically, to have resulted from building the Tower of Babel, has spread from the realm of language and the conceptual to the realm of the mathematical. Instead of the allegorical diaspora of one people into many peoples, who begin to occupy their respective territories in competitive manners, the abstract continent, while promising to welcome and accommodate anyone who speaks the language of mathematics, disperses into a number of bodies of reciprocal determinability—into many competing symbolical bodies of universal genericness. Each of these symbolical bodies provides and cultivates different customs of coding, and hence different realities of laws and rights. What I want to consider is that if we affirm that mathematics is a language, we can attend to its formulations and articulations as a kind of textuality that articulates a generic voice. Its articulations and formulations are relevant for *the many* and they are conserved *in all that is computable.* Every instance of a generic textuality does no more, but also no less, than providing and distributing the wealth of intellectuality throughout the reign of objectivity.

I GENERICNESS AS SYMBOLICAL BODY OF RECIPROCITY

> "Never forget the place from which you depart, but leave it behind and join the universal. Love the bond that unites your plot of earth with the Earth, the bond that makes kin and stranger resemble each other."[10]

ENUNCIATING THE UNIVERSAL When we attend today to Galileo's famous statement that nature may well be written in a book, yet that this book be written in the language of mathematics, we usually

9 Émile Benveniste, "L'appareil formel de l'enonciation," *Langages* 5, no. 17 (1970): 14; my own translation.

10 Michel Serres, *The Natural Contract*, trans. Elizabeth MacArthur and William Paulson (Ann Arbor: University of Michigan Press, 1995), 50.

treat it as a metaphorical statement. We tend to feel that mathematics is not a language. It is more immediate, a structure or an order that is independent of mediation, interpretation, and rhetorical instrumentalization. In this manner, I referred to mathematics as an abstract continent, which has for centuries now promised to welcome and accommodate anyone who proceeds according to its methods. But with information-based computation, the perspective of seeing in mathematics a language must appear much less metaphorical today. Hence, what I would like to consider in the following is how this dilemma is intimately related to the role of algebra within mathematics, and furthermore, with the constitutional status of algebra for computing. In computing, algebra indeed appears, in a sense that almost feels vulgar, as a kind of mathematical language. But the perspective of regarding algebra in this manner is far older than actual computers as we know them today, and it was perhaps most prominently pursued by Gottfried Wilhelm Leibniz and Baruch Spinoza in the seventeenth century, and then again by the algebraists in the nineteenth century. At issue for this perspective was, then as today, how we could make sense of objects if their extension in time and space is rooted within an analytical and abstract construction, and not within a directly measurable, real, and concrete immediacy of *datum* (givenness). To illustrate in perhaps the quickest manner what such rootedness within analytical extension involves, we can recall the Cartesian distinction between two substances, *res extensa* and the *res cogitans.* This distinction is hardly overestimated if we consider it crucial for modern science at large: science that is rational, experimental, and objective, because it only settles with statements that are backed up empirically. Discarding mathematical proofs without empirical basis from scientific methods acted as a lever to lift science from dogma. But it also opened up a particular lacuna: symbolic notations multiplied, and acquired specific capacities. Whereas arithmetics used to be self-evidently applicable in a uniform manner to all that can be counted, there began to emerge particular systems of symbolic reasoning, of which not all embodied the same capacities for treating problems. In short, calculation acquired an indeterminate prefix, and began to need specification with regard to the nature of the system whose deduction it was to govern. By the nineteenth century, there were numerous calculi around, and indeed, it became difficult even to distinguish between "a calculus" and "an algebra." It is in this situation that Boole set out to postulate that there is a nature proper to thought in the same manner as there is a nature proper to physics. He conceived of his *Laws of Thought* not as axioms in any logically foundational sense, but as conservational laws in a manner analog to how physical laws are conservational laws. In other words, Boole's laws of thought were not a kind of police system that is to control behavior; rather, they are laws that allow for an empirical approach also to the Cartesian *res cogitans.* With such an outlook, the

physical reality, in its status as the *transcendent referent* of mathematics, was challenged by a complementary "reality"—that of the symbolic. This is what stands behind the rising interest by mathematicians toward the end of the nineteenth century in establishing psychology as a natural science—on equal par and next to physics (Freud), or mastering physics (Husserl), or subjected to physics (Bertrand Russell, school of logical empiricism). We will come back to this bifurcation in the second chapter of this text, where we will discuss a few of the *lemmata* that arise from it in more detail, with an eye to their historical context and, especially, with regard to our question of what is at stake with the notion of the universal.
But first, let us attend to how these backgrounds have given way to the rise of programming languages, and how we might think about the "analytical extension" at stake in computing as a universal kind of text whose elements are generic and whose extension is objective, in the sense of not being "authored" by any one voice in particular.

UNIVERSAL TEXT, GENERIC CODE, PRE-SPECIFIC DATA

Universal text, I will argue, manifests not only a kind of writing that is more profound, and more abstractly decoupled from writing that captures and represents voice and articulation, as Derrida suggests. Universal text also manifests as a generic body-to-think-in, along the following lines: (1) like language, universal text is collectively engendered before it can be individually appropriated; but, also like language, it dies, turns stiff and formulaic once it ceases to be inhabited; (2) a generic body-to-think-in does of course have a form of organization, but the referent of this form is not transcendent to it, rather it is engendered in an immanent manner. Conditions for transcendentality *within* the immanence of a distributed body, organized through the way this body collects itself, are provided from the distributed collectivity *as it insists.* A generic body-to-think-in does not, properly, *exist;* and we cannot think of it as a *being,* because its essence is not perennial but self-predicative—its very nature is to engender its own nature. We should rather say, universal text conserves what remains invariant throughout all the forms and characters into whose expressions it might in principle engender itself. Universal text's collective originality does not follow the linear order of progeny, but is comprehensively and circularly constituted. But unlike Derrida's idea of an apparatus of arché-writing, generic textuality is not itself dead; it is quick and vivid, and its vividness is animated by no other transcendent principle than that constituted by the open totality of all the acts of learning that it comes to collect and organize. It is not a logics that follows an economy of parceled finitude (death); it is an animal that lives and prospers from how it is treated—generic textuality is animated by literacy. Its appropriation does not deprive or consume it, but enriches and engenders it. Thus, neither is it a logics that follows an economy of properties (life); rather might we see in it an infinitely wealthy principle, distributing rights of birth for all things in their universal origin.

ADA LOVELACE, THE ENCHANTRESS OF NUMBERS Let us begin by considering the backgrounds of programming languages. Ada Lovelace, the daughter of the somewhat scandalous poet (and freedom fighter) Lord Byron, is famous for the major leap in thinking that stands behind the paradigm of computational language. She considered that Charles Babbage's *The Differential Machine*, and its successor *Analytical Engine*, incorporate an abstract space in "manifest" (symbolical) form, such that it could be coded. The problem that Babbage's machines address is very pragmatic: they were both devised to automatically compute trigonometric calculations and logarithmic tables on which British Trade depended while sailing over the seas. The library entry of the European Graduate School gives a lively account:

> Charles Babbage came up with the idea about the time the Analytical Society was founded in 1812. He was sitting in front of a set of logarithms that he knew to have errors. At that time there were people, called "computers," that would compute parts of logarithms in a sort of mass productive enterprise. Babbage had the thought that if people could break down bits of a complicated mathematical procedure into smaller parts that were easily computable, that there must be a way to program a machine to work from these smaller bits and compute large mathematical computations, and to do so more quickly without human error.[11]

Lovelace was a mathematician, but her interest in Babbage's engines was precisely not that they operated mechanically on bundling arithmetic sequences in handy bits and pieces, but that the numbers actually open up an entirely different kind of space to think in. She was the first to consider that the numerical space, as it is "manifest" in such an engine, could actually have memory, and hence be structured in much more complex ways than the ideas of nonstriated number spaces on which arithmetics usually relies. Much more, she thought, a numerical realm with memory and differential, heterogenous coordination can be structured such that it can host activities not unlike the verbs are hosted by the grammatical structures of nouns, prepositions, and adverbs. That is, in different temporal forms that allow for storytelling, or, as we are more likely used to saying, to encode several activities into what we call "procedures." From a contemporary perspective, we could say that she attended to the mediality of numbers, not only to their in-

11 "Charles Babbage – Biography," European Graduate School, http://www.egs.edu/library/charles-babbage/biography/.

strumentality: it is still means to an end, yet the end does not count as being predetermined a priori. Rather, it is informed by what the means is capable of achieving—much like since the so-called linguistic turn in philosophy, we attend to the mediality of language within a transformational notion of grammar (see Noam Chomsky). Lovelace has been called "the Enchantress of Numbers,"[12] because she thought about the numbers in these engines as notational codes, and on this assumption she could invent the first theory of how to do what we today call, somewhat colloquially, "programming." But these are retrospective descriptions, and I put them in somewhat suggestive terms. Lovelace says:

> Many persons who are not conversant with mathematical studies, imagine that because the business of the engine is to give its results in numerical notation, the nature of its processes must consequently be arithmetical and numerical, rather than algebraical and analytical. This is an error. The engine can arrange and combine its numerical quantities exactly as if they were letters or any other general symbols; and in fact it might bring out its results in algebraical notation, were provisions made accordingly. It might develop three sets of results simultaneously, viz. symbolic results [...]; numerical results [...]; and algebraical results in literal notation.

This latter, she continues,

> has not been deemed a necessary or desirable addition to its powers, partly because the necessary arrangements for effecting it would increase the complexity and extent of the mechanism to a degree that would not be commensurate with the advantages, where the main object of the invention is to translate into numerical language general formulæ of analysis already known to us, or whose laws of formation are known to us.

We can see where her way thinking was, to a certain degree, in conflict with the pragmatic task at hand. "But it would be a mistake to suppose," she is careful to point out, "that because its results are given in the notation of a more restricted science, its processes are therefore restricted to those of that science."[13] This last remark contains Ada Lovelace's leap in thinking, and here, her contribution of an additional and genuinely intellectual dimension to the mechanical instrumentality to the genius of Babbage is fully enunciated. Thus, let us look briefly, with Lovelace's leap of abstract conception still in mind, at the much more recent development of how such thinking situates itself in

12 See Betty Alexandra Toole, ed., *Ada, the Enchantress of Numbers: A Selection from the Letters of Lord Byron's Daughter and Her Description of the First Computer* (Mill Valley, CA: Strawberry Press, 1992).

13 Ada Lovelace, translator's notes on *Sketch of the Analytical Engine Invented by Charles Babbage*, L. F. Menabrea (Geneva: Bibliothèque Universelle de Genève, 1842), http://www.fourmilab.ch/babbage/sketch.html.

an encodable number space that can host grammars for formulating computational utterances. Moreover, we can imagine these "abstract" activities that Lovelace envisioned as that which can be staged and dramatized, through programming, in a number space that is, peculiarly so, *symbolically literal.*

Two very strong paradigms in programming throughout the last decades can be distinguished. Early languages such as Fortan, Ada, or C started out with a procedural paradigm. The main interest with these languages was to make available for easy application, as a kind of toolbox of "instruments" in coded "form," the precise way of how a certain organizational procedure needs to be set up in order to function well. Think of SAP,[14] for example. The developments in this paradigm are driven by the fact that every step of decision can thereby be "dispersed" into constitutive procedures, and hence, an infinitesimal limberness can be introduced into organizational forms. The paradigm subsequent to the procedural one pursued a much less directly hands-on approach, and instead became more didactic. With languages like smalltalk, Java, and C++, an object-oriented paradigm follows the procedural, and it keeps apart the *what* (described by procedures) and *how* (the specification of this what). Through this distinction, negotiation begins to be supplied by "computational augmentation" about what is to be reached, and about how systems can be devised that allow the instantiation of procedures (whats) in much wider variations. Object-oriented programming allows devising entire libraries of abstract objects that do not depend on a statically specified order or classification system. Such abstract objects are called generic, and if we consider the algebraic genericness as the levels of abstraction in which things are treated in their powers, we can understand that they are not really "objects" at all. It be much more adequate to say that they incorporate entire "objectivities": they allow for one-of-a-kind particulars to "concretize" singularly, and be fitted optimally according to the local and contextual requirements of a task—and this not despite their mathematical formulation, but precisely because they are specified instances of universal enunciation, in the manner of algebra.

ALGEBRAIC PARADIGMS So let us look at algebra more slowly, by following its discussion in a dedicated article in *Stanford Encyclopedia of Philosophy.* Algebra is "a branch of mathematics sibling to geometry, analysis (calculus), number theory, combinatorics, etc.," we are told, although, as the article continues, "in its full generality it differs from its siblings in serving no specific mathematical domain. Whereas geometry treats spatial entities, analysis continuous variation, number

14 SAP is the name of a widely used enterprise software to manage business operations and customer relations.

theory integer arithmetic, and combinatorics discrete structures, algebra is equally applicable to all these and other mathematical domains."[15] What we can immediately see from this is twofold: (1) it is commonplace to regard algebra on equal par with other mathematical disciplines, in a manner that is "instrumental," and not "constitutive," as I would like to argue—it is presented as a brother or sister to them, not their parent; (2) however, we find support for the noninstrumental perspective immediately: unique about algebra among its siblings is, we are told, that it is independent of any domain in particular. A bit later on, when it comes to why algebra is of philosophical interest, the implications of this get even more explicit: "Algebra is of philosophical interest for at least two reasons. From the perspective of foundations of mathematics, algebra is strikingly different from other branches of mathematics in both its domain independence and its close affinity to formal logic."[16] Herein lies the problem at stake in conceiving mathematics as language: whether it is governed and organized by algebra or by logics is the point of debate and lobbying. And yet, isn't it rather strange to see them in competition, if we follow how the article continues?

> Algebra has also played a significant role in clarifying and highlighting notions of logic, at the core of exact philosophy for millennia. The first step away from the Aristotelian logic of syllogisms towards a more algebraic form of logic was taken by Boole in an 1847 pamphlet and subsequently in a more detailed treatise, *The Laws of Thought*, in 1854. The dichotomy between elementary algebra and modern algebra then started to appear in the subsequent development of logic, with logicians strongly divided between the formalistic approach as espoused by Frege, Peano, and Russell, and the algebraic approach followed by C. S. Peirce, Schroeder, and Tarski.[17]

This observation, that algebra has played a crucial role in the development of logics over the millennia, gives the actual structure the encyclopedia article follows. On its basis, it distinguishes three "generations" of algebra: elementary, abstract, and universal. The article makes no suggestion of how these generations are related to one another. This is rather confusing because the separation into elementariness, abstractness, and universality seems to suggest that they all unfold within a common scale where they gradually, and in a kind of bottom-up manner, extend their scope. This invokes a narrative of progressive approximation of a final goal—universality, the most recent generation of algebra, supposedly being the place to be reached. If we assumed instead that the generations corresponds to different levels of abstractness—each of which further

15 Pratt, "Algebra."
16 Ibid.
17 Ibid.

correspond to notions of elementarity, abstractness, and universality specific to each level—we can rely on such a generational model of algebra in order to compare how these notions can be formulated in a variety of manners. In the third part of this text, I will outline such a model by suggesting that each level of abstraction be a stage of "homothesis"—that is, of how relations of equivalence and identity can be formulated. It is within such a space of homothesis, I will argue, that scenes of originality can be staged in different manners: elementarity associates algebra to geometry and forms, and establishes the construction frame of a space of homothesis; abstractness associates algebra to arithmetics and numbers, and provides the axiomatic frameworks within which particular inventories (calculi) of how to count, occupy, and govern a space of homothesis can be developed; universality associates algebra with the alphabeticity of language and the articulation of invariant quantities, and allows to saturate the stage of abstraction with sense. The crucial shift in taking the mathematics-as-language-perspective culminates in the nature of these invariant quantities: they need not anymore be restricted to phonemes, to quantities that articulate the stream of breath, but rather we can read movement as a stream to be articulated, or equally, energy can be read as such a stream. But for now, and just to get more familiar with this difficult relation between logics and algebra, we will stick close to the generational distinction as is proposed in the *Stanford Encyclopedia of Philosophy* article. Let us recall that algebra provides "finite ways of managing the infinite," as the article states, by elaborating *general procedures* of how we can enumerate and count *possible solutions* that can be found for *a problem insofar as it is formulated in general terms.*

The article speaks about elementary algebra as having provided, throughout the history of algebra until the nineteenth century, finite ways of managing the infinite.[18] It elaborates: a formula such as πr^2 for the area of a circle of radius r describes infinitely many possible computations, one for each possible valuation of its variables. A universally true law expresses infinitely many cases, for example the single equation $x+y = y+x$ summarizes the infinitely many facts $1+2 = 2+1$, $3+7 = 7+3$, and so forth. Each of its methods is also applicable to many

18 The article marks the developments in the nineteenth century, which it labels "abstract algebra," as a singular event in an otherwise continuous history, an event that shatters all continuity that could possibly be expected from the (contemporary) developments he labels as "universal algebra." This is a view to which I do not subscribe. It would seem much more plausible to treat what Pratt distinguishes as "elementary" versus "universal" as being a rotational return of the same elementary character of algebra, yet on a different level of abstraction. We could then see in abstract algebra, which Pratt treats as a singular and intervening event, the logical "lever-phase" that institutes a new stage of abstraction. According to this scheme, we could look hypothetically to find similar "lever-phases," for example, before the invention of infinitesimal calculus, or before the adoption of the decimal number system, and so on. But as this is not the place to develop this view in any adequate detail, I will follow largely the structure proposed by the article.

nonnumeric domains such as, for example, subsets of a given set under the operations of union and intersection, words over a given alphabet under the operations of concatenation and reversal, or permutations of a given set under the operations of composition and inverse. Each such corpus of application is called "an" algebra, and it consists of the set of its elements and operations that rule over certain elements. Here, each algebra is treated in a fixed and closed-off manner. We can say that what is provided in them are distinct *inventories* of coding. These inventories allow to encode *particular situations* (events) in manners that allow them to appear as a case—that is, as an instance of a general form for which the inventory provides the means for computing possible articulations, declinations, conjugations, and so on.

