

Photosynthesis

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ABSTRACT: Plants synthesize with photons, so we commonly say. This article on photosynthesis introduces a notion of concepts that are to be thought of as capital and yet natural. They constitute a metaphysics of meteora alloys and copiousness through “actively lacking” a “proper” notion of conception.

KEY WORDS: materialism of intellection, capital concepts, *meteora alloys*, cosmic economy, amphibolic reason

The attempts and discoveries of Priestly and Ingenhousz . . . have been so significant not only because they triggered a huge leap in progress of understanding plant physiology, but also because they uncovered a radically novel view on the Earth's atmosphere. The air which we breathe is not merely a purely geological or mineral reality—it is not just there gratuitously, it is not effectuated by the Earth as such—rather it results, literally, from the breath of the other animate beings.¹

Plants “nourish” themselves from the substance of light—they synthesize with photons, so we commonly say. Yet how to think of such “nourishment,” or such “metabolism”? Plants are plants because and insofar as they photosynthesize. Plant nature can be separated from photosynthesis as little or as much as human nature can be separated from thought/intellect. Is there something to be made of this analogy between photosynthesis and intellect? If we think of it in an analogy to language, and the traditional question of language's substance in literary terms, would plant nature then be a Great Banquet, as Dante's *Convivio* depicts the nature of Tuscan vernacular at the allegorical table of the Latin language, featuring authority and host to the “lingo-gonic”² scene he dramatically depicts? What would be in the position of Latin, if this analogy were indeed an interesting one? Or ought we rather to think

of such nature, as Plato imagines in his Symposium, as akin to the philosophical perhaps? Plato's Symposium is a locus that is and is not a market place. In this site conceived as that of a symposium, there is a host and there are guests, but it is merely words that are exchanged for food and drink. Drinking and talking, more so than eating, give the cue that tempers the idea of such a wisdom-loving site that gathers guests around a common table by having them participate in a "friendly" kind of contest.

Is it utter nonsense if we try to extend something meaningful from attending to the nature of plants in analogy to a nature of intellect, such as to develop a more general—a generic perhaps?—idea of nature according to photosynthetic terms? Would we not rather just call such transformative metabolism thermodynamic "work," in the apparently sober (non-metaphorical) sense of transforming energy from one form or state into another? These are the questions that give the directionality which my attempt here (to consider photosynthesis as a new-materialist concept) strives to catch up with. What I am circling around is how, and whether, we might think of something like "quantum literacy" as a kind of quasi-photosynthetic nature.³

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We are at least distantly familiar with photosynthesis as a natural process—we know that trees and bushes, flowers and grasses all nourish themselves from the sunlight, and through their metabolism help to create a life-friendly atmosphere. And yet we are seldom amazed by it. We don't think of light as a "substance." We are not at ease with thinking of light in material terms. We are rather well used to thinking of photosynthesis *as a process*, that is, in relation to how it works technically. On the basis of learning to handle with greater and greater sophistication processes that are familiar to that of natural photosynthesis, or that explicitly harvest its effects, organic chemistry is producing synthetically natural alloys that permeate nearly every aspect of our lives (fabrics and materials, medicine, food, agriculture, etc.). Yet if we want to come up with a concept that does not describe the process but rather tries to capture photosynthesis as something worth grasping in its own right, as a principle, we need at least to clarify whether such a conception be a matter of epistemology or of ontology. Or should we refer to it perhaps better in the blended terms of an "onto-epistemology"?⁴ Either one, I want to maintain, is bound to miss the most unsettling aspect of photosynthesis. What I mean is its *economical* aspect—the aspect of a cosmic economy, of a spending and banking, a hosting and servicing, a withholding and a hypothecating, in short a substitution dynamics that conditions material rememberings as much as material negligences, and of which one has to maintain that it is natural, universal even.

