

## Introduction to New Materialist Genealogies

New Materialisms, Novel Mentalities, Quantum Literacy

Like the new materialist turn, feminist new materialist scholarship (Haraway 1988; Barad 2007) draws attention to a novel understanding of literacy that incorporates code and is not limited to linguistic registers of grammar, syntax, and semantics (Haraway 1997). At stake is the conception of literacy, whose articulations are capable of organizing the generative potential/contingency of the expressions and forms of conceptions as real things.

From the materialist investigations that coalesced through and in the merger of the sciences with humanities research (notably in Bergson 2004; Haraway 1988, 1991, 1997; Barad 2007; Lévy-Leblond 1976, 1999; Plotnitsky 2006, 2009), new materialist investigations join as part of a paradigmatic shift that we witnessed occurring across the pedagogic landscape of the early twenty-first century in environmental humanities, science, and technology studies as well as across the humanities and in the sciences (see Dolphijn and van der Tuin 2012). In the humanities, some of these shifts are articulated under the concepts explored in postcapitalist, posthumanist, and postcolonial positions. In the sciences, these new fields that opened in the twentieth century manifest, transversally rather than disciplinarily, the roles that informatics, systems theory, and cybernetics have de facto come to play in all fields (Wiener 1948; Bateson 1972; Whitehead 2011; Margulis and Sagan 2008; Hayles 2012). These investigations all result in a change in the narratives concerning knowledge forms, their production, and their meaning (Floridi 2015; Lyotard [1979] 1984; Serres 1969–80; Terranova 2004).

Through our study of new materialist research,<sup>1</sup> what we have come to discern is that this new materialist literacy has in part come about as part of a consideration of the methods that feature in the twentieth century in “quantum-thinking.” The epistemological as well as the ontological status of these methods in their practice—that is, in their current actualization—have largely unsettled the pedagogical landscape as a whole, and they are profoundly disturbing from the point of view of both objectivist and subjectivist philosophy. In effect, there are numerous attempts at disentangling—often in orthodox

fashion—the disturbing co-incidence of information and energy, of code and matter, that we witness in electro-technics and informatics. The novel manners of measuring chance are physical measures of a substantial kind of contingency that are physical in the sense that they afford, within certain bounds, of course, large degrees of controllability and reproducibility of effects in a systematic manner. Electro-engineering is capable of controlling something like an energetic weather, and this to amazing degrees of precision! Electromagnetic waves are singled out within fields from which they can never entirely be decoupled, and yet waves are organized into phases, the frequency patterns of phases are coded, and these markers are being used to host indefinite amounts of electro-technical channels (Bühlmann 2014)—channels with or without need for cables. As far as electronic channels are concerned, there is no difference in principle whether the medium is air, water, or a particularly polarized field (cable between a source end and a consumer end) through which encrypted units-that-make-sense (signals) establish a conditioned kind of a milieu for nonlinear discrete quantum-swappings of electric charges. It is inadequate to speak of exchange here, as there is no reference state that is well balanced and that could be approximated—at least ideally. And by the same token, it is no longer a metaphoric manner of speaking when we say that messages are being received from my hair dryer when it realizes that the temperature is not warm enough after I press a certain button; nor is it a more literal sense when I speak of communication when picking up the phone in order to call my friends or make a dinner reservation per short message services or when the thermostat in our laboratory/office/house records an average temperature or degree of humidity in a room that diverges from the optimal value to which has been instructed to be sensitive, and when that thermostat then receives from this recording a signal to make a certain adjustment. And yet, from thinkers such as Karen Barad, Rosi Braidotti, Arkady Plotnitsky, N. Katherine Hayles, and Donna Haraway, we are cautioned to be critical of the sites where units of matter come to be formed into definite meanings and how, why, and where those units are turned into informatics for specific ontological/ideological structures/programs (see Bühlmann 2014; Colman 2014, 2015; Kirby 2011; Lorenz-Meyer 2014; Girard 2014). While we must be attentive to the material reach of “bureaucratic tentacles,” as Marc Kosciw’s article in this volume details, so must the archival desires and militaristic coding of societies’ use of informatics forms mutate according to quanta changes (Virilio 2005; Schuppli, 2014; Stiegler [2012] 2015).