We can imagine the relevance of these inventories for science by considering that its symbolic constitution was, for example, crucial for learning to deal with quantities that must appear, in any intuitive sense, as genuinely "unreal"—as negative values, infinitesimals, imaginary units. In effect of dealing with them purely *symbolically*, instead of *intuitively*, algebraic inventories allowed, for example, to go from mechanics to dynamics: elementary algebra opens up toward counting the movement of elements in space (mechanics), and abstraction opens up to the interplay of elements in time (dynamics). Together, they introduce new magnitudes (speed, heat, and eventually electricity and information), and thus engender a whole wealth of new possibilities that can now be realized—thermodynamics, the clocking and control of processes in systems that are steadily supplied with power by the steam engine, the translation of this systemic view to working conditions, the invention of electricity, and so on. Algebraic inventories deal with symbols whose referents may be left arcane—in this sense, algebra can work with assumed quantities that, strangely so, are not really (physically) there. An infinitesimal is an infinitesimal exactly because it has no extension in space even if it has one in time, and the imaginary unit not only proportionalizes "complex" quantities, but, strictly speaking, it proportionalizes "virtual" quantities—virtual in the sense that if we try to picture them, they have a discretized extension in time without having one in space. In his 2007 book *History of Abstract Algebra*, Israel Kleiner writes illustratively:

> [Rafael] Bombelli had given meaning to the "meaningless" by thinking the "unthinkable," namely that square roots of negative numbers [imaginary units] could be manipulated in a meaningful way to yield significant results. This was a very bold move on his part. As he put it: "it was a wild thought in the judgment of many; and I too was for a long time of the same opinion. The whole matter seemed to rest on sophistry rather than on truth. Yet I sought so long until I actually proved this to be the case."[19]

19 Israel Kleiner, *A History of Abstract Algebra* (Basel: Birkhäuser, 2007), 8.

Kleiner describes what Bombelli meant: he had developed a "calculus," he explains, for how to manipulate these impossible quantities, which signified the birth of complex numbers. "But birth," he points out, "did not entail legitimacy."[20] This question of legitimacy arises because computing with such arcane symbols added a new dimension to mathematics with striking consequences: the input of certain values in a formula may now not only turn out to be unsolvable because of lack of solutions, it may also yield a solution space that is so vast in options that none of the possible solutions seems more necessary than any other.

The next generation of algebra is called abstract algebra. Whereas elementary algebra is conducted in a fixed algebra, as distinct inventories, abstract algebra treats *classes* of algebras having certain properties in common, typically those expressible as equations. Such general properties represent an axiomatic unity. In this generation, which emerged in the nineteenth century and was introduced via the classes of groups, rings, and fields, inventories of elementary coding are comprehended within larger frameworks—generic frameworks—that allow for generalizing the elements which they comprehend in different ways. With this, the central interest was no longer to find a particular solution, but to modulate and synthesize entire solution spaces by exploring the symmetry structures among them. Abstract algebra establishes, we might say, on the basis of elementary inventories for coding, generic spaces of potentiality. Within these generic spaces, the main goal is to expand the vastness of generically formulated solution spaces. Such solution spaces are *rendering* spaces for transformations (temporal change). With them, algebraic inventories can be elaborated into ontologies, into generically "natural" *Gestalten*.

With this, we are in the third generation of algebra: universal algebra. In universal algebra, the movement of analysis is no longer one that departs from cases and seeks to find generalization. Analysis in universal algebra is inverse: it assumes a generalization *speculatively*, and computes "backwards" in order to see whether one might empirically find cases that correspond to these generalizations. Whereas elementary algebra treats equational reasoning in a particular algebra (inventory for coding), and abstract algebra studies particular classes of algebras (generic solution spaces), universal algebra studies classes of classes of algebras, by attending to the categoricity incorporated by the inventories. It begins to explore the problematicity proper to the abstract and generic solution spaces. Universal algebra does not *apply* inventories of coding, nor does it *conform* to the conceptual generalization of the inventories into classes and sets (generically "natural" forms); it *adjoins* speculatively specified natures to the generic ontologies, and thus, by challenging them to grow ever more capacious, prevents them from

20 Ibid.

resting firmly. With this, universal algebra destabilizes the link between mathematical formalization and empirical falsification, because it treats any solution that can be computed as an arbitrary case. It regards any one formulation of a problem as problematical—that is, as genuinely indeterminate and yet (possibly so) resolvable.

Let us work out the contrast more strikingly: abstract algebra operates within a notion of fully determined general and conceptual nature, where a correct computation corresponds to a necessary framework within which a solution is to be found, and within the confines of which it allows for gradual variation. Universal algebra, on the other hand, operates within the impredicative horizon of definable frameworks, within which solutions can vary not only gradually, but also categorically—the values of its formulations can be predicated within varieties that may differ in kind.

This was indeed the key critique on Boole's algebraic logics, and it is illustratively expressed in an open letter by one of his contemporaries in the mid-nineteenth century:

> The disadvantage of Professor Boole's method is [...] he takes a general indeterminate problem, applies to it particular assumptions [...] and with these assumptions solves it; that is to say, he solves a particular determinate case of an indeterminate problem, while his book may mislead the reader by making him suppose that it is the general problem which is being treated of. The question arises, is the particular case thus solved a peculiarly valuable one, or one more worthy than any other of being solved? It is clearly not an assumption that must in all cases be true; nor is it one which, without knowing the connexion among the simple events, we can suppose more likely than any other to represent that connexion.[21]

Boole's methods were not shown to be faulty or inconsistent—the reason why they had been disliked or even spurned by so many was the immense depth of horizon they had opened up. The openness of this horizon results from regarding intuition not as based in a sensible quantity notion, referring to something that extends in both time and space, but as referring to an intellectual quantity notion. It is a distinction that affects the very heart of critical philosophy. Immanuel Kant himself had considered this possibility before discarding it. In a short appendix to the second book of his *Critique of Pure Reason* entitled "The Amphiboly of Concepts of Reflection," Kant criticized Leibniz's thoughts on a universal characteristics, in particular that they departed from an intellectual notion of intuition instead of a sensible one; he rightly observed that in

21 A letter by Henry Wilbraham, published as a supplement in *The Philosophical Magazine* 7 (June 1854); cited in Rod Grow, "George Boole and the Development of Probability Theory," http://mathsci.ucd.ie/~rodgow/boole1.pdf.

consequence of this, judgments about a thing in general—that is, about an object—can never be possible in an unproblematical manner.[22] With this development, mathematics opens up an abstract domain for developing and raising our faculties to make judgments—yet daringly decoupled from all grounds that could, unproblematically, be considered grounded in "natural" reason. This is why, as I want to argue here, we ought to begin considering our abilities to compute in terms of literacy.

It is surely due to these reservations that Boole's algebra, like the contributions of Hermann Grassmann, Bernhard Riemann, and others, were met with the greatest possible suspicion by their contemporaries. It is hardly exaggerated to say that within philosophy, the view on algebra as a *natural and vivid* language that is capable of articulating the universal in different manners (either in the elementary or universal form of particular cases or in the abstract form of generic logics) fell onto deaf ears except for some enthusiasts like Charles Sanders Peirce and Alfred North Whitehead, until Claude Shannon realized that Boole's logic could be applied to electrical current. On this basis he invented his *Mathematical Theory of Communication.*[23] The revival of the view on algebra as language, and as constitutional rather than instrumental for mathematics at large, is very recent (category theory developed roughly from the 1960s onward), and it still tends, today, to be regarded as "too abstract to be useful" by many.

And yet, in what kind of world would we find ourselves if we began to consider that through information technology, universal algebra is de facto constitutive for nearly all domains in how we organize our living environments today?

II LEMMATA IN HOW TO THEORIZE THE UNIVERSAL WHILE REMAINING NEUTRAL ON MATTERS OF BELIEF

In this chapter, a few of the *lemmata* shall be raised that mark the current impasses and limitations in how the universal can be theorized from a stance that wishes to remain neutral on matters of belief. We have already pointed out that toward the end of the nineteenth century, the project of developing a rigorous method for gaining insights on psychical phenomena that may count as objective as those gained on physical phenomena began to emerge broadly—in part from within the very heart of mathematics (namely number theory,[24] in the case of Husserl's phenom-

22 Immanuel Kant, *Critique of Pure Reason,* trans. J. M. D. Meiklejohn (London: Bohn, 1855), 194–208.

23 Claude E. Shannon, "A Mathematical Theory of Communication," *Bell System Technical Journal* 27, no. 3 (1948): 379–423.

24 See Husserl's early academic treaties on variational calculus and on the notion of number: *Beiträge zur Variationsrechnung* (PhD disseration, 1882); *Über den Begriff der Zahl.*

enological method), or by alluding to the new and emerging sciences of applied mathematics, namely the polytechnical sciences (in the case of Freud, who set out to characterize the human psyche in the generic terms of a dynamical apparatus). The question that gradually gained importance thereby concerns the "nature" (in the sense of "categorical status") proper to technical objects: are they to be considered as generic objectivities? Universal natures? Deliberately designed artifacts? In the following I will move in an indexical and annotating manner through some of those theoretical stances that deal in an explicitly critical sense with the question of technics and artificiality, and their relevance for aiming to formulate universal objectivity.

LEMMA 1: THE UNIVERSAL IN TERMS OF OBJECTIVITY.
LEMMA 2: THE UNIVERSAL IN TERMS OF SUBJECTIVITY.

In reasoning, so the agnostic stance maintains, there is a dimension at work in which we are all, as individuals, dispossessed. This stance expects the objects of such reasoning to be described in a universally valid manner: only under this condition can the concepts that comprehend such objects qualify as scientific concepts. Yet the question remains: to whom, *to what subject*, might we attribute such objective thinking? A universal subject would be a subject that needs to be conceived, somehow, as being capable of predicating the objective without any personal investment, will, or appropriation as privation. Indeed, we can read much of contemporary political philosophy with the lens of the ways in which universal subjectivity is be conceived—from this point of view, almost every contemporary contribution to the discourse roots back to G. W. F. Hegel's *Bureaucracy* as the universal class of such subjectivity, and Karl Marx's turn of it into the *Proletariat*: from Ernesto Laclau's and Chantal Mouffe's *heteronomeous condition of hegemoniality* to Michael Hardt and Antonio Negri's *Multitude,* Badiou's and Slavoj Žižek's ideas about how to conceive of such an *abstract persona whose voice is to matter most* (Žižek's Lacanian-Hegelian *master-slave discourse* and Badiou's *mathematical ontology*) to Giorgio Agamben and Paolo Virno's interest in personifying abstractly the (Marxian) concept of a *general intellect.* What has haunted political theory since the dawn of modernity is the idea of a subjectivity that is at once natural and universal, a truly "generic" subjectivity. A subjectivity that can truly claim to qualify the genus it describes without any reference to properties that would not naturally belong to all of its instances equally—naturally meaning, by their birth, by that which is given from the beginning, with what a thing is "equipped" to "set out" and "start with" in continuing to be itself. Robert Musil famously wrote a novel about a man he portrayed as living within an essential abstinence, without having individual qualities and property; the protagonist aspires to be, tautologically, nothing but a man—hence the book's title, *The Man without*

Qualities. The question that the novel struggles with is that as a character with a life of its own, the protagonist, Ulrich, is inevitably faced with a fact of life that challenges the pages like a sheer impossibility: Ulrich tries to find meaning in his life while refuting all possibilities offered to him by the particular class to which he belongs—as an intellectual, a mathematician by education—namely, that of the bourgeoisie. In vain attempts to reconcile "soul and exactitude," his individual vocation and his individual profession, Ulrich searches for a place and role purely within the "universal class of mankind"—that is, by refusing to accept any privileges that might be granted to him on the basis of his particular individuality-within-the-actuality-of-the-social.[25] Musil's novel is appreciated widely for its capacity to express and thematize in subtle and differentiated ways a particular zeitgeist.

LEMMA 3: THANATOLOGY, OR BECOMING GENERICALLY HUMAN WITHIN AN ECONOMY OF DEATH.

Let us look at a more recent example, which wrestles with the same topos, Bernard Stiegler's *Technics and Time, 1: The Fault of Epimetheus.* Stiegler's book is concerned with the question of humanism. Against the pragmatic eagerness of anthropological attempts at answering to this question, Stiegler reminds us of the Aristotelian distinction between natural beings and technical beings: "Every natural being [...] has within itself a beginning of movement and rest, whether the 'movement' is a locomotion, growth or decline, or a qualitative change [... whereas] not one product of art has the source of its own production within itself."[26] The essence of a technical being, in distinction to a natural being, Stiegler points out, is that no form of "self-causality" animates it. Self-causality is the essence of nature—of things that are born and decay, things that continue a genealogical lineage that unites them, in a distributed manner, through a shared generic origin. In the case of humans, and this is the trouble Stiegler wants to address by relating technics to time, both qualifications of the Aristotelian distinction apply: humans are natural, they are born and they die, but at the same time, humans are also the product of their own art, as the entire history of civilization testifies. Similar to Musil, Stiegler also maintains that man is the *animal without qualities*; yet unlike Musil's narrative, which projects the personal story of an individual protagonist, Stiegler's narrative accounts for this theme on the level of history. Thus, Stiegler's concern is not primarily Ulrich's admirable naïveté of attempting to continue with himself as purely himself in generic terms. Stiegler's concern is a

25 Robert Musil, *The Man without Qualities*, trans. Sophie Wilkins and Burton Pike (London: Picador, 1995).

26 Bernard Stiegler, *Technics and Time, 1: The Fault of Epimetheus*, trans. Richard Beardsworth and George Collins (Stanford, CA: Stanford University Press, 1998 [1994]), 1.

significant twist, abstracted. It is precisely because we cannot possibly succeed in Ulrich's honorable ambition, he maintains, even if we tried hard, that we qualify as generically human. For Stielger, humankind is not only, in its essence, the animal without quality. For him, this is only a derivative observation. What really characterizes man, according to Stiegler's narrative, is that *he had forgotten* in the original act when natural properties were being distributed among all kindred animals. What in Musil is the naivety of an individual's life project, turns with Stiegler into a naïveté that is man's original predicament. Stiegler refers thereby to the myth of Prometheus and his brother, Epimetheus, who, when the appointed time came for mortal creatures to be born, were told to distribute suitable powers as their natural properties among all animate beings. Epimetheus apparently begged Prometheus to do the distribution himself, and asked him to review it after it was done. Plato tells the story in his dialogue *Protagoras*:

> In his allotment he gave to some creatures strength without speed, and equipped the weaker kinds with speed. Some he armed with weapons, while to the unarmed he gave some other faculty and so contrived means for their preservation. To those that he endowed with smallness, he granted winged flight or a dwelling underground to those which he increased in stature, their size itself was a protection. Thus he made his whole distribution on a principle of compensation, being careful by these devices that no species should be destroyed. [...] Now Epimetheus was not a particularly clever person, and before he realized it he had used up all the available powers on the brute beasts, and being left with the human race on the hands unprovided for, did not know what to do with them. While he was puzzling about this, Prometheus came to inspect the work, and found the other animals well off for everything, but man naked, unshod, unbedded, and unarmed, and already the appointed day had come, when man too was to emerge from within the earth into the daylight. Prometheus therefore, being at a loss to provide any means of salvation for man, stole from Hephastaeus and Athena the gift of skill in the arts, together with fire—for without fire, there was no means for anyone to possess or use this skill—and bestowed it on man. In this way, man acquired sufficient resources to keep himself alive, but he had no political wisdom. This art was in the keeping of Zeus.[27]

As such, Stiegler maintains, what is essentially human is to be in advance of one's self—yet, he maintains, this is as much a delay as it is an advance. The means of salvation for human is skills in the arts, and mastership of fire, yet it is an incomplete means because humans also lack

27 Ibid., 187–88; Stiegler citing Plato, *Protagoras*, 320d–322a.

political wisdom. Without political wisdom, developing the power that is meant as their proper "means of salvation" might as well be turned against them.