In order to consider this economical aspect, we need not necessarily revert to literature and philosophy, as with the theme of the *Convivio* and the Symposium. We can think about photosynthesis as a principle also in mechanics. But to fully picture where we would be, then, we need to consider an alienating shift as well, namely that between classical mechanics and quantum mechanics. We need to ask what it means to speak of principles with regard to alloys. For Newton, principles belong to the domain of mathematics, not physics, while physics knows forces that *obey* those mathematical principles. This makes up the backbone of the apparently self-evident conception of passive matter: matter as hosting “indifferently” physical forces that are, in themselves, considered as determinate and uniform, bound to obey mathematical principles. Quantum mechanics on the other hand asks us to re-conceive of matter as agitated, as a restless, and semi-conductively circuitous, kind of communicative cyclicity. Quantum mechanics seems to suggest that there is a kind of “sense” proper to matter, that matter is not merely the meaningful host of sense that can be made. Sense literally means both, meaning and direction; through the optics of quantum mechanics, matter appears to embody a kind of corruptible meaning, meaning that is not constant and autonomous.

Science’s relation to matter and materialism has always been an ambiguous one; early materialisms, like Democritus’s atomism in antiquity, were just as much a moral philosophy as a natural one (a kind of proto-physics). This ambiguity results, we can easily understand, from matter being what can be learnt to be controlled through mechanic cunning, through *technē*, while it is at the same time what must be suspected—anticipated—to always host “more” than what one can attend to. Matter, hence, cannot be trusted. The only reasonable relation to matter, from a materialist point of view, seems to be one of “forcing.” Algebra itself, usually thought of as the mathematics that facilitates the adjustment of balances within its formulaic form (algebra is always expressed in equations, i.e., in speculatively setting equal what is not exhaustively known, what entails “unknowns”), was introduced by Al-Khwarizmi not only as the art of a re-constructive “completion” of a lost equivalence, but also as the art of “forcing” in the sense of “compelling,” literally a driving together in one place—this is an aspect that is often neglected in mathematical history books.⁵ Algebraic formulae of which it is assumed that they are fully *determinate* are what we have come to call “laws” of nature—building a deductive system of such laws is what Newton famously achieved, with his *Natural Philosophy According to Mathematical Principles*.⁶ On the other hand, algebraic formulae of which it is assumed that they are fully *determinable* (rather than determinate) are what we have come to call “principles,” and we tend to attribute them rather to chemistry than to physics. What I want to ask is this: how is it that of the two arguably most abstract and amazing “workshops” of nature, those of nuclear physics on the one hand and organic chemistry (which revolves all around working with photosynthesis) on the other, only one, that of nuclear fission, has

widely troubled philosophical discourses throughout the twentieth century. The other, that of photosynthesis, must be said to have been mastered in terms no less stunning than the latter, but with much less excitement, astonishment, and awe.

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In short, I want to situate photosynthesis as the dual in pair with nuclear fission. I want to regard both as principles in the geometric sense of polar coordinates: that is, I want to conceive a space with them that is temporal and has direction, and heads towards it, but that yet also changes this direction while doing so. Both of these natural principles literally “treat” solar light. Both of them head, and in that sense capitalize this multitudinous nature, albeit in different ways. I want to do this with an analogy: while the splitting (and perhaps soon fusing) processes of nuclear physics produce light with matter, the processes of photosynthesis incorporate light through materiality. For both poles of such coordination it is as if the “passivity” that matter has classically been ascribed reveals itself as active and inchoative, as a strangely circular “conditionality” dynamics for whose “passive-activity” (or “active-passivity”) contemporary mathematics gives us the beautiful term of “percolation” for better grasping what appears to go on here. The mathematics of percolation addresses a “condition” that is what it is (a condition) only insofar as it is “lacking.” A memorable formula we can hold on to: percolative conditions facilitate a “seeping-through” like liquid seeps through sieves, or like a river bed does through the ground it traverses. Such conditions lack, and it is through lacking that they leave traces.