The disturbing co-incidence of information and energy, of code and matter that we witness in electro-technics and informatics, is being treated in an orthodox manner whenever the mathematical-physical measurements of those units (in technical register: the probability amplitudes) are considered to manifest a fake kind of possibility spectrum rather than a true physical potential. This is, for example, at stake when distinguishing analog communication from digital communication, while saying that analog communication is somehow immediately unfolding within and as a medium of the real, whereas digital communication is an immaterial kind of abstraction that can safely be considered as irrelevant when thinking about the epistemological or ontological status of the methods applied. Wolfgang Ernst's landmark volumes *Chronopoetics* (2013) and *Gleichursprünglichkeit* (2013) are key representatives of such a distinction, while Elie Ayache's recent book *The Medium of Contingency: An Inverse View on the Market* (2015) draws attention to the urgency of coming to terms with how we address the ghostly effectiveness of this supposedly fake kind of possibility spectrum: as he points out, the measurement of chance with methods from quantum-thinking (where information and energy, code and matter coincide) is constitutive not only for electro-engineering at large but also for contemporary economy. If we want to gain better clarity with regard to the particular epistemological and ontological status that is to be attributed to methods used in quantum-thinking, then we need to find a manner of grasping what is happening in such measurements of chance, and in the mechanics that afford construction, intersubjective understanding, and objective reproduction, with those energetic-informatic units that are called *quanta*.

We need to find a manner of grasping what it means that we are dealing with a substantial kind of chance, in which the classically immaterial possibilities manifest massive potentials, while at the same time every amount of classically manifest (pre-quantum physical) potential—like water as a source for energy, or movement, or heat—dissolves into just such spectra of possibility and reveals itself as a source and host of contingency rather than as a foundation from which to draw necessities. Quantum-thinking is thinking that is inevitably situated and always already physically active. It is an active taking-measure that will have made a difference (remembering Bateson's famous characterization of information as “a difference that makes a difference” [1972, 459]). As such, quantum-thinking is a doing that is a dealing with measurements, a doing that generates data—data that can never entirely be singled out from the data with which it interacts,

just as the waves that are being encoded can never entirely be singled out from the electromagnetic field through which they propagate (Bühlmann, Hovestadt, and Moosavi 2015).

Such data-producing measurement—as it comes into being through interactions with other data—makes meaning out of and within a “relationality of object, apparatus of measurement, and observer,” as Barad has so eloquently described it (2007, 389). The experience from which quantum-thinking draws can be measured into units (quantum-physical recording and transmission of signals within, through, and across probabilistic spectra of possibility). Those units of experience, hence, can be measured as quanta; they are not fixed because of their relational constitution. From a quantum-thinking point of view, we will have to understand the nature of reality very differently compared to the one measured by Newtonian physics. This fundamental change in science-based knowledge, gradually formed through the twentieth century, is evidenced in discussions that involve terms like *clinamen*, *complementarity*, *encounters*, *diffraction*, *entanglement*, and many others. Speculative narratives—such as those by Elizabeth de Freitas and Helen Palmer, respectively, in this issue—also assist in our thinking of the different codes of the social, political, educational, and philosophical as ways and means for imagining alternative futures and hence also alternative presents, by decoupling perception from known knowledge paradigms, and as ways of articulating what we are on the way to those becomings.

The quest for a quantum literacy, whose importance we want to emphasize with this issue, lets us hope to find and stabilize methods that enable thinkers and practitioners of all kinds to engage with complex situations occurring everywhere on the globe today, across debates concerning technology and the creative arts but also as information and communications technology affects the economy, the ecology, the media, and various forms of institutional politics.

We would understand by *quantum literacy* a kind of disparate, distributive, and population-based cognitive faculty that is capable of expressing and addressing conditions, and hence grounds and reasons, to support all sorts of processes in terms of quantum-thinking: while quantum-thinking can maintain control of processes (even if without quite understanding how [except that we know it is “by mathematics”] and why), it remains entirely clear that the manners of control are just manners of dealing that could and can be otherwise, different, refined, more crude or more differentiated, generalized, et cetera. Instead of calling thinking either lucid or blind, we can begin to qualify different lights that apply to thinking: thinking is not either cor-

rect or false, true or corrupt. White light is the sum total of any color at all—independent of the famous argument about different cultures and different languages having different amounts, and even different kinds, of colors they distinguish. The point, hence, is just that no insight can ever give an exhaustive account of what can, in principle, be sighted within the probabilistic possibility-spectra that provide reason and support within quantum-thinking.

This might sound like an overtly ambitious if not largely naive bunch of claims. But what we are after is how to account for a novel technics—digitization and computing—of which we have just begun to witness and experience the profound inversions it introduces in the realms of politics, economics, ethics, science, and religion. What is at stake with speaking of a quantum literacy is finding a manner of bearing witness to these changes, even if there is no way of taking an outside stance to them. A key inspiration in beginning to think of quantum literacy has been Eric Havelock's *Preface to Plato* ([1963] 2009). Much as many would say of today that the terms and registers in which we say quantum-thinking manifests itself are mere manners of speaking, Havelock paid close attention to the novel manner of speaking that is documented in the writings between Homer and Plato. They are manners of speaking, he consents, but his interest was not in an etymological tracing of where they come from immanent to language. His concern was that this novel manner of speaking manifests a change in mentality, to which, as with all changes in mentality, the only direct access is in vocabulary and changes in phrase structure, grammar, and logics. Describing changes in literacy that result from variations in information storage, Havelock observes,