Stiegler's narrative follows a proper logic, which he believes to be capable of relaxing (or even healing the wound of) this predicament. It is a logics that lives not from thinking itself timeless, but that must keep itself alive through remembering the mythical origin of the thought whose forms it organizes. And the origin of such thought is its own original indetermination. According to the myth of Epimetheus and Prometheus, humankind owes its predication in Genesis, that which makes humans properly humane, to having *been forgotten*. Prometheus equips humankind with the gifts of technics to compensate their being, *originally*, forgotten. Thus it is true that human beings are, generically speaking, technical beings; but coming to terms with our generic nature, for Stiegler, is bound to fail if we pursue it in terms of anthropology—that is, in terms of a logics that assumes an original fullness and determinedness of humankind's identity. Coming to terms with human nature can only succeed if pursued in what Stiegler calls *thanatology*: "The tragic Greek understanding of technics [...] does not oppose two worlds. It composes topoi that are constitutive of mortality, being at mortality's limits: on the one hand, immortal, on the other hand, living without knowledge of death (animality); in the gap between these two there is technical life—that is, dying. Tragic anthropogony is thus a thanatology that is configured in two moves, the doubling-up of Prometheus by Epimetheus."[28]

The originality of humankind consists in its own origin as a *default* that is left empty—that is, pure form without specification. If we reconsider our nature in terms of an original indeterminedness, which was only "compensated for" by the gifts that characterize humankind as a species, and if we invest our intellectual energies into actively remembering this origin, then the tragic way in which human capacity to intellect and reason seems to be bound up with the two generic temperaments of Prometheus (which is foresight) and Epimetheus (which is hindsight), might be temporarily postponed and controlled. Such investment of intellectual energies might well be made in the form of logics, and its pursuit for identifying the proper relations between things. Yet it must be a logics which proceeds, first and foremost, by granting anything that presents itself—all apparent evidence—a proper autonomy and lawfulness about which all that can be said is that it must be different from what appears evident. At this point, Stiegler follows the doctrines of Derrida closely: we must think originality through writing, the latter maintains. For Derrida, writing is the act of bracketing an empty object, and must be considered as independent from the full presence

28 Ibid., 188.

of speech as, for Stiegler, the generic form of humankind must bracket an empty object, and considered as independent from the full presence of humankind in its assumed identity. Both hold onto how logics may organize forms of life and thought. And for both it is a non-metaphysical logics of *reproduction*: for Derrida, literacy has to be considered as an apparatus,[29] and for Stiegler, the nature of humankind has to be considered as an empty default. Only by considering the relation between Derrida's thought about writing and Stiegler's thought about human's origin like this can we see that Stiegler's dramatization of the Musilian theme (man without quality, or rather, positive properties) would be ill understood as an anthropological theory. For Stiegler's position neither seeks to define the generic identity of humankind, nor that which might count, in logical terms, as the negative other to such identity—which Derrida calls *différance*: "the history of life in general."[30] The whole problem consists, Stiegler writes, in this Derridean theme (the history of life in general), and in the sense that death is being given once the "rupture" has taken place—the rupture being humankind remembering that what is essentially human is to be in advance of oneself: "Life is, after the rupture, the economy of death. The question of *différance* is death."[31] In this, Stiegler and Derrida agree; yet on its basis, the former articulates a theory of history as an apparatus that is to account for anthropogony, and the latter articulates a theory of literacy as an apparatus that is to account for the textuality of all knowledge.

LEMMA 4: OUTRAGED ABOUT THE HYPOCRISY THAT REIGNS FOR PRINCIPLE REASONS WHERE THANATOLOGY IS IN POWER.

Michel Serres is as outraged as Stiegler about any positivist anthropological project. For him, too, there is a dimension of dispossession at work in what may count as generically human. Yet he sees this dimension of individual dispossession in what we experience in shared knowledge, literacy, and theory. "Today, it is all about mastering mastery, at stake is not anymore the mastering of nature," he contends.[32] What appears like the one and only outlook to Stiegler and Derrida—to write the history of life in general, according to a logics that organizes its forms in apparatic terms—to him counts as the utmost betrayal, as an act of servile hubris. For Serres, such aspiration seeks to realize the absurdity of eternal motion, or, as he sharpens the formulation of what this means: the mastery of "eternity in actu."[33] Thus, Serres's own out-

29 See Jacques Derrida, *Of Grammatology*, trans. Gayatri Chakravorty Spivak (Baltimore, MD: Johns Hopkins University Press, 1997 [1967]).
30 Ibid., 139.
31 Ibid.
32 Michel Serres, "Verrat: Thanatokratie," in *Hermes III: Übersetzung*, trans. Michael Bischoff (Berlin: Merve Verlag, 1992 [1974]), 127. All translations of this text are my own.
33 Ibid., 136.

rage concerns a certain hypocrisy that he sees elevated to power once humankind settles into the conditions of thanatology. This is so for principle reasons; it is not out of arbitrary coincidence: any apparatus, Serres calls to mind, must (1) be driven from a motor, and (2) feed from energy stocks. While the first point is considered by both Derrida's and Stiegler's apparatic logics (a difference, literally, is considered by Serres as the very principle of any motor),[34] the second point presents problems for a logics that is conceived in terms of an apparatus.

The act of striving to master *eternity in actu* requires us to collapse our relation to the colossal, the immense, the only true source of all humbleness—as Serres holds—the very distinction that there are things that depend upon human powers, and things that don't. The desire to master eternity in actu grows out of fear, despair, and violence, in Serres's opinion. What he sees shaped thereby is an instrument that, because it is declared to be absolute and uttermost mighty, has no purpose or project anymore—the most powerful and most productive "triangle," as he calls it, the "triangle of industry, science, and strategy."[35] He sees this instrument developing along a suicidal vector: for establishing the constitution necessary to support apparatic mastery (knowledge) on purely general grounds, it depends upon activating all forms of reason into a restless state of available mobility within a closed, triangulated parcours.[36] This parcours of pure instrumentality, without purpose, is characterized by Serres as a *motor*—"the abhorrent motor of modern history. Which reproduces itself by absorbing, within its exponential growth, all that it is not."[37] There are several instances of it, as it is part of this motor's structure to be "the greatest of all possible multiplicators."[38] Without a proper purpose or project, this closed parcours circumscribes all forms of reasoning, which are subjected to the categorical demand of obeying how a particular instance of this instrument "plays" them. And each one of the particular instances is geared toward nothing else but feeding from *what it is not*—hence, the "true objective" of each triangle apparatus "is the death of that which has produced the same infrastructure."[39] Serres puts it drastically: "The sum total of all these objectives is genocide. Humanity has turned, collectively, suicidal."[40]

34 Cf. Michel Serres, "Motoren: Vorüberlegungen zu einer allgemeinen Theorie der Systeme," in *Hermes IV: Verteilung*, trans. Michael Bischoff (Berlin: Merve Verlag, 1992), 43–91. Also, Vera Bühlmann, "Primary Abundance, Urban Philosophy: Information and the Form of Actuality," in *Printed Physics, Metalithikum I*, ed. Vera Bühlmann and Ludger Hovestadt (Vienna: ambra, 2012), 114–50.
35 Serres, "Verrat," 104.
36 Ibid., 105.
37 Ibid. Translated in German as "Der abscheuliche Motor der neuen Geschichte."
38 Ibid.
39 Ibid.
40 Ibid.

Knowledge-in-general literally rules in an irresponsible manner, because it listens to nothing that comes from outside the institutions it sanctions. In a servile and suicidally committed manner—"excited to madness"[41]—institutionalized knowledge guides human politics not by striving to accommodate what is observed without ever having been expected. Instead, it rules idiotically—that is, without inhibitions due to its own state of ignorance, sanctioned as the common denominator of all that counts in the name of thanatology's voided forms of integrity. Institutionalized knowledge rules self-righteously, and hence mercilessly, by disposing over death in a manner almost completely immune to irritation and doubt. Such knowledge decides and acts as if on a mission that takes place in the service of life. But life-in-general is life-in-theory, Serres maintains: it is theory raised to control actuality.

So let us look closer at the relation between motor and theory. "Every theory of motion and time, every theory of movement as history, names and constructs a motor which is to power and drive such movement."[42] Here, Serres is in agreement with the point of view of thanatology: movement, theorized, is the quickness of death. Let me elaborate on Serres's argument. A motor needs alimentation. If nothing were to exist outside or next to a motor—if, for example, we'd have a theory of motion and change that characterized life-in-general—then we'd have instituted a theory that governs eternity in actu: "If nothing exists except that which is moved, it can find its aliment only in that which it moves."[43] If we were to find the motor within that which it moves—and nothing else is the claim of history!—that is, after the collapse of colossality as a category that hosts fate and prevents the eternal from ever being fully actual, then the motor depends upon the reservoirs within the very element in which it exists and which it moves. "If the motor is within that which is moved, it functions by reserves, by stocks, by capital which it can find in there."[44] It is a motor that drives time as it takes place, and which constitutes space as things happen in it—an existential motor—by corrupting the very existence driven by it. It is a cannibalistic motor. Theory that feeds on theory. History that feeds on history. Science that feeds on science. "The reservoir—a concept that we find in usage from Carnot to Bergson—keeps producing the energetic surplus that the motor adds to its inert running. This surplus provides a continuation. This 'additional more' is a part that is taken from the whole, the reservoir, the capital. Thereby the entire question extends

41 Ibid., 97.
42 Ibid., 135. The German reads: "Jede Theorie der Bewegung und der Geschichte, der Bewegung der Geschichte, benennt oder konstruiert einen Motor, der diese Bewegung hervorbringen soll."
43 Ibid., 136.
44 Ibid.

to these parts: to the sum of the reservoir, to the consummation of its sum total."[45] Every attempt to measure the sum total of the reservoir meets at least three antinomies: that of space, that of time, and that of the unpredictability of that which can be exploited. "It is not enough to contest that what is moved be finite, that the reservoir be finite, because there are finite things that are of immense magnitude, practically impossible to enumerate, such that on a human and historical scale it comes to be equivalent with the infinite. One only needs to consider the sum of energy that exists in the sun."[46] But if measuring the reservoir is not a viable path to take, because it provides no ground for argumentation, then how to go about it? "One needs to describe directly how the motor functions."[47] Let us then follow Serres's description closely. Such a motor consists, he elaborates, in "the industrial complex at large, linked up with scientific research in its quasi-totality, whereby both are finalized through military application spectrums."[48] Such a motor, Serres continues, "is the most dynamic and most powerful that has ever been produced by history."[49] And yet, he pauses, it is first and foremost a motor, and it is so in several regards: (1) as "it is the product (this means the intersecting plane) of our most effective multiplicators (intervention, production, innovation), it produces an inexorable, steadily accelerating movement"; (2) "it grows exuberantly and occupies space: it keeps growing, autonomously, and spreads equably from limit to limit, without the diverse conditions, which reign here and there, affecting it in any recognizable manner"; (3) it subjects "a more and more capacious ensemble of material, economical, intellectual, human and political elements to its reign"; and, further, (4) it "mobilizes the most advanced innovation and produces the majority, the growing majority of new products and new services."[50] In short: "Propagation, movement, proliferation, expansion, control, novelty, all of these exist in this locus and through this locus."[51] That is, the locus proper to the motor. It is, finally, perhaps the motor *per se*, insofar as it, and this is the fifth point, "homogenizes the partitioning and represents the invariant through the diversity of its frames of reference."[52]

Serres is careful to distinguish that all five points are nothing but a close description of how the motor works, and to sum them up and make any conclusions about them is a different matter. All of this description seems risky, but as long as the relation "between the exploit and the

45 Ibid.
46 Ibid., 136–37.
47 Ibid., 137.
48 Ibid.
49 Ibid.
50 Ibid.
51 Ibid.
52 Ibid.

remuneration product" is "partitive and move[s] between limits,"[53] the risk seems to be fairly small. But, and this is the crucial point, "the new products are of a powerfulness that equals the global reservoir."[54] The motor produces what Serres calls *world-objects*: "objects with the dimensions of the world, in the precise sense of the dimensional equations: for space (ballistic rockets), for the speed of rotation (stationary satellites), for time (the durability of atomic waste), for energy and for heat."[55] We are no longer playing with percentages and partitives, but "with the totality of the available capital, and the game is, decisively so, finite."[56] This is what Serres means with his image of a collective suicidality. It is here that he points to the betrayal of life, of which he accuses thanatocracy. Continuing with generalizing representations of the universal, while the motor that drives literacy and history shows in a wholly unambiguous manner that its finality is nothing less than lethal, Serres maintains that "the totality of the product is geared toward the total destruction of the totality of the reservoir."[57]

It is important to realize that the "madness of theory" of which Serres speaks does not identify a particular and unfortunate dysfunction. For Serres, it is a principle madness that characterizes all theory that does not consider its own measurements in terms of theatricality and dramatized activity. Theory that makes its own stage of abstraction transparent takes the triangle as an objective operator to measure what cannot be measured without specifying it—that is, without depriving it of its generic universality. It attempts to measure, directly, what is immense. Immense does not mean incommensurable, contradictory, irreconcilable—these characteristics apply only if we subject immensity to a metrical principle; if we see geometry as an axiomatic system that *represents* the universal. But how could we think about geometry differently? Geometry can never give birth to what it measures except via physics, Serres maintains, and he insists on applying geometrical measures not in a relation of ideal reference and representation, but within the (algebraic) lawful terms of conserving physical quantities: in the so-called Laws of Conservation (named after Emmy Noether), quantities can be measured of which all that needs to be specified is that they remain invariant throughout any transformation that is possible within a system. Such systems may count as perfectly generic. The laws of conservation of mass energy would be an example of such a system, or the conservation of linear momentum, angular momentum, electric charge, color charge, or probability. In all these systems, no positive definition of the characters of the conserved quantities is needed.

53 Ibid., 139.
54 Ibid.
55 Ibid.
56 Ibid.
57 Ibid., 141.

Before we examine how Serres proposes to account for the character of the universal in terms of invariances, let us take these critical considerations on direct measuring and the role of the triangle while returning to Stiegler's and Derrida's point of view on ontology as thanatology.

LEMMA 5: FROM INVENTORIES TO APPARATUS.