But how to think of such “sieves” in terms other than those of “form”—since the concept of “form” gains its rigor only from being considered as the active other to passively-passive matter? We have forgotten that the word “condition” comes from *condicere* “to speak with, talk together, agree upon.”⁷ And we tend to forget that contemporary physics is a physics for which there is not only *universality*, literally a turning towards a unifying one, but there is also a strange kind of *conversation* going on, a discrete circling together that lacks central direction, that revolves around an empty center: contemporary physics is one whose quantities are not magnitudes of inert matter but countable measures (quanta) of unsettled order-relations, that is of “information”: everything, insofar as we can treat it in the terms of physics as a science, is literally engaged in the manifold activity of sending, receiving, storing, and processing information.⁸ Physics that treats the natural conversations that take place and go in the alloys of these two polar coordinates is still a domain governed by laws. But the placeholder of the voice that speaks decisively is never really a “neutral” one; it is not only feminist philosophers such as Simone Weil, in *Gravity and Grace*, who have been seeking to address this adequately. The promise that a philosophical conception of photosynthesis as a principle holds is

that of coming to terms with the androgynous, with the “hermaphrodite,” or, as the etymological dictionary also holds it, the “womanish” nature of a cosmic and conversing universe. The nature of the universe is receptive and fertile as well as determinative and decisive. In a-cosmist cultures, life and things are bound to be ignored—they appear unreasonable, unfounded, irrational.

What I want to suggest is that such a strange condition, a condition that results from percolation—one that is what it is (a condition) only insofar as it is “lacking”—brings to the fore again, with regard to reasoning, the dimension of speech next to that of writing. For speech too, as for the “filters” we seek to name properly, it is constitutive that it lacks what it renders present. For it too, it is characteristic that it is actively receptive and restless, formulaic rather than formal, spectral (in the sense of optical instruments) rather than representative or expressive. From a communicational physics point of view (an information theoretic one, not an ontological or an epistemological one), it is indeed as if photosynthesis can be regarded as a kind of natural speech: such a physics puts us face to face with an androgynous and talkative, but no less determinative and decisive kind of nature. But at the same time, the very fact that organic chemistry (as well as photovoltaics and semi-conductor technology) are capable of technically *reproducing* processes that involve photosynthesis points out that such a kind of “speech” cannot be attributed with the main characteristic for which we usually value (or discredit) speech vis-à-vis its stated forms, that is in relation to writing: even if communicational physics presents us with a kind of natural speech, this speech can evidently not count as immediate expression, or un-mediated articulation; otherwise it could not be explicitly formulated, and it could not be refined through ratiocination and fabrication.

The mathematics of percolation affords us with the ability to address rigorously, and, mediated by its (symbolic) instruments (its formulations, the spectra, and its forms of analysis), also with exactness, a strange kind of condition in which matter actively lacks, as we said. This condition is better called a “conditionality,” and such conditionality, I want to suggest, needs not only be regarded as hermaphroditic and androgynous; it also needs to be addressed in the terms of a lawfulness whose statements are captured in what we might perhaps best call “capital concepts.”

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Capital concepts are conductive rather than delineating concepts. They are hosting what they conceive rather than deciding what belongs to what. The unit to measure their form as well as their materiality is a restless unit in circulation. Capital concepts are concepts that don't grasp; they erect. Their manner of conception is decisive, but does not happen according to principles. They conceive not through outlining and separating, but through accommodating

and facilitating, like channels do in communication technology. They are also not symbolic concepts that would unify different things. Rather, we can think of them as actively accommodating what they are to conceive by letting it get away. Capital concepts don't capture; they offer. They are reasonable but without making sense. This is because abstractly considered, they can make any sense, while on the other hand, if they are looked at concretely, they are concepts that can no longer be considered capital; they are principled then, and have turned into administrated heritage. It is true that we need to say of capital concepts that they lack direction (sense), *but they do count*: they "lack" direction (sense) actively, "percolatively," by collecting all that can be considered as absent. Capital concepts host what they conceive rather than deciding what belongs to what—attempting to account exhaustively for what they are capable of "hosting" is as impossible as accounting exhaustively for all that can be realized, over time, with a certain sum of money is.