Direct evidence for mental phenomena can lie only in linguistic usage. If such a revolution as outlined did take place in Greece, it should be attested by changes in the vocabulary and syntax of written Greek. The semantic information hitherto compiled in Greek lexicons will not help us much, in so far as the various significations of words are arranged for the most part analytically rather than historically, as atoms of finite meaning suspended in a void, rather than as areas of meaning which are contained and defined by a context. The effect is to foster the unconscious assumption that the Greek experience from Homer to Aristotle forms a cultural constant capable of being represented in a sign system of great variety, to be sure, but consisting merely of sets of interchangeable parts. (Havelock 1963, vii)

With this interest in looking for keys in linguistic usage, keys that unlock a novel manner of thinking, a novel mentality, we can recognize in Havelock a new materialist *avant la lettre*. His starting point was that “all civilizations rely on a sort of cultural ‘book,’ that is, on the capacity to put information in storage in order to reuse it” (vii):

Between Homer and Plato, the method of storage began to alter, as the information became alphabetised, and correspondingly the eye supplanted the ear as the chief organ employed for this purpose. The complete results of literacy did not supervene in Greece until the ushering in of the Hellenistic age, when conceptual thought achieved as it were fluency and its vocabulary became more or less standardised. Plato, living in the midst of this revolution, announced it and became its prophet. (vii)

His project was not another history of Greek philosophy in the accepted sense of that term. It was to study “the growth of an abstract vocabulary in pre-Platonic Greek,” considered “not as an addition to the tongue (though this also must be taken into account) but as a remodeling of existing resources” (vii–viii). The foregrounding of literacy, by Havelock, is his response to a realist interest: “The Greek culture was maintained on a wholly oral basis until about 700 B.C. and if this were true, then the first so-called philosophers were living and speaking in a period which was still adjusting to the conditions of a possible future literacy, conditions which I concluded would be slow of realisation, for they depended on the mastery not of the art of writing by a few, but of fluent reading by the many” (ix).

The entire discourse of metaphysics, which we associate with that Greek period, is what Havelock sets out to understand from a genetic-historical point of view: he was interested in asking, empirically and scientifically, how the mentality that produced the metaphysical discourse came about (xi). His hypothesis is that the so-called metaphysical thinkers all tried to “rationalize the novel source of knowledge” (x)—whereby he means, in profane manner, the said “cultural ‘book’” (vii) from which civilizations draw “the capacity to put information in storage in order to reuse it” (vi). So how did that book change? Havelock wants to account for the novel vocabulary of abstract terms, which we today associate with metaphysics. And he thinks about this by contrasting it with the formulaic language that predominates still in Homer’s writing and that offers formulas, recipes of how-to, concrete manners of proceeding in schematically depicted situations.

The formulaic style characteristic of oral composition represented not merely certain verbal and metrical habits but also a cast of thought, or a mental condition. The Presocratics themselves were essentially oral thinkers, prophets of the concrete linked by long habit to the past, and to forms of expression which were also forms of experience, but they were trying to devise a vocabulary and syntax for a new future, when thought should be expressed in categories organized in a syntax suitable to abstract statement. This was their fundamental task, and it absorbed most of their energies. So far from inventing systems in the later philosophical manner, they were devoted to the primary task of inventing a language which would make future systems possible. Such, in simplified outline, was the new picture which began to emerge. (x)

If Havelock calls into question the whole assumption that early Greek thought was occupied with metaphysics at all, or even that it was capable of using a vocabulary suitable for such a purpose, it is because, by all objective evidence, it was just in the process of devising “a language which would make,” so he says, systems different from the ones from which the formulaic expressions derive — “future systems,” he calls them — “possible.”

Our agenda in emphasizing the importance of beginning to speak of a quantum literacy is similarly motivated. We recognize that what we regard as evidence are manners of speaking. Haraway, for instance, addresses the new literacies that emerge from the developments in transgenics in the 1980s (1997, 56), enabling her to produce new ways for articulating kinship through material-semiotic practices (Haraway 2016). Haraway argues with biologic models to produce organized systems with which to work (2016, 63); she conceives of them in their difference from applications, which she thinks of as static systems. With quantum literacy, we can think of applications as an opening up of models, as plugging in new concepts, attaching new points, diffracting points, and hence triggering bifurcations in the continuity of lines and lineages. Applications, then, are parasitic upon a system (see Serres [1980] 2000); they are what prevents a system from ever truly settling within a form of organization. As in biology, where parasites and symbionts are long acknowledged to play a major role in evolution (see Haraway 1989), applications as parasitic “mobile units” that hook up with the dynamic functioning of a system at points (literally: discretely) are a major factor in the evolution of technical systems.