Categories, in the empirical tradition after Aristotle, govern all notions of order independent of the assumption of one highest kind or an abstract universal principle, like those of Unity, Beauty, Justness, and the like. Although, this is not accurate: arguably, the sun must be understood as a universal principle of the empirical tradition, because it casts shadows on all things equally and hence renders them comparable by geometrical measurement and description. If we measure the shadows, anywhere and at any point in time, we will receive the same description—if we do it systematically. Thus, by means of geometry, we can qualify a thing's nature, make it distinguishable and integrable into a collective. For that, *measuring* (magnitude, asking *how much*) and *counting* (multitude, asking *how many*) were intimately related in a veritable *philosophical grammar of quantity*,[58] the predecessor to modern mathematics as logical concepts of terms of sets. The outcome of categorial thought was the invention of inventories of pure forms that seek to comprehensively characterize all that is natural about natural beings. Aristotle distinguished ten different categories, among which we find quantity (e.g., four-foot), quality (e.g., white, grammatical), state (e.g., wearing shoes), date (e.g., yesterday, last year), and relation (e.g., double, half). Perhaps the crucial change that took place with the advent of experimental methods in science around the sixteenth century, as opposed to the Aristotelian empirical tradition, was with regard to the role of these inventories. In science as well as in governance, the new manner of working systematically gradually began to discredit the manners of counting things on the basis of inventories that were meant to classify entities. Rather, experimental manners of working systematically began to realize that those inventories can be reckoned against each other, with significant *profit.* What counted as means to qualify different species of beings according to their different natures gradually turned from indexing natural kinds of beings to indexing being-in-general. The modern notion of laws came to factor out the authority of categories and their tabular organization in inventories. Laws cease to count on the basis of particular inventories that claim to specify, as best possible, what is actually given.

58 For a detailed discussion on this distinction, see Howard Stein, "Eudoxos and Dedekind: On the Ancient Greek Theory of Ratios and Its Relation to Modern Mathematics," *Synthese* 84 (1990): 163–211. Especially the first paragraph entitled "The Philosophical Grammar of the Category of Quantity," 163–66.

The legitimacy of a description rests on the success of general schema, whose application in the description of a thing indicates what can be produced and reproduced.

Let us say, somewhat hyperbolically, that metaphysics as the study of the natural distribution of properties has gradually given way to dynamics as the study of the transformable distribution of properties. A notion of logics in the service of dynamics rather than metaphysics does not yield a natural order of things, but an apparatus that provides the possibility to transform all naturally distributed properties in their particular values.[59] For a logics that constitutes an apparatus, "everything begins with reproduction."[60] In the beginning, Derrida points out, we find "original prints,"[61] not the plenty presence of speech or archetypes in full pureness. An apparatus's logics (here Stiegler agrees with Derrida) can no longer count as a logic of what is—being, life. It can no longer constitute an ontology; instead, it must count as a logic *of original default.* When logics no longer constitutes competing inventories, but one collective apparatus, we find ourselves within a logics of *generative transpositions within systems.* What is being transposed, for Derrida, is purely generic speech in the form of phonetic writing that is characterized as "writing within writing."[62]

In technical terms, it is linear algebra that provides the mathematics in whose terms *everything that works* can be described in *how it operates.* Within it, we can do computations in the transformability space of purely formal, and hence generic, quantities. Derrida's position negates the reality of a mathematical space of purely formal quantities and insists on the in-existence of an original and literal code; as he maintains, this code is given only as a cipher for which no key can possibly exist. Serres, on the other hand, seeks to abstract from the sheer operativity of linear algebra (rather than banning it to an impotent kind of being-negative, as *différance*, circulating and distributing quantities of death as the very essence of life-in-general), and shifts focus to universal algebra. With this, the generic stream of sheer circulation turns into a generic breath that can be articulated in a universal manner—universal as corresponding to the universality that can be characterized by alphabets of code. We will come back to what this implies in a moment. For Derrida and Stiegler, as well as for Serres, the crucial point regards how we think about the *nature* of generic quantities in whose transformation space we find ourselves, once

59 Eventually, with electronics and information science, natural properties cannot only be transformed in their proper values; they can also be distributed among things in "unnatural" manners. With the rise of organic chemistry around 1900, from pharmaceutics to the doping of semiconductors, the original default of things is no longer its generic identity bare of all qualities, but the other way around: its generic identity as having virtually all qualities distinguishable and distributable.

60 Jacques Derrida, "Freud and the Scene of Writing," *Yale French Studies* 48 (1972): 92.

61 Ibid., 92.

62 Ibid., 86.

logics turns away from the questions of *why* it might work (metaphysics), and instead focuses exclusively on *how* it works. Husserl, Heidegger, Derrida, and Stiegler in the continuation of their thought, all thematize generic quantity in terms of a general *energetics.* It was clear already in the nineteenth century that such a notion of quantity cannot be understood as strictly physical, but that it must count as a symbolic. What this entails in philosophical terms has indeed been problematized by nearly all late nineteenth-century mathematically affine intellectuals—Boole, Ferdinand de Saussure, Charles Sanders Peirce, Ernst Cassirer, Husserl, Russell, and Whitehead—all of whose work is anchored to distinct problematizations of the question of algebraic quantity.[63]

Roughly speaking, the disputes unfolded around whether it ought to be addressed as logical or as psychological. In the case of the former, the point of dispute regarded whether logics ought to be addressed in terms of conserving knowledge, and accordingly through clarifying its "existential/semantical import" (Gottlob Frege), or in terms of mathematics as an art, in terms of conserving learning to know. Disputable about the latter perspective (regarding the activity of learning to know, as opposed to general representations that count as knowledge) is that the act of genuine learning cannot be mechanized. Even if procedures and methods are developed and provided, they resist universal applicability and depend upon a literacy that is more comprehensive than strictly mechanical, and that needs to be mastered individually (Boole, Peirce, Whitehead). In short, at stake in this dispute is once more the discarded metaphysical question of *why* mathematics works, beneath and above the sophistication of *how* it works.

LEMMA 6: INTELLECTUAL BRIGHTNESS BENEATH THE LIGHT OF THE SUN, AND THE WORLD AS A WELL-TEMPERED MILIEU.

Let us look more closely at how Stiegler frames this context as the "technicisation of mathematical thought by algebra, in terms of a technique of calculation" in his introduction to the first volume of *Technics and Time.*[64] At stake is the idea that geometry is the barer of all meaning

63 George Boole, *An Investigation of the Laws of Thought on Which Are Founded the Mathematical Theories on Logics and Probabilities* (1854); Charles Sanders Peirce: various contributions to the principles of philosophy, exact logics, and diagrammatic reasoning based on a triadic notion of signs (from 1867 onward); Ferdinand de Saussure: *Mémoire sur le système primitif des voyelles dans les langues indo-européennes* (1879) (annotation: Saussure attempted to quantize/quantify the phonetic "materiality" of language in this treatise, which was to serve as the basis for a "general system of linguistics"); Edmund Husserl's dissertation: *Beiträge zur Theorie der Variationsrechnung* (1882) as well as his habilitation: *Über den Begriff der Zahl: Psychologische Analysen* (1887); Bertrand Russell's dissertation: *An Essay on the Foundations of Geometry* (1897); Alfred North Whitehead: *A Treatise on Universal Algebra with Applications* (1898); Ernst Cassirer: *Descartes' Kritik der mathematischen und naturwissenschaftlichen Erkenntnis* (1899).

64 Stiegler, *Technics and Time,* 1, 2.

insofar as we can consider it natural, objective, and bare of willfulness and instrumentalization. Stiegler continues the considerations brought forward by Husserl, according to which an arithmetization of geometry has lead "almost automatically to the emptying of its meaning. The actually spatio-temporal idealities, as they are presented first hand in geometrical thinking under the common rubric of 'pure intuitions,' are transformed, so to speak, into pure numerical configurations, into algebraic structures."[65]

Numeration is considered, by Stiegler as well as by Husserl, as a loss of "originary meaning and sight."[66] Universal meaning, the meaning of nature as nature—meaning bare from intellectual distortions—renders itself, through the algebraic method that arithmetizes geometry, as symbolic meaning: "In algebraic calculation, one lets the geometric signification recede into the background as a matter of course, indeed one drops it altogether; one calculates, remembering only at the end that the numbers signify magnitudes. Of course one does not calculate 'mechanically,' as in ordinary numerical calculation; one thinks, one invents, one makes discoveries—but they have acquired, unnoticed, a displaced, 'symbolic' meaning."[67] With this emphasis on geometric signification, Husserl (and Stiegler and Derrida) remain attached to the sun as the universal "principle" central in the empirical tradition since Aristotle. All alphabetical characterization that can be given of things must be grounded in the uniform play of natural light and shadow. With its emphasis on direct measurement, the empirical tradition has always countered a tradition that we might summarize as conceptual, and which held the discreet character of the phonetic alphabet as the governing principle over the elementariness of geometrical forms. While the former sought to comprehend of the world in purely natural light, the latter credited its symbolical domination by intellectual brilliance. Central to it is the rejection that measurement be possible in any direct manner, and it proceeded and developed around the symbolization of this indirect or mediate nature of measurement. While such symbolization was of course appropriated as legitimating evidence for distributing privileges, in religious and mystical interpretations, it seems safe to maintain that algebra itself is bare of any such appropriations. It proceeds with symbols in a purely formal manner, and contributed all the major steps in abstraction that have allowed us to decipher nature through mathematics in increasingly general terms. In this sense, the algebraic method is a method of natural science on equal par with the geometric, while both have served

65 Ibid., 3. Stiegler cites Husserl from *The Crises of European Sciences and Transcendental Phenomenology*, trans. John Barnett Brough (Chicago: Northwestern University Press, 1970 [1954]), 41.

66 Ibid., 3.

67 Ibid.; cited from Husserl, *The Crises of European Sciences and Transcendental Phenomenology*, 44–45.

ends that must be considered as not following the purely scientific interest of studying nature. Obviously, this is exactly what Husserl among many others in the nineteenth century would not grant; the insistence on "geometrical signification" discredits algebraic symbolization of any natural and non-vested legitimacy.

But the geometric method and the algebraic method can be observed to have always challenged each other throughout the history of science. In antiquity, the algebraic method can be seen (however implicitly) at work in Plato's Timeaus, and the role he ascribes therein to the triangle as a veritable geometric *atom*—capable of partitioning in due terms the physical elements of fire, water, earth, and air—which he conceived to be distributed proportionally among all sensible things. The triangle can partition the sensible, and mediate between it and the intelligible, because it is an "atomic ruler" extracted from the platonic solids in their pure regularity.[68] In this setup, the triangle is not itself a pure and intelligible form, it is an "operator" which serves as a mediator between spheres (the intelligible and the sensible); in this sense, we must regard it not only as a form but also as an atom. Furthermore, Lucretius's atomism can be read in this tradition as well, which Leibniz followed. And it has perhaps been most duly worked out in the latter's dream of a *mathesis universalis*, a philosophical projection of the alphabet into a general order of the alphabetical. Leibniz conceives of the universal not through an *inventory of pure forms* and deduced from an axiomatic system, but through the *infinitary articulation* of an axiomatic system with the help of a *characteristica universalis.* Such a method appears to Husserl, Heidegger, and many others, as Stiegler rightly summarizes, as metaphysical. And indeed, there is plenty of reason for their caution, for it is not difficult to see Leibniz's dream in the long historical context of assuming there to have been, once, an Original Language in pure form, a language before the tower of Babylon, an Adamitic language even before the Fall. In short, an innocent and virginal language where all meaning is unambiguous and immediately and equally transparent to everyone who speaks it; a language where neither lies nor poetry are possible (or necessary), where thinking needs not be guided by logics, nor has any use of sophistication, tactics, foresight, or planning.[69] Any pursuit of such a language is deeply nested within the problematics of how to separate science from religion, and, ultimately, the question of how empowerment through learning (intellectual brilliance) can be affirmed through cruel narratives of salvation and apocalypse, understood in terms of necessary purification, absolution, and penitence.

68 Plato, *Timeaus*, trans. D. J. Zeyl (Indianapolis and Cambridge, MA: Hackett Publishing & Co, 2000).

69 Umberto Eco has written a fantastic book on this subject: *The Search for the Perfect Language*, trans. James Fentress (Malden, MA: Blackwell Publishing, 1995).

Yet all this precaution disregards the infinitary mode of articulation that Leibniz was careful to attribute to his way of thinking about the character of the universal: he did not claim to have found a new alphabet, rather he raised the alphabet to the level of *the alphabetical* by treating its space of symbolization in a mechanical and operative manner. It must be distinguished from mechanical manners in their constructive sense because it works with the discreetness of coded forms. Here, Leibniz can introduce an *infinitary* way of proceeding by the "alphabetized" geometrical method.

LEMMA 7: TWO TRADITIONS OF MATHEMATICAL REASONING, THE PROBLEMATICAL AND THE AXIOMATICAL.

Thus, the caution regarding Leibniz's dream need not lead hastily to its judgment and condemnation. What I will try to argue and work out in the following pages is a misunderstanding that seems to underlie the rejection of calling upon the universal in the *operative* terms that combine method with characteristics, rather than in *descriptive* terms that combine form and systems of rules. Indeed, we can pick up a distinction that goes back to Pappus of Alexandria in the sixth century, between two vectors of interest in how to think about the relation of mathematics to nature, namely as "problematics" and "axiomatics."[70] Dan W. Smith summarizes as follows: "The fundamental difference between these two modes of formalisation can be seen in their differing methods of deduction: in axiomatics, a deduction moves from axioms to the theorems that are derived from it, whereas in problematics a deduction moves from the problem to the ideal accidents and events that condition the problem and form the cases that resolve it."[71] We can characterize this distinction by profiling these two notions in light of each other: both relate mathematics to solving problems on the basis of experience already gained and documented, traditionally in the form of algorithmic tables.[72] Now, while the former is more concerned with extracting more general procedures of how to pose problems such that they can be solved from such an experience, the latter is concerned with articulating systematical forms of organization that can integrate the diverse principles of how such experience based insight may be accommodated within a common body of knowledge. Viewed along these lines, I would characterize the tradition of problematics with primary interests in *operations*, thereby choosing one of two fairly bitter pills—here, the one of dealing with a *diversity of manners of expression and formulation.* The tradition of axiomatics, on the other hand, can be characterized with

70 See Jaakko Hintikka and Unto Remes, *The Method of Analysis: Its Geometrical Origin and Its General Significance* (Boston: D. Reidel Publishing Company, 1974).

71 Dan W. Smith, "Axiomatics and Problematics as Two Modes of Formalisation: Deleuze's Epistemology of Mathematics," in *Virtual Mathematics: The Logic of Difference*, ed. Simon Duffy (London: Clinamen Press, 2006), 145.

72 See James Ritter, "Babylon – 1800," *A History of Scientific Thought: Elements of a History of Science*, ed. Michel Serres (Cambridge, MA: Blackwell Publishers, 1995); and James Ritter, "Measure for Measure: Mathematics in Egypt and Mesopotamia," in ibid.

primary interests in *integrating particular applications of operations into a common compass, whose stability lives from unified manners of expression and formulation*, choosing, in this case, another pill that is also fairly bitter—namely, that of ignoring from further consideration all that tends to obstruct the established hierarchical system that is meant to represent such a unified compass. The axiomatic tradition is what we came to call "theoretical mathematics," while the computations of new general procedures is referred to as the heuristic and merely subservient "art of computing," or "art of mechanics," bearing on a sense of sight that belongs, so the accusation of modern morals, more to *imagination* than to *theory*.[73] Still today this distinction of different senses of inner sight—literally allowing us to reach "insights" through thinking—is made reference to, even in common day conversations, as "intuition." While intuition means for many some kind of singular and individual gut feeling, the notion has meanwhile also come to be used as a veritable flag word in the defense, or, respectively, the attack of the superiority of the axiomatic tradition. In this tradition, the sense of the concept (intuition) is quite different—it names a general and intersubjective, not singular and individually varying, sense of inner sight. The proponents of the axiomatical tradition always took great pride in allowing no operations other than those that can be carried out by compass and ruler—which is important to remember, if we try to understand how the irrational value that characterizes the diagonal of a square (the square root of 2) could be such an annoyance over centuries! With the invention of infinitesimal calculus and the elaboration of a general science of dynamics, this restriction was no longer tenable—for no other reasons than the sheer pragmatic success of symbolic notations.[74]

In the narrative of Stiegler (following Husserl, Heidegger, and Derrida), this is the beginning of techno-science: science that (1) arithmetizes (and hence discretizes) geometry; and (2) algebraizes (and hence symbolizes) arithmetics: "With the advent of calculation," Stiegler writes, "which will come to determine the essence of modernity, the memory of originary eidetic intuitions, upon which all apodictic processes and meaning are founded, is lost."[75]

73 As in engineering today, in its general sense of "inventor" or "designer," derived from the Latin *ingenium* for "inborn qualities, talent."