To put it in yet another way: capital concepts are concepts that "grow" not only in terms of extension (inflate or deflate), but also in terms of "age." They are concepts that grow old. But this also means that they can be born. What they conceive is neither a deficient nor a full meaning: they have meaning, very many meanings and a big plentitude of meaning; what they conceive is the very of the many and the bigness of the plenty. Capital concepts conceive sense only insofar as they lack it. They are abundantly full of meaning but *bare* of sense. Bursting with the meaning that they host, they do not make any sense as long as they do not spend themselves. It is in this sense that capital concepts can be said to be of "solar" multitude. They grow old, they mature and make sense only if they are receptive to one precise directionality: namely to exhaust themselves in actively conceiving all that they are capable of hosting. Capital concepts can be cruel hosts, just like concepts that classify can be cruel.

Reasoning in terms of capital concepts does not try to get things right. At the table of a natural, androgynous intellect,⁹ the hosting reason seeks to complement whatever direction his guests might take with an inverse path to this direction: reason that wants nothing but to never cease being a host will want to keep things open. It needs to lose direction. It needs to let go of what it accommodates. In other words, capital concepts incorporate intellectually what it means to lack a body: They are nothing on their own except their own generic in-existence. A capital concept is one of uttermost generality—it is like a sun that tries to collect all it has to spend. At that same time, capital concepts are concepts only insofar as they are parsed (partitioned) into the scales of a never properly lasting minutesimality that inheres to, and that inhabits, the massive passing of time in spaces of polar coordination. They are concepts that need to be sounded. For they matter in what they are saying—not despite, but in that they are, precisely, attempting to not ever say anything in particular. But this they do actively.

Let's recapitulate: A capital concept is never at rest; it is a concept only in that it is restless, and it is restless only in that it lacks. It lacks in a passively-active mode of crediting its own content, in a great amount of actively-passive manners. Photosynthesis, I want to suggest, is to be addressed as just such a capital concept—capital hence not in the sense that it would be divine, sacrosanct, or in any other moral and/or ideological way “superior.”

But still, to begin speaking about photosynthesis as a concept in this manner entails a coming to terms with the “hypostatization” (or “reification,” if one prefers). Let's look more closely then at what photosynthesis does when it says nothing in particular.

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For roughly one hundred years now, organic chemistry and electro-engineering sciences have developed a more and more patent understanding of how to mimic technically one of the most amazing principles according to which nature sustains itself: a process that converts sunlight, water, and carbon dioxide into an atmosphere in which it is possible for life forms to *breath* (carbohydrates and oxygen). As a quick glance at Wikipedia clarifies, we refer to photosynthesis almost only in the terms of property and use-value as fuels: “The term, artificial photosynthesis, is commonly used to refer to any scheme for capturing and storing the energy from sunlight in the chemical bonds of a fuel.”¹⁰ This reduction to the categories of production and work with regard to thinking about photosynthesis is inadequate. Plants not only alter their milieu, their ecological niches; they actually change the world at large. The understanding of photosynthesis as a natural process has brought us an utterly transformed view on how to think climate and the atmosphere: the air that we breath is not merely a geological or mineral reality; it is,—again: *literally*—composed of as well as generated through the breath of other beings.

This, at least, is the fascinating view that the agricultural engineer and philosopher Emanuele Coccia in his book *La vie des plantes: Une métaphysique du mélange* (The Life of Plants: A Metaphysics of Mixtures) familiarizes his readers with.¹¹ It is foremost with the evolution of plants, he maintains, that “life defines itself as a kind of circulation of liveliness,” and brings forth what he calls “the disparateness of life's forms” that manifests in the distinction of kinds and kingdoms for different forms of life.¹² Plants, so his metaphysics of mixtures suggests, reintroduce a re-conception of the great theme of the *Scala Natura*, the Great Chain of Being, but one that is stripped from any linearly progressing notion of ascension or progress. The scales in such an approach to the disparateness of life's forms are many; they are not one. And the paths they bridge—as we will see, literally between heaven and earth—are not only numerous; they must also be regarded as paths that facilitate

ways downwards as well as such that lead upwards. Any association of top of the Scala Natura with divine dignity and superior worthiness loses its rational ground (its reason). Understanding more about the process of photosynthesis appears like a giant atmospheric laboratory for transforming solar energy into biomass. Plants “destroy the topological hierarchy which appears to rule the cosmos.”¹³ They show us “that life manifests a break within the asymmetry between container and contained. As soon as there is life, what contains comes to rest within what it contains (is itself being contained by it) and vice versa.”¹⁴