We are talking here about a generative double articulation (Hjelmslev [1943] 1969; see also Deleuze and Guattari 1987; van der Tuin 2015).

Thus we insist that there is something real that drives the invention of this novel kind of abstract vocabulary. Furthermore, this “real” is not a further field of expertise for the few knowledgeable men. It perfuses all our living environments today. Our agenda hence is a political one: we are looking for such a literacy as offering strategies and methods for the conceptualization of entities and events that pre-occupy our contemporary present and that we know not how to deal with because—or perhaps, rather, *in that* and *in how*—they involve classical metaphysical ideas like identity, being and becoming, states and becomings, oneness and plurality. We are thinking of ethical human rights, migration and refuge, border control and actions of militarism, terrorism as a novel form of violence, climate change and the ecology, equitable distribution of resources. In short, what we aim at with a quantum literacy is the articulation of a significant discourse for critical and creative research, one that is of relevance for all those who are interested in learning to think (O’Donnell 2012; Bühlmann 2016a) in terms that are more adequate for addressing ethically the role and power of knowledge in terms of life and code. How exactly to take a stance is something that the new materialists highlighted for us in their circling of the situated objects of knowledge, to paraphrase Haraway. Quantum-thinking thus emerges out of the studies of the epistemologies of genealogies of the feminist new materialisms (Braidotti 2012; van der Tuin (2015), inspired by materialist philosophies of process and change (Bergson [1986] 2004; Whitehead [1925] 2011) such as we see in the account of the entanglements of epistemologies of matter by Marie-Luise Angerer in this issue.

To start with thinking up such a literacy, we propose a perhaps naive, surely simple, analogy: as metaphysical thought managed to wrest itself from the concreteness of poetic, epic formulation—in all its formulaicness, its templates to store what is common sense (constitutive for cultural commonality, storage of shared knowledge; see for example the essay by Iris van der Tuin in this issue on the concept of metaphysical change)—we have to wrest ourselves from another formulaicness, which we currently learn to speak and articulate with incredible eloquence and power in programming and informatics.

On a material level, the analogy is this: the vowel alphabet measures the articulation of breath, entirely formal and exterior to any understanding in particular. It has opened up speaking as a technics that could be mastered with more or less learnable and teachable



sophistication for which no bottom or horizon line preexisted, a technics that was open-ended, an art: rhetorics granted manners of how to temper, intensify, modulate—control, in the same inexhaustible sense as we talked about above—the effects of articulation by speech, manners that could be acquired by practicing writing. The immediate performativity of rituals and religious customs became mediate with the novel vocabulary of more abstract thought (that of metaphysics). Rituals organize sites for societies to practice their cultural and political exclusiveness, which may grant (temporarily) an appeased site—but always on the basis of declaring certain violence as good and sacral, as René Girard argues ([1972] 1977). Because of ritual's opening up of spaces by linking code with processes of substitution (see Bühlmann 2016b), such protected sites can also be seen as offering places to think analogously—as the article by Whitney Stark, in this issue, notes—where the language of quantum enables her to argue for “a constellatory body called ‘quantum feminisms.’”

Today, quantum physics measures the articulation of energy, entirely formal and exterior to any understanding of energy in particular. It too opens up a technics that can be mastered with more or less learnable and teachable sophistication: how to temper, intensify, modulate—control—the effects of articulation by writing in code.

Literacy takes distance from identifying with any one truth in particular. It is interested in pushing the limits and in transgressing and smoothing the rigid boundaries of what is merely formulaically done. Literacy does not accept that what is formulaically done must be considered to be immediately natural and necessary. It looks for invention of elsewhere, othernesses, heterogeneity of circumstances, the production of information, androgyny in thought rather than “male reason” and “female emotion.” As the article in this issue by Monika Rogowska-Stangret argues, new materialist feminist thinking has enabled us to articulate and think “the body and the *category* of the body” in a transcorporeal mode, which engenders (quoting Barad 2012, 16) an “infinite plentitude of openness.” At the same time, the interest in literacy does not say that there is nothing like a truth; it maintains that the determination of truth is, right now, not our predominant concern. This is the commitment behind the political agenda we pursue with this. Our concern is how to live up to the power of the newly available technics by learning to be sophisticated in dealing in its terms. We are looking for how to rethink stances we used to deem trustworthy but whose authority is challenged by informatics and the novel algorithmic human condition we witness emerging.

More than all else, perhaps, the algorithmic human condition challenges our trustworthy stances of time, temporality, history, and their ways of dealing with originality, descent, linearity, heritage, generation, generativity, belonging, becoming, identity, and knowledge (Arendt 1958; Braidotti 2006; Grosz 2005; Parisi, 2013; Schuppli 2014). The selection of articles in this issue characterizes the discursive landscapes in which these concerns are virulent today.

## Note

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