74 The famous Calculus War between Newton and Leibniz was related to this: other than Leibniz, who invented a particular system of notation (which we still, more or less, follow today), Newton insisted on what he called "the tangential method," a method that allowed him to keep working with ruler and compass; accordingly, what to Leibniz were "infinitesimal numbers" (i.e., a fictitious multitude), was an elusive and nongraspable magnitude to Newton—he called them "fluxions."

75 Stiegler, *Technics and Time*, 1, 3. *Apodictic* is a term from Aristotelian logics that means "capable of demonstration." It is central for notions of logical certainty. For Aristotle, apodictic, meaning also "scientific knowledge," contrasted with *dialectic*, which means merely "probable knowledge." In his *Critique of Pure Reason*, Kant contrasted apodictic statements with other qualifications of them as *assertoric* and *problematic.* The former means that something can merely be asserted to be the case, and the latter asserts only the possibility for a statement to be true.

Stiegler calls universality in relation to forms and rules that are deduced from how the forms can be combined *eidetic intuitions.* It corresponds to the sense of inner sight we have aligned, above, with the axiomatic tradition. What Husserl, Heidegger, Derrida, and Stiegler (among many others in mathematics and philosophy since the nineteenth century) mourn is the eidetic intuition of "actual spatio-temporal idealities,"[76] to which we must add, in the axiomatic tradition, the "geometric significance," of whose loss Husserl speaks and for which he makes the development of algebraic methods and its symbolic notations responsible. This concerns a notion of universality within the compass of a unified hierarchical system that allows for objective representation. It is significant within what we might call an approximated horizon, a horizon, hence, that is not actually a horizon, but one that is a *represented* horizon. Within it, geometry is appreciated as representing (however resistant to positivization it may be considered) what remains constant. As such, geometry is taken into service of a *representation* of the Originary Language, the language before the fall, where neither care must be given, nor responsibility must be taken, of how we speak and communicate—because all meaning is immediately transparent. In the service of representation, geometry appears to have the capacity of purifying what can be named from all subjective investment, by measuring it objectively.

LEMMA 8: THE IDIOSYNCRASY OF PURE MATHEMATICS.

Vis-à-vis such a dream, the heuristics of algebraic computations that seek to render its equations solvable on ever further levels of abstraction seems to ridicule the orders among the fields that have already been "purified" (conquered) and imprinted to one common plane of generality. This is how Stiegler can write: "The technicisation through calculation drives Western knowledge down a path that leads to a forgetting of its origin, which is also a forgetting of its truth. This is the 'crisis of the European sciences.'"[77] Algebra behaves, as it always has within the problematic tradition, idiosyncratically. And this to an extent that has rarely, if at all, been achieved before—perhaps not any more since Pythagoras, with regard to the irrationality of the number that counts the diagonal of a square. As was the case with Pythagoras's irrationality of the diagonal, the two complementary ways of thinking about mathematics (axiomatics and problematics) were coarsely polarized in the nineteenth century into good and evil. Only with one complication: namely that this polarization, somewhat schizophrenically, regarded the symbolical as diabolic, because it rendered explicit a plurality of notations rather than keeping with the notation of one

76 Ibid.
77 Ibid.

universal meta-language.[78] Hermann Weyl has famously captured these sentiments in statement: "In these days the angel of topology and the devil of abstract algebra fight for the soul of each individual mathematical domain."[79] Despite this drastic statement, Weyl was certainly an intellectual who would have readily agreed in *not* condemning and judging Leibniz's dream of a *characteristica universalis* too hastily. A rather singular voice between the two predominant camps at the time with regard to the role of algebra for reasoning (the intuitionists and the formalists), Weyl was eager to make explicit exactly the very same distinction that is crucial with regard to Leibniz as well: that the universal can be systematized alphabetically both in the *operative* terms of method and characteristics, and also in *descriptive* terms of conceptual form and numerical bodies of rules.[80] For him, the placement of intuition (as the natural faculty for insight) could not be decided simply in terms of "naturally given" versus "intellectually achieved." Rather, together they are irresolvable:

> In the Preface to Dedekind (1888) we read that "In science, whatever is provable must not be believed without proof." This remark is certainly characteristic of the way most mathematicians think. Nevertheless, it is a preposterous principle. As if such an indirect concatenation of grounds, call it a proof though we may, can awaken any "belief" apart from assuring ourselves through immediate insight that each individual step is correct. In all cases, this process of confirmation—and not the proof—remains the ultimate source from which knowledge derives its authority; it is the "experience of truth."[81]

Weyl does not position the algebraic procedures of proof against empirical procedures of induction, as many of his contemporaries suggested. Rather, he insisted that we need some kind of "inductiveness" at work within the abstract symbolic procedures—that is, an empirical approach *within* symbolic reasoning. In this, arguably, he might agree with Dedekind, and also with Boole, much more than he himself seems to believe in the above citation: both did not place algebra (proof procedures) under the regime of an axiomatic logics; rather, they both suggested that we need to always subject to empirical testing and questioning what may be perfectly substantiated by symbolical proof. Truth, according to this view, will never free itself and purify its statements from a certain

78 The Greek term for *symbol* derives from *syn-ballein*, literally meaning that which is thrown or cast together; *dia-ballein*, its opposite, means casting apart. The diabolical hence denotes the symbolical's other, that which keeps from fitting and unifying, thus that which introduced discord and discrepancies.

79 Hermann Weyl, "Invariants," *Duke Mathematical Journal* 5, no. 3 (1939): 500.

80 See Herman Weyl, *The Continuum: A Critical Examination of the Foundation of Analysis*, trans. S. Pollard and T. Bole (Kirksville, MO: Thomas Jefferson University Press, 1987 [1918]).

81 Ibid., 119.

deliberateness that corresponds to the amount of significance in which literacy is vaster than logics. It is in this sense that their algebraic philosophy was at odds with the apologetics of geometrical ideality.

Serres has attempted to put Leibniz's dream back into the context of this open issue. In a text entitled "Leibniz, Translated Back into the Language of Mathematics,"[82] he maintains that what has not been understood sufficiently about Leibniz is that his philosophy must be regarded as systematic, of course, but in a manner that does not create one homogeneous system (an apparatus), but a two-fold one, an *amphibolic* one. Where this has indeed been noticed and accounted for—most prominently by Kant[83]—it has been taken as a flaw and mistake, a necessary absurdity that ought be avoided for the reasons just elaborated (relating to the algebraic quantity notion and the philosophical problems it entails). Serres's ambition with "translating Leibniz back into the language of mathematics" is to show that this *structural amphiboly* is not a malfunction or failure inherent to Leibniz's philosophy (insofar as it aspires to be systematic), but, inversely, that it is essential for it: "perhaps we ought to understand," he suggests, "that Leibniz conceived (at least) two systems in one; for sure, we ought to assume that combinatorics, which initially was a technique for manipulation and which was eventually raised to the level of a universal doctrine, served Leibniz as a relational organ: an organ for relating a universal analytics with a universal aesthetics, for his system conceives firstly an analytics, and its morphology conceives an aesthetics."[84] For Leibniz, and this is Serres's point, mathematics does not allow us to clear our language into universal purity—mathematics is the universal language in which nature expresses and articulates itself. This inverts the relation fundamentally: learning to be clear in how we express thoughts is still in the service of filtering away what only *appears*, but is not; but there is no state of reference to be approximated, and laid bare, by this filtering. Clear and precise formulations express manifestations of symbolic solidity. Mathematics as universal language is a language that does not *describe* reality, it *speaks* reality—it collects reality; it comprehends reality. Its articulations manifest things in their symbolic consistency and reasonability. Mathematical language, in its formality, saturates itself *with* reality: "Formalism is not opposing reality, if we ignore serious nonsense," Serres maintains, "it is a technique of comprise, which is capable of saturating itself with a maximum of reality."[85] This,

82 Michel Serres, "Leibniz, in die Sprache der Mathematik rückübersetzt," in *Hermes III.*

83 Kant, "Amphiboly of Concepts of Reflection," appendix to "The Transcendental Analytic" of *Critique of Pure Reason.* See the essay on Kant's own approach to what he called "Transcendental Deliberation" by Andrew Brook and Jennifer McRobert, "Kant's Attack on the Amphiboly of the Concepts of Reflection," *Theory of Knowledge* (August 1998), https://www.bu.edu/wcp/Papers/TKno/TKnoBroo.htm.

84 Serres, "Leibniz," 151.

85 Ibid.

he continues, is "the comprehensive paradox of a mathematics that is of ideal purity and plenary applicability: a language at the threshold to monosemy, hence the certainty of communication that is almost perfect, and at the same time bursting with polysemy, hence the promise of manifold transport. We are never deceived or deluded in it, and yet it is capable of saying all."[86] We can think of this process of saturation perhaps best, if we consider the capturing process that it constitutes in analogy to how photovoltaics captures sunlight and is able to store it as electricity. However, we must bear in mind that this analogy works only one way: photovoltaics may help us understand Leibniz's idea of how the real can infinitely saturate itself, yet Leibniz's manner of thinking is insufficient in understanding how photovoltaics works. For this, we need the registers of quanta, as electro-dynamic units, and they must be considered as something different from Leibniz's infinitesimals; in fact, it seems that they are inverse to each other: while Leibniz's infinitesimals highlight continuity at work within discreetness, the quantum view highlights discreteness at work within continuity.

Let's make our analogy speak about the idea of saturation: there is a truly generic materiality to electricity, because its form remains indeterminate before it is translated into heat, pressure, impact, and so on. It is crucial to distinguish photovoltaics from other ways of capturing energy, because it is the only source that comes from a *without* of the planet's ecosystem. Fossil energy, and also energy garnered from the weather like wind or tide, is different from solar: it merely shifts around the distributions within the overall balanced system. Solar, on the other hand, adds to the total amount as it is manifest in the whole. From this, we can also see more clearly that Leibniz's universal language in no way forecloses the question of how we orient the development of intellectual power such that it turns out to be for the good; indeed, it complicates possible answers as they exist, because it prevents the comfort of ever settling in one form of organization. With this thinking, Leibniz introduces a new multitude to science—that of the infinitely small—and with it, also a new magnitude that will eventually constitute a notion of natural elements entirely dissolved into ratios of energy and matter, measurable in terms of heat, in thermodynamic systems.

In Leibniz's thinking about mathematical language capable of *speaking real* (algebraically) as immediately realizing what is spoken, the elementary units—the characters, we might say—are monads. Serres specifies: monads "are the true atoms of nature; in one word, they are the elements of all things being."[87] Further, he indicates how we might read this: "The monads are for the nature of things being, what notes are to combinatorics, what letters are for written or what sounds are

86 Ibid., 158.
87 Ibid., 154.

for spoken language, what points are for geometry, what truths are for logics of certainty, and so on: stoikeia."[88] Yet, as he immediately points out, it would be a misunderstanding to think that monads *were* actually points, notes, atoms—rather, "they are elements of nature just like they are elements of languages, mathematics, music, and so on."[89] Again, think of quantities of electricity gathered through photovoltaics—they can come to manifest in anything, in any form and any materiality; they are not, originally, food or wood or water or wind. Let us bear with this analogy between quantities of (solar) energy and monads for a moment. Monads are supposed to be true elements, simple and original entities—a monad is what cannot be divided.[90] And yet we must not think of them as elements that are naturally given. Leibniz does not argue for a literal interpretation of language in the sense that the reference relation be transparent and neutralized. For him, it is not the case that his language of monads would, miraculously, be capable of expressing things in an immediate manner. The two-foldedness of his thought on systems, the amphibolic nature of a system's structure, is essential to his thinking: monads do not *stand in for* atomic elements, they *count* atomic elements by subjecting them to a symbolical order. The articulation of monads position and expose structures that may saturate themselves by capturing bits of indeterminate substance into the terms of the articulation: "Substantiae vel suppositi," as Serres puts it.[91] In our analogy we can say: the structure of exposition is symbolical, and arranged such that it may capture bits of the continuity of indeterminate substance—just like the semiconductors of photovoltaic cells are structures that expose a symbolical net that captures, through filtering out of the indeterminate stream of light, quanta of electricity.

Again, it is with this analogy that we can understand better how formalisms, through being essentially *saturateable*, can *speak real* for Leibniz, as well as for Serres. Contrary to common views that think that system means state or stasis, Serres elaborates, what we can learn from Leibniz is the idea that "system means quickness (speed)."[92] Analysis is amphibolic in the sense of being alphabetic, in a Leibnizian manner, and it counts universally insofar as it may take as its object *anything at all*—insofar as it is rendered into discrete and finite form. That is, it is alphabetic in all the manners in which anything at all can be listed and catalogued by inventories of coding. In the words of Serres: "alphabets of linguistic, musical, signaletic, numerical kinds, the comprehensive

88 Ibid.
89 Ibid., 155.
90 "The Monad, of which we shall here speak, is nothing but a simple substance, which enters into compounds. By 'simple' is meant 'without parts.'" Gottfried Leibniz, *La Monadologie*, trans. Robert Latta (Oxford: Oxford University Press, 1898 [1714]), 1.
91 Serres, "Leibniz," 155.
92 Ibid., 158.

project of the alphabet of human thought, calculated in its uttermost limits."[93] Intellect, from this point of view, is not a transcendent voice that can give us unproblematic authority; rather it is "the playground of the possible."[94] With this perspective, Leibniz frustrates the promise of comfort in order to gain insight into an orbit of eternal stasis, through the development of intellectual capacity; but at the same time, he provides important grounds for shattering the power structures in the pre-Enlightenment era of political and religious absolutism, which had instrumentalized and even monetarized just such hopes, and turned them into a veritable apparatus of oppression.[95]

Let us recapitulate briefly. Leibniz, in Serres's reading, has raised mathematics to the level of self-awareness of its symbolic constitution: "The true presents itself with greater ease than the whole of reality, which remains for God's view alone. […] The true is but elected out of a completion, whose totality remains elusive to us."[96] Analytical discovery and demonstration through proof do not depend upon exhaustive treatment of the real. If we think of mathematics as a language, and its grammaticality as that of the alphabetical (any alphabet in general), consisting of universal characteristics (monads as mathematical terms)[97] and universal method (mathesis, equations as conservational laws), then technics is not the Other to natural beings. Technics can then be understood as what allows us to understand the *nature* of what we know. Serres describes what this perspective on algebra would change; let us quote two rather long passages in order to at least raise an idea of what is at issue: "We are in delay with a science of our own knowledge, just like with a science on the knowledge of an author."[98] He then asks, "Why is it that we still don't have an articulate description of our spaces of perception […] no articulate description of gestures, of conaesthetics, of introspection (*Innenschau)*, of proprioceptive capacity, of the schemata of our bodies, the practical ways of conduct in work and craftsmanship, our sportive and artistic activities, of all the pathological composures of the body vis-à-vis itself and its environment?"[99] Topology is, or contains, he maintains, an aesthetics, "just like the logical-algebraic complex contains an analytics."[100] Together

93 Ibid., 155.
94 Ibid., 154.
95 In the sense that people were promised, salvation can be bought from the representatives of the church—a veritable economical market offering "units of absolution" to be brought into circulation.
96 Ibid., 175.
97 Ibid. Serres writes for example: "The original is a term" (153), or "What might we understand by 'system' if not first and foremost a sum?" (156). Or, in a passage that is most explicit in how the infinitary resolution of mathematical terms in systems of equations can be understood, he writes: "Only the written equation provides for the totality of the possible" (218).
98 Ibid., 164.
99 Ibid., 163.
100 Ibid., 164.

they allow us to learn to understand the world according to a *morphology of the forms in which we think* as a diverse collective, and yet, because we can articulate thoughts in mathematical terms, also universally.