The image of such a “resting,” from his botanical point of view, is a strong one: plant life dies of a too much of oxygen in its milieu and feeds on carbon dioxide, while higher forms of life die of a too much of carbon dioxide in their milieu while they feed on oxygen. It was only with the spreading of vascular plants across the surface of the Earth that the planet’s atmosphere for different life forms grew more differentially stable: with the plants going ashore, the face of the planet has substantially been transformed, massive amounts of carbon dioxide have been absorbed by plants, and oxygen was released into the planet’s atmosphere. When plants left the oceans for the shores, when they multiplied and began to populate the earth, they facilitated the production of matter and organic composites in such amounts that higher forms of life could develop more complicated compositions of life forms. Animals are capable of absorbing the amounts of energy they need to survive thanks to the existence of plants—with them, and by them, the earth produces its atmosphere and lets the beings that populate its surface *breathe*: “The life of plants is a current cosmogony, the ongoing genesis of our cosmos.”¹⁵ In Hesiodic ductus, so Coccia, “botanics ought to call inhuman material gods all those forms of life that are capable of photosynthesis.”¹⁶ To him, they are “domesticated titans” who “need to use no violence in order to found and facilitate new worlds.”¹⁷ From a certain point of view, Coccia writes, plants have never left the seas—rather, they have brought their fluidity to where it had not been before: “They have turned the universe into an immense atmospheric ocean, and they have brought maritime habits to all beings.”¹⁸ He continues: “Photosynthesis is but the cosmic process of liquidating the universe, a movement through which the world emerges as a fluidum: it lets the world breathe, and it holds the world in a state of dynamic tenseness.”¹⁹ The paradigm of such mutual entanglement was called breath (*pneuma*) already in antiquity, he elaborates. “Aspiration, breathing, indeed means exactly this experience: what contains us, air, turns into what is being contained within us, as well as the other way around, what is contained in us turns into what contains us. To breath means to delve into a milieu which percolates us as much as we percolate it.”²⁰

Coccia maintains that it is not enough to recognize, as the Aristotelian tradition did, that reason is the *locus formarum*, the domain of forms. Reason is not merely the repository of all forms which the world can accommodate. For reason

is, at one and the same time, *causa formalis* and *causa efficiens*.²¹ Coccia wants to think here a mixture of these two Aristotelian notions without reducing them to a novel “one”—reason, then, can never be thought of as pure according to his metaphysics of mixtures; but neither does the distinction itself conflate into an indistinguishable soup: as we will see, the reason he cares to talk about with his plant philosophy is one that is, and always will be, *amphibolic*, amphibolic in the sense of adapted to aspire its own realization in several milieus. What is perhaps the most important aspect of Coccia’s treatise on photosynthesis is the idea that understanding more about plant life can teach us about a certain amphibolic duplicity: “It is as if plants are leading two lives: one in the air, bathing in light and immersed, made of visibility and intensive interaction with other plant- and animal life of any size; and the other chthonic, mineral, subliminal, ontologically nocturnal, engraved into the lithic body of the planet, in synergetic communication with all existent life forms that populate it.”²² These two lives of plants are not alternatives, and they do not mutually exclude one another. They are “the essence of one and the same individual, which unites in its body and in its experience earth and sky, stone and light, water and sun. . . . Already in the body of the plant all is contained in all: the sky is in the earth, earth is being pushed towards the sky, air turns body and extension, extension is but an atmospheric workshop.”²³ To Coccia, plants are cosmic mediators; they are ontological amphibians that “link up milieus, spaces,” that “exhibit how the relation between organism and milieu cannot be thought about in exclusive terms . . . but need[s] to be considered in inclusive terms.”²⁴

Coccia’s account is poetically beautiful, and very timely in the interest it pursues: namely to think of plant life as manifesting “a break within the asymmetry between container and contained.”²⁵ But if indeed photosynthesis is the cosmic process of liquidating the universe, a movement through which the world emerges as a *fluidum*, then a philosophical conception of photosynthesis, if it wants (as is my interest in this article) to orientate itself in terms that are equipollent (not alternative) to the positivity of scientific accounts, cannot be content with stating that photosynthesis is what “lets the world breathe,” and what “holds the world in a state of dynamic tenseness”²⁶—it needs to reflect on the nature and the manner of such a conception too.

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How exactly is this novel attention to photosynthesis not merely another return to what Jean-François Lyotard has called “a Great Narrative”? A novel language game that, ultimately, aspires to absorb and dominate other language games? A novel point of identification that is to inflate and swallow up, as so many others did before this one, a wealth of precious differences that exist in their own right?

What Lyotard has called “a Great Narrative” counts to him as such mainly because it fails to accommodate an explicit stance of authorship. Great Narratives come quasi-naturally, as if nobody in particular were speaking, as if no voice could be addressed as a subject that articulates what these narratives narrate, a voice that in its turn can be challenged, responded to, spoken with, *dialectically*.

But what if we *could* address the quasi-domain in the terms of which such naturalness comes along with which a great narrative speaks? What if this domain needed not be one of transparency, of “transparentism” as Jean-Yves Girard has recently called it?²⁷ What if this idea of capital concepts were indeed one of concepts in the sense that they could be referred to a proper domain, a domain of their capitality, the house, the *oikos*, of such a natural economy—a domain to which belongs *all that is possible, anything at all, in every conceivable way*? Isn’t this what philosophy has coined the word “universe” for—universality, as that which is not derivative of a particular root, tribe, territory, dominion, or culture?

A great narrative that would accommodate explicitly also the stance of the voice, of the subject that speaks, *apparently transparently so*, this would be a narrative that organizes the space of this domain, that articulates and builds its house—the container as well as the contained—of this natural *oikos*. It would be a quasi-epic narrative that speaks about how this apparently transparently speaking voice can be addressed in the terms that are proper, adequate, to its own domain—let’s call it the domain of the apparently transparent. It would be a quasi-epic narrative that teaches not only the story of its heroine, but also instructs how this heroine came to be the person as who she speaks, with such natural ease and apparently transparent clarity. It would be a narrative that “clears” the absurd thickness of, say, James Joyce’s *Ulysses*, like an egg white clears a tomato soup into a transparent, almost color free liquid of extraordinarily intense taste. It would be a clarity that is neutral in an augmented spectrum of intensive qualification.

The heroine of such a quasi-epic story needs to have a name. But whose name? Whose sex? Whose genealogy? Which “nature”?

Michel Serres has suggested organizing conceptions of such “clarified flavors,” such “augmented neutralities,” in what he calls *chronopedia*.²⁸ Serres proposes to turn from the Encyclopedia tradition as a means to organize knowledge to a manner that not only geometrizes the role of the circle in the encyclopedia but also temporalizes and materializes it. Serres’s *chronopedia* implies a temporalization of geometry, one that draws balances about and between the organization of knowledge in the terms of a *meteorological geometry*. I will come back to this shortly. As I understand it, this turn proposes, like Coccia’s does, a capitalization—a totalization—of what can be learnt. But unlike Coccia’s, it facilitates keeping track of how such capitalization proceeds.

Such a notion of the totalization of knowledge no longer equates light with insight in any simple and direct way: rather, it seeks the generalization of the natural

source of light, the sun, such as to be able to treat it geometrically. Knowledge turns into a question of light's materiality—and "materiality" here means, strictly speaking, the amount of mass that is proper to light. Within the contemporary mass paradigm in quantum physics, light is not the opposite of material. Light is, in a fascinating way, at once continuous and yet discrete with and within what philosophy used to call "matter." In quantum physical terms, light, simply, is the *absence* of mass. The question at the core of the chronopedic thinking is thus: how to account for the absence of something genuine, something natural, in the sense of not acquired, without presuming the terms that characterize such genuineness that is "not-there"?