> The weaver does not plunge his hand in the same multiplicity as the mason, the athlete, or the pianist; the claustrophobic does not develop the same topicality within one and the same "space" as the actor, and so forth. How is it that we don't know—even though we do know—that theory is mistaking things, even though it would actually be ready; that we are immersed in precisely describable and highly differentiated multiplicity; that the individual differs, without doubt, and perhaps even determined by a peculiar profile within such manifoldness, in utterances that are extrapolated from that which Leibniz has said about manifoldness's topicalities? I don't see why these domains ought to be excluded from mathematical treatment.[101]

The morphology of the forms in which we think when we learn, when we exert mastership in craft and art or do science, let us relate to nature in its bursting quickness: "All of nature is full of life. Nature is full, everywhere. How to describe such fullness, such continuity, these invariants which are stable across steady and continuous variations, these geneses which are coupled to processes of conservation, these interactions which rest on recursion?"[102] The morphology of quick manifoldness contains an aesthetics, because aesthetics is the one realm of judgments that cannot exhaustively be reasoned. This is why in Leibniz's double articulation of formalism and morphology, of analysis and aesthetics, of logical algebra and topology, never claims to exhaustively and comprehensively realize an accord (*Einklang*) between intellect and existence, between reason and liberty, monadology and monads, culture and nature. It contents itself with saying that it does realize one such accord: "Leibniz did not create a concluding mathematics of science, nor did he formulate a concluding metaphysics. This, he never claimed. He merely thinks that his two-fold philosophical system can realize such accord."[103]

III REALISM OF IDEAL ENTITIES: CONCEIVING, GIVING BIRTH TO, AND RAISING IDEAS ON THE STAGE OF ABSTRACTION

> "Language faces a truly boundless realm, that of the thinkable. It must make an infinite use of a finite stock of means, and it can achieve this through the identity of the power that engenders thought as one and the same with that which

101 Ibid., 164–65.
102 Ibid., 163.
103 Ibid, 166.

> engenders language. Language is not to be treated as a dead something, engendered. It is not an oeuvre (ergon), but itself activity (energeia)."[104]

The nature of the universal, according to the perspective we owe to Leibniz (and Serres's reading of Leibniz), can be separated neither from concrete sensible reality nor from the conceptual reality of that which is only intelligible. The nature of the universal is real, virtual, and dispersed, equally much throughout the intelligible as the sensible. The presence of what belongs to no thing in particular insists as the noisy confusion between the two spheres, and is hosted in nature's comprehensive and bursting quickness of all that grows and decays. In the last two chapters of this text, I would like to return to the question with which we lead over to the lemmata discussed in the previous chapter: in what kind of world would we find ourselves if we began to consider that through information technology, universal algebra is de facto constitutive for nearly all domains in how we organize our living environments today? Two things seem crucial: (1) we would have to assume that what we can calculate is not the necessary but the possible; and (2) theory must provide a basis for decision rather than relieving thought from the demand of "transcendental deliberation."[105] If we regard mathematics (algebra) as a language, we must assume that ideas are essentially problematical and dependent upon clarification. As a consequence, reasonable thought alone does not liberate us from the responsibility of power and the associated challenging task of dealing with moral value. Leibniz's proposed system for philosophy suggests that we gain from it at once "an organon of intuition" as well as "an architectonics of formal idealities."[106] With this, we have a two-fold reality: organismic and capable of metabolism and affectivity, as well a political complement, that of an architectonics, which gives rise to the question of where such natural reality of intellectuality may be thought to reside. So let me counter the lemmata discussed within the framework of a possible theorizing of the universal that aspires to remain neutral on matters of believe with a brief and preliminary enunciation of how to dope such theorizing without the aspiration to remain neutral with regard to matters of belief—neutral, however, in a categorical sense, not in any specified one.

104 Wilhelm von Humboldt, *Über die Verschiedenheit des menschlichen Sprachbaus* (Berlin: Druckerei der Königlichen Akademie, 1836), §13; my own translation. The original German: "Denn sie steht ganz eigentlich einem unendlichen und wahrhaft grenzenlosen Gebiete, dem Inbegriff alles Denkbaren gegenüber. Sie muss daher von endlichen Mitteln einen unendlichen Gebrauch machen, und vermag dies durch die Identität der Gedanken- und Sprache erzeugenden Kraft. Man muss die Sprache nicht sowohl wie ein totes Erzeugtes, sondern weit mehr wie eine Erzeugung ansehen. Sie selbst ist kein Werk (Ergon), sondern eine Tätigkeit (Energeia)."

105 Brook and McRobert, "Kant's Attack on the Amphiboly of the Concepts of Reflection."

106 Serres, "Leibniz," 165.

INTELLECTUALITY HAS ITS NATURAL RESIDENCE IN UNIVERSAL TEXT WHOSE CORPUS PROVIDES A COLLECTIVE BODY TO THINK WITH AND TO REASON IN.

Text is not the scene of writing that hosts life-in-general; rather we might see in it the body of universal genitality. This body is the residence of the mathematical principle, which is host to all things generic and pre-specific. It governs magnitude, multitude, and value—symbolically. It is the master of all things that are most unlikely to ever happen or turn real. Universal genitality, incorporated in the principle of mathematics, is capable of performing incredible acts—like giving multitude an extension in time that is subjected to the fullness of space (Aristotelian ontology); or magnitude an extension in the fullness of time without having one in space (Dynamics); or it can give multitude an extension in an abundant plenty of space, together with a distributed-yet-collected extension in time (probability amplitudes in quantum physics). Universal text is the body of an infinitely wealthy principle, its content is arithmetic and its form is restlessly generous; and yet it cannot give without demanding: it demands mastership in logics and in geometry by those who desire to receive what it has to give. Universal text as the natural residence of intellectuality is also the collective body to think in. It is genealogical without originarily determined pureness; it is corporeal and yet arcane; it is natural in the sense of being sexed and gendered, yet impredicatively so: universal text is universal genitality. The architectonics of formal ideality is neither constructed from ultimate elements nor does it grow according to ultimate morphological body plans, rather, we might say, perhaps it takes shape through blossoming. It cannot be decided whether the character of the principle that is master in this residence (mathematics) is a One or a Many. Rather, it is, symbolically, both at once: it collects and comprehends confluxes from many geneses. This principle, which masters the natural residence of collective intellectuality, demands of its subjects nothing more than reasoning in a manner that proceeds archly as well as utterly precise, such that it may provide auxiliary structures of symbolical stages for abstract thought to conceive and engender objective ideas.

The elaboration of fantastic speculation out of which we might begin to dope the issues at stake in the lemmata described is an infinite task that can never be completed. But according to the suggested formulation above, we can at least begin to frame a preliminary answer to the main question of this text, namely, *What is at stake with the notion of the universal?* What is at stake with enunciations of the notion of the universal, we might say, is the symbolical nature of the stage for abstract interplays between (1) the world as the entirety of the inhabited world (*ecumenical movement*); and (2) the state of public things in the world (*republic*). The promised reward of such a philosophical perspective should not be difficult to see—in a world whose marketplace extends globally, whose national governments are dependent upon each other, and whose cosmopolitical citizens communicate across all geographical, political, and professional boundaries. Even the mathematical and formal descriptions of things chemical, physical, or biological, are capable of manifold representation. Matter that is informed can be assumed to exist in universal and original form as little or as much as this can be assumed of language itself. This reverses the legendary confusion of speaking in many tongues, which is said to have come from Babylon. While the Babylonian confusion usually exhibits that we have many names for the same thing, the informability of matter inverses the situation: we now have many things for the same name.

Hence, what I would like to suggest is a realist approach to the universal, which would consider it not as a space that gives room and passively hosts the extension to all things, insofar as they are pure and do not contradict each other. In a realist understanding, the form of comprehension that is proper to the universal is communicational, and its nature is vivid and of infinite capacity. Unlike a notion of space that hosts the extension of things, which is supposed to be only giving without ever demanding anything, the communicational nature of the universal must be considered as being equally giving as it is demanding: it gives everything that can be the object of intellection, and it demands to be received, spelled out, interpreted, formulated, and integrated into the architectonics of its formal ideality. It is a consequence of such communicational nature that nothing that corresponds to it—nothing that can be called universal—can ever be owned. But at the same time, it is not real unless it is being conquered and appropriated, intellectually. All communicational reasoning in the terms of universal text is archly reasoning; it is not reflective or projective reasoning. The nature of the universal is self-engendering; it does not, properly speaking, ever cease to take place or actually happen as long as its demand finds response and respect. We may think of it perhaps as an intermitting point, a moment that resides in its own lasting, or as a circle that desires to comprehend everything that it encompasses. All these circumscriptions, I would like to suggest, characterize the stage of abstraction from which a non-algebraic scene of writing, ultimately, accrues.

Serres draws a portrait of Thales, and focused on his conception of the famous theorem at the foot of the pyramids, from which these ideas take much of their esprit.[107] How can we face something impenetrable, immense, and ultimately arcane, Serres asks. What are we facing in the moments when we seek to elaborate symmetries through erected symbolical structures such that they are capable of conserving that of which all we can say is that (1) it must be considered invariant, and (2) that it

107 Michel Serres, "Was Thales am Fusse der Pyramiden gesehen hat," in *Hermes II: Interferenz*, trans. Michael Bischoff (Berlin: Merve Verlag, 1992 [1972]), 212–39.

can be passed on from one form to another form? Thus, in the remaining parts of this text we shall approach an elaboration of this *infinite task and its reservoir for doping* in indirect and iterative terms, by following Serres through the account he gives of how the birth of pure geometry has never taken place.[108]

HOMOTHESIS AS THE LOCUS IN QUO OF THE UNIVERSAL'S PRESENCE

> "Thales, who reads in the traces of the body, deciphers, ultimately, only one secret, that of the impossibility to enter the Arcanum of the solid body in which knowledge resides, buried forever, and out of which wells up, as if from a ceaselessly springing source, the infinite history of analytical progress."[109]

1ST ITERATION (ACQUIRING A SPACE OF POSSIBILITY)

In Serres's text, we find ourselves in the desert with Thales, facing, in the pyramid, an impenetrable constellation. We might well recognize the pyramid's outline as a triangle, but we know not how to measure it. We are taken to accompany Thales on an adventure that is pure concentration, a tour during which we reach, eventually, in a circuitous manner, what is straightforwardly and directly inaccessible—a space in which measuring the pyramid becomes possible. It is an adventure in *archly* reasoning, reasoning that proceeds by an act of double duplication: on the one hand, we duplicate the situation in which we find ourselves, and on the other hand, simultaneously, we duplicate ourselves as we find ourselves comprehended in that situation. All that is left for us to do, if we follow Thales and Serres, is to give an account of how we proceed by aspiring to measure each repetitious step taken. The cunning that drives such reasoning never properly manifests itself, neither positively nor negatively. It establishes, through what I will call *double duplication*, a stage of abstraction that is capable of hosting a play of homothesis as the dramatizing establishment of "homology between the crafted and the craftsman."[110] The cunning by which we are driven manifests in no other way but in tending to its own continuation. Tended by his own cunning, Thales's double duplication introduces a time that might remain, by giving way to the unlikeliness of finding an accord in which *it* (measuring what is overpowering, colossal, and immense) acquires a space of possibility, exposed from elaborating the soundness of the presumed accord by computing auxiliary structures in all of which the same invariant quantity is at work. The postulation before Thales's

108 "If one were to understand by the birth of geometry the rise of absolute purity out of the grand ocean of these shadows, then we might as well, a few years after geometry's death, say that it had never actually been born." This is Serres's answer to Husserl's mourning in the end of his article. Ibid., 238–39.

109 Ibid., 232.

110 Ibid., 226.

inner sight—a postulation in theory—of a module, from Latin *modus*, literally "a measure, extent, quantity, manner," is enough to stage the invariant quantity at stake. This is what Serres tells us.

But how to find this quantity? All that there is to be contemplated, for finding an answer, so Serres tells us, is that Thales must find a unit of procedure, and that the quantity of this unit ought to be, if the procedure be feasible and valid, conserved by a structure. Thus, Thales must attempt to *stage* abstractly the very act of virtually "en-familiarizing" himself with what is colossal and immense. Thales knows that the interiority of the pyramid is inaccessible, that it would be an unworthy violation to force his access into it. Thus, Thales pays all due respect to that, and premises for his own symbolical double duplication that the interiority spaced out in it be inaccessible as well. He treats the size of his triangle purely structurally—without knowing, at first, anything about the structure nor how he could possibly apply his triangle for measuring. We thus learn that Thales begins this elaboration by building a stock of experience—Serres calls it a *résumé*, from Latin *resumere*, "take again, take up again, assume again." Before Thales will be able to actually draw a circle, we learn, he has to actually go in circles. Many times. Learning to measure, even in theory, Serres maintains, is an operation of application. One has to "blossom into" the capability of doing it. Thus Thales keeps beginning, summing up what he finds along his iterations, and treats the sums he comes up with as a product of reciprocity, from *reciprocus*, "returning the same way, alternating." Gradually, so we are told, he invents a scale of reproduction. How? All that we can say in this first iteration is that Thales measures the pyramid by postulating—on grounds no more "solid" than the immateriality of a desire—that it be possible, and by striving to elaborate the conditions for his own postulation.

2ND ITERATION (LEARNING TO SPEAK A LANGUAGE IN WHICH NO ONE IS NATIVE)

One idea Thales substantiates in the course of the elaboration of his postulate—the postulate being that the inaccessible pyramid is measurable—is that the pyramid incorporates the principle of homothesis. Homothesis is, as we learn from Serres elsewhere, "the same way of being there, of being placed."[111] The space of homothesis is a space of dislocation, deferral, and adjournment, "with or without rotation," as he puts it.[112] Things that are governed by this principle, things that are tributary to the space of homothesis, are things that can be considered as equally bounded. In short, they can be considered as

111 Michel Serres, "Gnomon: The Beginnings of Geometry in Greece," in *A History of Scientific Thought*, 88–89.

112 Ibid., 88.

things that are commensurate. But what can be the source that sheds light onto such a space for abstract intellection, and hence open it up to our intuitive sight? It is the sun that treats all things equally. Yet this equality, Serres warns us, cannot in any direct manner be found in the sun itself, as if it gave each thing its natural gloss immediately. Nevertheless, we are told, the sun facilitates that an abstract space may be engendered. The engendering of such an abstract space is, for Serres, the Greek miracle whose revelation eventually made possible what he calls the fabrication of a mathematical language, the sole language "capable of halting conflicts and which never needs translating."[113] The language spoken in such abstract space is the sole language in which there are no barbarians, because everyone speaks it as an immigrant, with no political obligations of conforming to the mother tongue spoken by natives.[114]

3rd iteration (setting the stage for thought to comprehend itself)

This language allows articulations on the stage of abstraction, and for Serres, its possible articulations open up and constitute the scene of writing. Within a space governed by the principle of homothesis, the scene of writing is constituted around homology. For Serres, it is the Greek understanding of logos that will allow alphabetic writing to think of the cosmos no longer in terms of genesis and progeny, but in terms of a logics that comprehends the cosmos *within* the universe. Homology, he tells us, is threefold: number, relation, and invariance. Arithmetics, geometry, and physics. This fantastic premise of one universal logos, Serres maintains, allows Thales to see in the pyramid a manifestation of the homothetical principle. On this assumption, Thales can postulate the *invariance of form* to complement the *variations of quantity.* Armed with such thinking, the colossality of the pyramid becomes less daunting, and this without the need to divest its constitutive secret, its inaccessible interiority. The archly reasoning that supports such thinking is not the reasoning of an individual subject rising up against the principle that governs its own predication. In Thales circuitous thought, there is nothing revolutionary here whatsoever. The reasoning exerted in support of homology is an automatic reasoning, we are told, from *autos*, "self," + *matos*, "thinking, animated." As Serres puts it, it is the reasoning that happens as the world exerts itself upon itself,[115] a world that thrusts forth and pushes out of itself, in order to adjoin to itself what happens to it. Serres calls this the reasoning of how the gnomon

113 Ibid., 77.
114 Ibid. "All the cultural hegemonies of the world are impotent against this community and against the universality of this teaching."
115 From *ex-*, "out," + *serere*, "attach, join."

counts, the reasoning that seeks to account for the objective ruler that sets the natural play of shadow and light in scene by collecting it with its own apparatus of capture. "Who knows? Who understands? Never did Antiquity ask these two questions," Serres maintains.[116] The gnomon allows to indicate time, but foremost it is an observatory that does not, like modern telescopes, bundle what gathers into something specifically for the sight of an individual subject. In the events the gnomon is capable of staging, Thales (and anyone else) participates as nothing more than as a pointer, an index or cursor, since "standing upright we also cast shadows, or as seated scribes, stylus in hand, we too leave lines."[117] But aware of this precise circumstance, Thales now sets out to reason about how the gnomon stages, as an apparatus of capture, the play of shadow and light. In his double duplication, Thales literally tries to catch up with the course of what he himself (as a gnomon) indicates, and hence makes observable. It is by trying to catch up with his own significance within the situation that Thales eventually begins to substantiate the concept of similarity as an invariance—or, to make Serres's point more clear, as an idea contemplated by the world in its own automatic reasoning. Even though Thales is trying to catch up with his own significance within the situation, the active center of knowing resides outside of Thales himself: "The world renders itself visible to itself, and regards this rendering of itself: here resides the meaning of the word *theoria.* To put it more clearly: a thing—the gnomon—intermits the world through stepping in, such that the world may read on its own surface the writing it leaves behind on itself. Recognition: a purse, or a fold."[118]
For Serres, the scene of writing is automatic too, as it is for Derrida as well. But unlike its characterization by Derrida, for Serres the scene of writing unfolds on the stage of abstraction, and is a dramatic, not a mystical, space. But it too is a space that knows no individual poets or playwrights. The dramas it puts forth are authored by a collective subjectivity that spells out the reasoning of a world that exerts itself upon itself.