The concepts of a chronopedia turn to light's intensities, qualities, appearances—yet not via the path of negation. Such genuine absence can only be masked, and it can only be masked as a "rest"—it is what rests amidst any intellectual gesture that contrasts a postulated identity with its difference. We have been obsessed with the Cogito long enough, Serres maintains; we ought to think about thinking as we think about the weather. We should begin to say that *it thinks*, just like we say that *it rains*. The voice that speaks in chronopedic terms is a natural, and a generic voice, but it is the voice of a subject too. Like the weather, it is natural and universal, and yet always locally situated. Genuine absence that can only be masked is the rest that remains when we try to anticipate and predict the weather, understood in the ancient tradition of the *meteora* as the sum of all measurable, and thus articulable, temporalities, durations, seasons.

This anonymous third person singular, the "it" in "it thinks" needs to be addressed properly—and properly means, so Serres, the inverse to its anonymity: the *anonymous* "without a name" must be addressed as an impersonal persona, by calling it with any name. The voice in great narratives needs to be addressed by its proper "any-name": Serres calls this the nemo-panonym, *panonyme*, a six-fold name that is proper to the world itself: Pantope (all of its places), Panchrone (all of its durations), Panurge (the universal worker, instead of the demiurge, the public worker), Panglosse (all of the spoken tongues), Pangnose (all of knowledge), Panthrope (all sexes, instead of only man as in "anthropos").²⁹

In Greek mythology, Pan was the impersonation of nature, guardian and multiplier of all things, literally "the nourisher"—moved by lust and living in the woods, with a hybrid half-human half-animal body: horns on his head, and the legs of a goat. Pan is a god in a world of abundance, and yet he is not only moved by lust but also animated by desire. The nymph Syrinx, well known for her beauty and her chastity, hid from him in hollow water reeds, from which Pan invented the flute as an instrument to express his longing for her. If we address the impersonal voice in great narratives as Pan, then we will not forget so easily that the "it" that "thinks" will always be haunted by what it desires and longs for but can never consume or own. The sounds of the world's longing—sounds that are as pleasing as dreadful—will

always be on the verge of triggering panic, groundless fear, contagious in its spreading and so forceful that it dominates and prevents reasonable and logical thinking.

Panic literally means “all that pertains to Pan” (from the suffix -ic). The story goes that he would wander peacefully through the woods, playing his flute and resting always at noontime. If disturbed in his sleep, Pan would shout so loudly that all herds would stampede. Addressing the world with this six-fold proper name means not forgetting that the world needs to rest when the sun is high in the meridian, when the light is clearest. This is because authentic knowledge of the world, organized in a chronopedia rather than an encyclopedia, “overflows with results and intuitions.”³⁰ It “sets up multiple reference points grouped into constellations with forms that are as disparate as those of scholarly disciplines. Thus knowledge finds temporary truths whose luxuriously coloured sparkle flickers and changes with the duration of the Great Story.”³¹ If there is something to my initial interest, namely to begin thinking of quantum literacy in terms of photosynthesis, then to the degree that one is literate—the more one knows about it (and hence is alienated from it as something that would happen naturally and uniformly)³²—one would have to think of oneself not as a star but as a planet: “The only lights that do not tremble emanate from planets without an original brilliance and that, as I said, behave like mirrors. Magnificent, but modest enough to be reduced to the punctual . . . great in size but wavering in doubt and questioning, those truth-stars stand out against the enormous black background of non-knowledge, that is empty without limitations or full of yet unexplored galaxies: things still to be understood and to be grasped.”³³

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NOTES

1. Coccia, *Die Wurzeln der Welt*, location 574.
2. I speak of lingogony here, the coming into being of a language, as one speaks of theogony, e.g., Hesiod.
3. Regarding ‘quantum literacy,’ cf. Bühlmann, *Mathematics and Information in the Philosophy of Michel Serres* as well as Bühlmann, Colman, and Van der Tuin, “Introduction to New Materialist Genealogies.”
4. Barad, *Meeting the Universe Halfway*.
5. Cf. Kalin, *The Oxford Encyclopedia of Philosophy, Science, and Technology in Islam*: “The Meaning of Algebra. The two important terms related to algebra are *al-jabr* and *al-muqabala*. Al-Khwarizmi did not explicitly define these terms, and he was not always consistent. The literal meanings of *al-jabr* are ‘completion, restoration, setting back in place’ or ‘forcing, compelling.’ . . . The literal meanings of *al-muqabala* include ‘comparison,’ ‘matching,’ and ‘balancing’” (24).
6. Newton, *Natural Philosophy According to Mathematical Principles*.

7. Online Etymology Dictionary, "condition (n.)."
8. Serres, "Information and Thinking."
9. Woolf, *A Room of One's Own*.
10. Wikipedia, "Photosynthesis."
11. Coccia, *La vie des Plantes*. In the recent years, we can witness a growing philosophical interest in plant life, cf. for example Mader, *Plant-Thinking*; Nealon, *Plant Theory*; Mabey, *The Cabaret of Plants Botany and the Imagination*; and especially also Irigaray and Marder, *Through Vegetal Being*.
12. Coccia, *Die Wurzeln der Welt*, loc. 124. Here and throughout my own translations to English.
13. Coccia, *Die Wurzeln der Welt*, loc. 124.
14. Coccia, *Die Wurzeln der Welt*, loc. 124.
15. Coccia, *Die Wurzeln der Welt*, loc. 124.
16. Coccia, *Die Wurzeln der Welt*, loc. 124.
17. Coccia, *Die Wurzeln der Welt*, loc. 124.
18. Coccia, *Die Wurzeln der Welt*, loc. 431.
19. Coccia, *Die Wurzeln der Welt*, loc. 431.
20. Coccia, *Die Wurzeln der Welt*, loc. 124.
21. Coccia speaks here, somewhat irritatingly, of a "formale Wirkursache," a "formal and efficient cause"; if I understand correctly, he wants to say that the Aristotelian *causa formalis* and the *causa efficiens* are to be regarded as merged into a mixed causality, according to which reason, from a metaphysical point of view, cannot possibly be addressed as "pure" because it is always already "impure" but still distinguishable into formal and effective aspects. Coccia describes a "formally efficient cause" that needs to be regarded at the same time, and with the same legitimacy, as an "efficiently formal cause." The reference passage in the German edition goes (my own translation): "It is not enough to recognize, as the Aristotelian tradition did, that reason is the place of forms (locus formarum), the stock of all the forms that the world can accommodate. For it is at the same time also reason's own formal and efficient cause [*ihre formale Wirkursache*]. If there is a reason, then it is only one which defines the engendering of each single form of which the world is composed. A seed, on the other hand, is the exact opposite of the simple, virtual existence of a form, with which it is often confused." Coccia, *Die Wurzeln der Welt*, loc. 190.
22. Coccia, *Die Wurzeln der Welt*, loc. 981.
23. Coccia, *Die Wurzeln der Welt*, loc. 981.
24. Coccia, *Die Wurzeln der Welt*, loc. 981.
25. Coccia, *Die Wurzeln der Welt*, loc. 124.
26. Coccia, *Die Wurzeln der Welt*, loc. 431.
27. Girard, *Le Fantôme de la Transparence*.
28. Serres, *The Incandescent*.
29. Serres, *The Incandescent*.
30. Serres, "Information and Thinking," 17–18.
31. Serres, "Information and Thinking," 17–18.
32. An interesting affirmation of such intellectual alienation has recently been adopted by Laboria Cubronics's *Xenofeminism Manifesto* (<http://www.laboriacuboniks.net>).
33. Serres, "Information and Thinking," 17–18.

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