4TH ITERATION (INTELLIGENCE THAT IS IMMANENT AND COEXTENSIVE WITH THE UNIVERSE)

Such a collective subjectivity depends upon an artificial memory. Serres finds such a memory in the canonical lists and tabular organization of practical problems—the preparation of how certain results to certain problems may be found more easily, based on how problems of a same kind have already been resolved whenever they have imposed

116 Serres, "Gnomon," 80.
117 Ibid.
118 Ibid. My translation here deviates from the proposed one, which suggests the following: "The world lends itself to be seen by the world that sees it: that is the meaning of the word theory. Even better: a thing—the gnomon—intervenes in the world so that it might read on itself the writing it traces on itself. A pocket or fold of knowledge" (86).

themselves previously.[119] The problems thereby treated are mainly economical problems; they revolve around how to count what is given—but not around how we might account for the manners in which we do count that which is given. The tables in which the treatment of these problems is organized must be ordered around a step-by-step procedure that will lead whomever follows it to the desired decision or solution. Such methodical, goal-oriented procedures are what Serres calls *algorithms.*[120] They spell out how to reach all intermediary steps as one attempts to multiply quantities, to divide them, to raise them to a different power than that in which they are given, to extract the roots of a quantity or to sum up or divide them. The overall framework of these operations, one might say, consists in finding ways of counting, as exhaustively as possible, the possibilities hosted in a quantity's reciprocal value—these possibilities are the very substance of economic thought.[121] The methods of how such tabular organization is gained, is strictly algorithmic. An algorithm is made up of techniques or operations of how to count—what we today summarize as the operations of arithmetics. Its procedures in Babylonian science know three classes of numbers: the givens (data), the results, and the constants, which are the stepping stones from given to desired results.[122] As long as possible manners of accounting for how what is given is counted by these tables, quantities lack a proper generality; they are always concrete and singular. Generality is not seen with regard to the things given, it applies to procedures only: an algorithm is an algorithm (and not an account of one's experience, like a fable or a tale, for example) because it is a general rule that can be reproduced in its experiential value by anyone who follows its steps. Once a specific procedure is put in numerical form, one and the same algorithm can be applied arbitrarily to particular situations. Such algorithmic procedures usually end with the formulation: "Behold, one will do likewise for any fraction which occurs."[123]

Against this background we can understand Serres's admiration for archly reasoning that has not the particular economical interest of a people at its core, but that fantasizes a reasoning proper to the world itself. The homological dramas that unfold in his homothetical space of abstraction, and that are expressed in the scenes of writing that accrue from it, are full of brilliance; yet the intelligence that shines in it is not that of an extraordinary priest, king, or an official expert. Archly reasoning differs from algorithmic reasoning mainly in that it treats

119 Ibid., 86–87.
120 Ibid., 86. See footnote 10, p. 725: "Algorithm: contrary to appearances, the word does not come from Greek but from Arabic and means a finite set of elementary operations for a computational procedure or the resolution of a problem."
121 In these descriptions, I follow mainly the account given by James Ritter in his essay "Babylon," 17–43, as well as "Measure for Measure," 44–72.
122 Ritter, "Measure for Measure," 62.
123 Ritter cites from the Rhind Papyrus, ibid., 69.

the *manners of accounting* in which that which counts expresses its power, are being treated wittily, and challengingly. The brilliance that shines in the archly reasoning of a world that exerts itself upon itself, by double duplication, is the brilliance of a world that collects and discretizes itself in a genuinely public language (that of mathematics). For Serres, "intelligence is immanent and, probably, coextensive with the Universe."[124] The world owns a huge stock in forms, he tells us, "there is a vast objective intelligence of which the artificial and the subjective constitute small subsets."[125] The new economy that corresponds to the archly reasoning of the world feeds from the cornucopia of ideas that the world might recognize as its own, while trying to keep track, in its reasoning, with who and what it actually is.

5th iteration (inventing a scale of reproduction)

So let us turn back to Thales, and how he gradually invents a scale of reproduction for measuring the colossal manifestation of the pyramid. Thales sees in the pyramid the eminence of a principle, we said, that of homothesis. But how can we learn to en-familiarize ourselves with the meaning of this? What we can learn from Serres is that homothesis abstracts from the tabulatory accounts that preserve and collect, in their algorithmic tables, all that the gnomon indicates. One way to put it is to say that Thales steps out of the apparatus of capture's reign, and that he dares to multiply the very principle of its regime.

Let us recapitulate and see how Thales proceeds. Thales has no direct access to the object he wishes to measure, and sets out to establish the possibility of an indirect way, by double duplicating the situation and engendering the form of this double duplication as a reduced model. He proceeds to measure the pyramid by postulating that it be possible, and elaborating his own fantastic postulation before his inner sight, that is, in theory. He begins this elaboration by building a stock of experience—a résumé—or, as we might say now, by treating what appears to be *a given as data to be organized* in algorithmic tables. What appears as a given, he dares to think, is given by the gnomon and can count only as indexes to something that is not exhaustively given in what the gnomon collects. This something, he considers, must be of such a *magnificent* quantity that the form of reciprocity that hosts it also hosts the size of the pyramid as one of its possible variations. If one were to en-familiarize oneself with the dimensions of the monument, and hence be capable of measuring it, this magnificent quantity is what one would need to better comprehend. Thus, after having stepped out of the immediate reign of the gnomon's apparatus, Thales gives way to a thrusting forth of his mind beyond what it is yet capable to encompass. He wants to learn. Following Serres in his account, we can

124 Ibid., 96.
125 Ibid.

remind ourselves that before Thales will know, and be able to draw his famous circle in order to measure the pyramid, he has to iterate and go in circles, on grounds no more solid than his desire that it be possible. He has to assume a result that seems, from all he can know, beyond reach—and it is on the premise of its assumption that he must try to find an algorithm that will guide his way to the result whose solvability he presumes against all odds. Thus Thales gradually builds up his résumé. He continuously sums up what he finds along his iterations, and attempts to treat the sums he comes up with as values proper to his hypothetical form of reciprocity of a quantity so magnificent that it hosts the invariant quantity that makes the pyramid comparable to the reduced models he is trying to build.

But from what stock of experience does he draw when attempting to build a model? Going around in his circles, Thales regards the pyramid as an objective ruler. He begins by regarding it, as is the common manner of thinking, Serres suggests, as a sundial. He expects the pyramid to speak about the sun, and to indicate the hours of measuring. He marks the outlines of its shadows as time goes by, and faces a growing number of varying outlines, the longer he goes on. As he continues his circles, he begins to consider that the outlined shadows (which build his stock of experience, his résumé) must all be variations commensurate with one another by that module of which he knows nothing more than that he must proceed according to its proportionality in his attempted act of double duplication. The way how Thales eventually succeeds in abstracting from the idea of the gnomon, explains Serres, is by changing the real setting of his exercise into a *formal* setting in theory: instead of bringing the pyramid to speak about the sun, he can now ask the sun to speak about the pyramid.[126] This perspective, which is now a theoretical one, no longer based on experience alone, does not, as before, require that the magnificent quantity, whose form of reciprocity hosts the invariance he seeks, be real and actually given; it may remain a secret—like those secrets, inherent to materials and to tools, which forever inspire the development of a craftsman's mastership.

Hence, we can imagine how Thales's view gradually begins to change. He ceases to contemplate the variations he observes and registers, as he goes in circles, for the sake of finding in them a new "given," from whose concrete shape he learns a general procedure. Yet with it, he cannot mechanically compute, as it was custom with the algorithmic way of thinking, what may count as constant and common throughout the transformations among all the outlined shadows. No, he begins to take the stance of the artistic craftsman—and he is well aware that what he attempts to craft must remain abstract. He sets out to craft a genuinely theoretical object, one that duplicates the objectivity of the ruler. Now, the variations begin to interest him because they must host, he thinks, the essence of an

126 Serres, "Was Thales am Fusse der Pyramiden gesehen hat," 218.

invariant quantity that, like a guest, can never appear in its familiarity as long as it is respected as a guest (and not subjected to the customs of one's own home). Like a guest who is familiar and strange not due to willed disguise, but by lack of alphabetized commensurability, the invariant quantity must be treated in a space, and in a language, in terms of which the artistic craftsman too is an immigrant and a stranger. It cannot be the concretely objective space of collective memory that allows for the dramatic act of an *inceptive* conception, rather it must be an abstract space which is capable of staging the intuitive concreteness of collective memory. From now on, Thales strives to en-familiarize himself with the immenseness of the pyramid; he no longer hopes to succeed in subjecting it to an order that he would already be familiar with. He aspires to do so by expecting from that which changes ceaselessly (the shadows) that it be capable of speaking about what is stable in an abstract and non-concrete manner (the measured pyramid). He thinks about the setting in which he finds himself (at the foot of the pyramid, in the desert) as a formal setting, not as a real setting, and with this, Thales can find a trick to render—against all likeliness—the course of the sun *permanent.* He no longer participates in the dictate of the gnomon as a real ruler, where what it points to must belong to what is already given, but to what can be seen in what is given only by pointers to something whose magnitude is magnificent, and as such bound to remain immense, and barred from being directly experienced.
With this leap into theory, Thales no longer uses space to indicate time; he arrests time through generalizing one particular, and real, moment—that when our shadows and our bodies have the same length. As Serres puts it: "He homogenizes the singularity of each day in favor of a general case—one has to stop time in order to evoke geometry."[127] In other words, Thales must symbolize a world in which he could relate to a monument of such awesome colossality and vastness, from the Latin *colossus*, "a statue larger than life." Like this, Thales can think with all the cunning and conquering reason he is capable of, and yet without being disrespectful to the secret at the center of the pyramids. Such is the symbolical nature of intellection, Serres seems to be saying, an intellectual nature that is not at odds with an ethics of mutual respect. We can see in the birth of mathematical theory the unlikeliness of beginning to converse abstractly.

6TH ITERATION (THE FORMULA, A DOUBLE-ARTICULATING APPLICATION)

Thales's double-articulating application of the gnomon contemplates all possible variants of a triangle by inscribing them, theoretically, into a common compass: the course of the sun's permanency. This is how Thales eventually succeeds in conserving, in his textual formula of right-angled triangles, a universal and formal concept of similarity. Its compass is

127 Ibid., 219.

conceived by a reasoning that is proper to the world as it exerts itself upon itself—the course of the sun as collected by a duplication of the gnomon. Thales's theorem states, as a means of conservation, that if A, B, and C are points on a circle where the line AC is a diameter of the circle, then the angle (∠)ABC is a right angle.

For Serres, as we will see in a moment, recounting what Thales might have seen at the foot of the pyramid is inevitably a text about originality. Like Thales himself, Serres is not interested in revealing the signification of this origin by claiming to be familiar with it, but instead he wants to postulate, again like Thales, further theorems of universal value. Let's see what some of Serres's own postulations are, and how he sets out to elaborate on them.

IV. THE AMOROUS NATURE OF INTELLECTUAL CONCEPTION: UNIVERSAL TEXT THAT CONSERVES THE ARTICULATIONS OF A GENERIC VOICE

1ST ITERATION (MARKING ALL THAT IS ASSUMED TO BE CONSTANT WITH A CYPHER)

First we must see what is the object of Serres's own double duplication. Thales, we said, double duplicated the algorithmic mode of iteration and established a textual formula that conserves an infinite amount of variations. As Thales puts the algorithmic mode of iteration in Babylonian science at stake in order to generalize from its custom, Serres puts Thales's archly reasoning at stake, which he sees as consisting in duplicating the scene—in order to generalize from Thales's custom. What happened in this "Thales moment" counts to Serres not so much *as the origin of geometry* (which is today's customary association with this event), but *as the inception of a stage for abstract thought.* The inception of such a stage is necessary, he maintains, for developing proper alphabets of formal reasoning out of the formality of mathematical statements—alphabets that, like any alphabet, allow for expressing an infinity of articulations by a finite stock of elements. Thus, if Thales was capable of formulating his theorem by attending—theoretically—to the permanence of the sun's course, Serres wants to reintroduce temporality and the vividness of real happenings into the formal settings established by Thales. If Thales questioned the principle of the gnomon by multiplying it, and thereby invented the space of theory (homothesis and homology, organized according to an abstract principle of similarity), Serres sets out to question the principle of theory by multiplying it, and to inventing an alphabetic view on the timeless space of formal theory. Such an alphabetic view is what to him counts as the birth of physics from the spirit of mathematics.[128]

128 See Michel Serres, *The Birth of Physics*, trans. Jack Hawkes (Manchester: Clinamen Press, 2000 [1977]).

Serres's account sets out to speak about how the abstractness of an architectonics of formal ideality had been fabricated. The proposal is simple. What Thales realized, according to Serres, is threefold:

1 the possibility of reduction: Thales creates a model that extracts from the given situation a skeleton reduced from all singular context, and that is in favor of a general case;
2 Thales affirmed the idea of a module: that throughout different sizes and scales, the quantities at stake must be commensurate;
3 Thales conceived of the model in a general, not in an iconic, representational manner: he invented a scale of reproduction.[129]

These are the conditions that make *the creation of a model* possible, as an intellectual act of engendering. Yet, as conditions, they depend upon being bracketed and enciphered: Thales, trying to win the immense for a mutual encounter in a realm in which both are immigrants, all familiar constancy in terms of space, time, practice, perception must be questioned and marked with a cipher. Driven by his desire, Thales treats them as coefficients that must, in *some* way of which he knows he can never see in an immediate manner, be at work within what he seeks. And indeed, once Thales comes to measure the pyramid, each condition will be raised in their powers: space will host something that does not exist, a general model; time is arrested and one of its moments is rendered perennial; practice comes to envelop not a necessity, but something that appears necessary (a theory); measuring does not depend upon tactile perception, but upon visual sense. Thales, in the account Serres gives of him, invented the stage of abstract conception by conquering, without disgrace, what is, in its dignity, impenetrable: the arcanum of the pyramid's lasting and unviolated immenseness.

2ND ITERATION (CONFLUENCE OF MULTIPLE GENESES)

Serres's own double duplication of the Thales situation constitutes, in turn, a model. What he sees while tracing the conquering movement of Thales's act of intellection, lets him face something that appears to him as immeasurable as the pyramid must have appeared to Thales—let us call it the *graceful desire* by which he sees Thales moved. The desire that desires the arcanum. The desire for revelation of what must remain, if one does not want to violate it, concealed. So what does Serres do, in his account of Thales? He sees in the Thales situation a multiplication of originality in procedural, operative terms: *algorithmic* originality times *gnomonic* originality times *formulaic* originality times *textual* originality (the originality he adds to it when he reads Thales's story as a story of origins).[130] The multiplication of origins supports a multiplication of how we can account

129 Serres, "Was Thales am Fusse der Pyramiden gesehen hat," 214.
130 Ibid., 219. As Serres literally puts it: "a multiplication of genetic procedures" and "the origin of geometry is a conflux of geneses."

with givens by rooting them in *enciphered* constants, and by symbolically domesticating the growth of what can be yielded from these roots (the variables in all possible variation) if we carefully tend to their tabular organization. The careful tending of such graceful desire consists in treating formulaic statements as theoretical fabrics, which aspire to caress the integrity of the colossal through offering dramatizations of possible rapports, in which the terms of such statements feature as protagonists, as actors on stage in texts of proper originality. In the plurality of such dramatized theoretical fabrics, we can render the givens comparable as things that remain, essentially, elusive and come to the world from an outer space of universal intellection. Like this, the "givens" must be regarded merely as pointers to a magnitude with which we can en-familiarize ourselves if we collect the indexical pointers that mark that magnitude, by integrating them into a commensurate compass; stating that what can be conserved into a formula depends upon abstract conception in a realm of theory, and this realm is, essentially, inexhaustible. More concretely, in his multiplication of originality, Serres faces *an immense product*, a result that integrates the streams that spring from all these different originalities, as *the confluence of multiple* geneses.[131] The alphabetization of the theoretical space must attempt to draw balances from this immense product.[132]

So how does Serres imagine that the Greeks were able to conceive of the abstract stage of geometry? Through a fourfold genesis, he suggests:

1 a *practical* genesis which consists in "producing a reduced model, coming up with the idea of a module, tracing back what is afar to what is near";
2 *sensorial* genesis which consists in "organizing the visual representation of that which cannot be sensed immediately by touching";
3 a *civic* or *epistemological* genesis which consists in "departing from astronomy and inverting the problem of the sundial";

131 Ibid., 219–20.
132 In "Gnomon," Serres writes: "And so it does not appear that the Ancients sought or thought of elements absolutely first or last: there are elements everywhere, in local tables" (112). He explains: "The term Elements, which translates into Latin and our modern languages the title used by Euclid and probably Hippocratus of Chios before him, originates from the letters L, M, N, in the same way as the alphabet spells the first Greek letters: alpha, beta, and the sol-fa sings the notes: sol, fa. The authentic title *Stoicheia* does indeed mean letters, understood as elements of the syllable or of the world" (111). And, further: "Again, what is an element? This mark, this line, the dash, the hyphen, in general the note, as these words were used by Leibniz. And in the plural, a series of these notes, a series generally grouped in a table or a chart of points and lines, in well-ordered lines and columns. As far as I know, the Elements of geometry also consisted of points and lines that we have to learn to draw. Today, as in the past, everywhere we see similar tables: the letters of the different alphabets, numbers in all bases, axioms, simple bodies, the planets, markings in the sky, forces and corpuscles, the functions of truth, amino acids. […] Our memory preserves them so easily that they themselves constitute a memory in the triple sense of history—hence the commentaries—of automation and of algorithms" (113).

4 a *conceptual or aesthetic* genesis which consists in "stopping time in order to measure space, swapping the functions of variability and invariance." [133]

3RD ITERATION (THE RESIDENCE OF THAT WHICH IS GENUINELY MIGRATIONAL)

From within this insubordinate happening of confluent streams, which Serres recounts while contemplating what Thales might have seen, Serres identifies three conditions that will firmly support to gracefully appropriate a sense of inner sight (theory) by building schemata in the form of optical diagrams.[134] Optical diagrams contain the essence of theory, he holds, yet this essence is an act: that of transportation.[135] Theory, by sending whomever reasons theoretically on travels, allows him or her to grow more familiar with what manifests itself as immense. Let us recapitulate Serres's reasoning. The sense of sight, and that which is seen, premises the following givens: position and angle, a source of light, and an object that is viewed as either dark or light.[136] The confluent streams are treated as processes of transportation, and the questions to be asked, Serres maintains, are questions of where that which is caught up in transport properly resides:

1 "*Where is the proper residence of position and angle?* Anywhere. Where the source of light resides. Application, relation, measurement are possible because field markers are brought into constellation; one can see the sun and the peak of the pyramid in constellation, or one can see the peak of the tomb and the uttermost end of the shadow in constellation."[137]
2 "*Where is the proper residence of the object?* Also the object must be transportable. And in fact it is transportable: either because of the shadow which it casts, or because of the model that emulates it."[138]
3 "*Where is the proper residence of the source of light?* It varies, one only considers the sundial. It transports the object in the appearance of the shadow. It resides within the object, this, we will call the miracle."[139]

It is an enchanted world, the world in confluent streams of multiple geneses, and yet it is a world of objective reasoning. It is a world in which what testifies the immenseness of life and death can be encountered gracefully. Where a monument evokes a sense of tremendousness

133 Ibid., 219.
134 Serres, "Was Thales am Fusse der Pyramiden gesehen hat," 221.
135 Ibid.
136 Ibid., 219–20.
137 Ibid., 220.
138 Ibid.
139 Ibid.

and seems to demand subordination, Thales shows us (via Serres) how we can en-familiarize ourselves with it by considering abstractly and carefully superordinate concepts, *hypernyms*, by dramatizing them. To conceive of the world abstractly is a form of conquering that never annexes what it conquers but "coexists" with it. To conceive abstractly brings to work what one is familiar with from where one comes from in an altogether original manner, by treating what appears to be constant as ciphers that need to be rooted in symbolic domains yet unknown, to be engendered by no other way than by *archly* reasoning.

4th iteration (universal genitality)

On the stage of abstraction, all that features in it is immigrant. It is the stage on which to conceive of things in their genericness, and in their universal genitality. It is a theorematical stage, and it enables the unfolding of plays in the scene of writing: plays that perform the measurement of originality in theory. Nothing in these plays is native to their plotlines; everything that features in them is on travel. With regard to such measurement, no one can possibly be at home when he or she dares to make statements about what happens in a scene of originality. Such measurement depends upon one's own en-familiarization with what is awe-inspiring—on the sole condition that we can count, if only the ways of conduct are not without grace, on the colossal's hospitality: "The theatre of measurement performs how a secret may be deciphered, how an alphabet may be deciphered, and how a drawing may be read."[140]

In Serres's account of theory, mathematics is the key to history, not the other way around. A scene of originality cannot be witnessed, he insists.[141] In it, something immense is posed at the discretion of a theory, and a theory is the dramatization of an arcanaum, a secret. Mathematics is archly reasoning that seeks to engender a circuit. Nothing more. It cannot be witnessed, it can only be actualized. If the essence of theory is transport, as Serres maintains, then theory is never about identifying with the revelation that takes place in abstract conceptions that are attributed to count as scenes of originality—like that of Thales and the inception of the theorem of angular measurement within a circle. It is not important whether Thales draws the circle around himself, or around a simple stick, as far as the statement of the scene in the form of a theorem is concerned. A theorem expresses a schema, an optical diagram, and the schema is a stable auxiliary construction that allows a thing to be transported. Such auxiliary constructions render all things mobile; they are vehicles.[142] They facilitate within the reality of the universal the migrational activity of that about whose essence we can say nothing more than that it is im-

140 Ibid., 229.
141 Ibid., 221.
142 Ibid.

mense, a crystallization between life and death, a being about which no one knows anything beyond what can be stated of it in the universal terms of mathematical agreement. As a thing stated like that, in its dramatized originality, one can tap into the circuit of activity that is organized in its statement. And this without, properly speaking, understanding it.

But one needs to understand the theorem. And this involves, ever again, to "pay" ones coordination of familiarity, the elements of one's world, "as a tribute" to the possibility of spelling out of the theorem. That is why mathematics, to Serres, is the key to history. What can be told by theorematical statements are dramatizations of an immense content, and in that, they are not much different from how the schemes in mythical tales work: a schema is what remains invariant regardless of the number of times a story is told. But the schema is not the origin of this invariance, it is its vehicle.[143] Every mythical tale is the dramatization of a given content. The relation between a schema, and the mobilization of an original thing that the schema affords, is essential for a tale to become tradable. Mathematics is a language, but one can speak in it only in the terms of a private, unpublished story. Because what it expresses cannot be witnessed; it can only be actualized. Knowing a theorem means to have lived up to encounter the arcanum it hosts with grace. It can only be talked about from afar, through anecdote, on the relation between two ciphers that are, ultimately, not to be deciphered: "Thales's geometry expresses, in the form of a legend, the relation between two blindnesses, that of the result of practice, and that of the subject of practice. It formulates and measures the problem yet without resolving it; it dramatizes the problem's concept, yet without explaining it; it poses the question in admirable manner yet does not answer it; it recounts the relation between two cyphers, that of the mansion and that of the monument, yet it deciphers none of them."[144]

5TH ITERATION (MATHEMATICS IS THE ELECTRIC CIRCUIT OF CUNNING REASON)

A theorem renders available certain techniques, because techniques envelop a theory. They are stable coatings that package the acts of archly reasoning in scenes of originality, in abstract conception. In order to take these practices and do something with them, in order to apply these techniques, one needs not know the theory that they envelop. But without knowing it, one doesn't touch upon the question of originality. It cannot be separated from the pride of a craftsman who seeks to become masterful, in the sense of conquering his material without disgracing it. As Serres puts it:

> What is the status of knowledge that is contained in a technique?
> A technique is always a practice that envelops a theory. The entire

143 Ibid.
144 Ibid., 225.

question—in our case that of originality—reduces here to a question of mode, the modality of this envelop. If mathematics springs one day from particular techniques, it is without doubt because of an explication of such implicit knowledge. And if the arcanum (the secret) plays a certain role in the tradition of craft, then certainly because its secret is a secret for every one, including the master. There is a transparent knowledge that resides hidden in the hands of a craftsman and his relation to stone. It resides hidden, it is locked in by a double bar; it remains in the dark. It lies in the dark shadow of the pyramid. This is the scene of knowing, it is here that the possible, the dreamt, conceptualized origin is staged and put in scene. The secret of the architect and the stonemason, a secret for himself, for Thales and for us, this secret is the scene of shadow plays. In the shadow of the pyramid, Thales finds himself within the implicitness of knowledge, which the sun is supposed to render explicit from behind, in the absence of us.[145]

All things stated are artifacts, and artifacts conserve an implicit knowledge. Grasping how it is implied is the truly difficult thing, the impossible thing, because if one desires not to violate the secret, there will always be a remainder left. The circuit that can be established by archly reasoning cannot possibly exhaust its source. What reveals itself in scenes of originality, by abstract conception, is always impure. The universality of geometry resides in its application, and only there. In terms of purity, geometrical universality can never be born.[146] In other words, it can never become physics, it can never be considered natural. Mathematics as language, on the other hand, allows us to consider all things natural. This is how Serres can claim that mathematics is the circuit of cunning reason, or archly staged scenes of conception. If originality is actualized in such scenes through theory, and if theory is transport and a theorem is a vehicle, then we can regard mathematical formulas as textual in a sense not unlike semiconductors are for electronics. This is indeed what Serres suggests:

Measuring, the direct or indirect field survey, is an operation related to application. In the sense, evidently, in which a metrics, a metretics, relies on an applied science. In the sense that in most cases, measuring constitutes an application in its essence [*Wesen der Anwendung*]. But most of all in the sense of touching. A unit of measure or leveling rod is being applied to a thing which is to be measured, it is being laid alongside it, it touches, and this as many times as necessary. A direct or indirect measuring is possible or impossible when such application is possible. Inaccessible is, hence, what I cannot touch, where I cannot lay the leveling rod, what I cannot apply my measuring unit to. In such cases, so people

145 Ibid., 223.
146 Ibid., 238–39.

say, we must go from practice to theory, we must come up with an artfulness and devise a replacement for those sequences that are inaccessible to my body, the pyramid, the sun, the ship at the horizon, the riverbank at the other side. Mathematics were, so considered, the quasi-electric circuit [*Stromkreis*] of these cunnings.[147]

6th iteration (the real as a black spectrum)

However, to see in mathematics the quasi-electric circuit of cunning reason would be to underestimate the scope of practical activities. Because the established circuit is a bridge, archly, between tactility and sight. To theorize means to organize sight according to the quasi-tactility of a conceptual body that lives in the scenes that unfold on the stage of abstraction. Measuring puts two things in mutual relation, and a relation presumes a transport—of the levering rod, of the angle, of the things applied when measuring. There is an inexplicable intimacy between knowing and the problem such knowing lays out theoretically. Homothesis constitutes the stage of abstraction, and the homology—the variable equivalence—that can be expressed by the statements of homothesis belongs to the reality between product and producer. What is formulaically set up as equivalent is *an invitation to read into* what the formula states; it is not a question of addressing and answering. Reading mathematically means to stage a scene that supports trading the secret of the manifest body through scenes that are accessible only to an intellectual sense of sight. The anecdotes in which the origin of a theorem can be told imply a schema that feeds off of and lives on in the dramatizations it supports. The schema, the optical diagram, can be traded only in written form. It keeps what is enveloped by practices through *not* explicating it. In proceeding like this, the schema demarcates something real, something stable and lasting that belongs to the manifest body one seeks to measure: its arcanum, its secret. And it demarcates this secret by treating it as an invariance that can only be conceived abstractly, by attributing it a measure, as a manner of how to proceed. The stage of abstraction is the theater of measuring—what is being measured, by dramatization, is "the real as a black spectrum."[148] From the point of view of the craftsman who seeks to understand more about the origins implied in his material, the material's original reality resides in the shadow cast by the sun. It is the shadow that bursts with spectral information: "Knowledge of things resides in the essential darkness of manifest bodies, in their compactness behind its faces."[149] Knowledge about the real is natural not despite but only because it is conceived and born abstractly. It is impure because it was conceived within the happenings of confluent streams of geneses,

147 Ibid., 215; my insertions.
148 Ibid., 232.
149 Ibid.

whose pool of possibilities cannot possibly be exhausted. It is from the essential darkness of things that can be rendered apparent on the stage of abstraction, in the plays that unfold in the scene of writing, where knowledge of real things lies buried, Serres maintains. From its source springs the infinite history of analytical progress: “The body which can never be exhaustively described from analyzing its bounding surfaces retains in the safe depth of the bounding surfaces' shadows a dark kernel.”[150]

Remembering the stage of abstraction that supports real knowledge allows us to see the purity of mathematics instead of an ideality of representations. The purity of mathematics is constituted by nothing more and nothing less than the presumption that there be contained, within manifest bodies, ever more that can be explicated in theory. To see ideality in the geometrical forms, as Plato did, instead of assuming purity in the mathematical theorems, means to dislocate homothetics and homology into the eternity of the one moment that Thales arrested when he wished that time—the epitome of change—might speak about the solidity of the thing he faces. It means that geometry is conceived yet cannot be born. It means to postulate that there be no reality to desiring conquest, that technics be either divine fate (Prometheus, Pandora, etc.) or the stigma of decadence. It holds that revelation be apocalyptic, purifying, in that it clears the spectrums of recognition into the whiteness of virginity. This white spectrality, which supposedly allows us to recognize the identity of things as they ideally are, behind their disturbed appearance in actual existence, constitutes the idea of pure intuition. By insisting on the essential darkness of things, Serres may well sound like a worried prophet; yet it would be the prophecy of a worldly nature and a natural sexuality that is driven by the desire to conquest and master what is never intended as possession:

> [But] when the moment has come and this postulation of the purity of geometrical form, inherited from the Platonic legacy, will die because nothing can be supported by intuition, when the theatre of representation has closed its doors, then we will see secrets, shadows and implication explode anew in the world beneath abstract forms, and before the eyes of surprised mathematicians—explosions which have been prefiguring long before these deaths. The line, the plane, the volume, their distances and regions will once more be viewed as chaotic, dense, compact […] entities, full of dark and secret angles. The simple and pure forms are not that simple nor that pure; they are no longer things of which we have, in our theoretical insight, exhaustive knowledge, things that are assumedly transparent without any remainder. Instead they constitute an infinitely entangled, objective-theoretical unknown, tremendous virtual noemata like the stones and the objects of the world, like our masonry and our artifacts. Form

150 Ibid.

> bears beneath its form transfinite nuclei of knowledge, with regard to which we must worry that history in its totality will not be sufficient for exhausting them, nuclei of knowledge which are profoundly inaccessible and which pose themselves as problems. Mathematical realism wins back in weight and re-adopts that compactness which had dissolved beneath the Platonic sun. Pure or abstract idealities will cast shadows once more, they are themselves full of shadows, they are turning black again like the pyramid. Mathematics unfolds, despite its maximal abstractness and the genuine purity which is proper to it, within the framework of a lexicon which results, partially, from technology.[151]

Technology manifests, as implicit ideality, that whose theorems are mobilized in the representations of its variables and coefficients, representations which are dramatized in myth and transported through language. Technology is bursting with implicit knowledge. Every technology is a text that hosts an account given about a scene of originality, of abstract conception. And this, following Serres, is no embrace of mysticism.

151 Ibid., 237.