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A Reflection on Language, Relations and the Digital

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Abstract

This article takes off from what Lyotard calls 'the immaterial', demonstrated in the exhibition Les Immatériaux *that he curated at the* Centre Pompidou *in 1985. It aims at outlining a concept of 'relational materiality'. According to Lyotard, 'the immaterial' is not contrary to material: instead, it is a new industrial material brought about by telecommunication technologies, exemplified by* Minitel *computers, and serves as basis to describe the postmodern condition. Today this materiality is often referred to as 'the digital'. In order to enter into a dialogue with Lytoard, and to render his notion of 'immaterial materials' contemporary, this article contrasts the concept of relational materiality with some current discourses on digital physics (Edward Fredkin, Gregory Chaitin) and digital textuality (Matthew Kirschenbaum). Against the conventional conception that relations are immaterial (neither being a* res *nor even having a real* esse*), and also contrary to a substantialist analysis of materiality, this article suggests that a relational materiality is made visible and explicit under digital conditions. It suggests a reconsideration of the 'relational turn' in the early 20th century and the concept of concretisation proposed by Gilbert Simondon. The article concludes by returning to Lyotard's notion of materialism and his vision of a new metaphysics coming out of this 'immaterial material', and offers 'relational materialism' as a contemporary response.*

Introduction

In 1985 the French philosopher Jean-François Lyotard curated an exhibition at the *Centre Pompidou* entitled "the Immaterials" [*les Immatériaux*]. It depicted the postmodern condition associated with the revolution in telecommunication technologies, exemplified by the *Minitels* and automation technologies used in factories such as *Peugeot*. What Lyotard called telecommunication technology, is what is now known as 'the digital'. However, the title might foster the misleading impression that Lyotard understood the digital as immaterial; on the contrary, the immaterial, to Lyotard, is fundamentally material. The term *les Immatériaux* was strategically chosen in order to disrupt the modern

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concept of matter.[1] According to Lyotard, the immaterial designates a new material, which could not and should not be the continuation of the traditional conception of matter.

Like his exhibition, Lyotard's analysis of the relation between the digital and the postmodern remains neglected. What makes it interesting to follow Lyotard's line of thought, is not only that he was one of the first to systematically analyse digital materiality, but also that he has extended the significance of digital materiality far beyond the realm of technology to a general cultural form, namely the postmodern. I will address this profound re-configuration of a metaphysical paradigm that dominates modern philosophy in the last section of this article. In the past decades different approaches to understand digital materiality have emerged and somehow Lyotard's profound analysis has been disregarded. This article is not a systematic analysis of Lyotard's thoughts *per se*, but rather an attempt to 'think with' Lyotard. This essay will shed light on Lyotard's analysis, especially by contrasting his work with some recent contributions on digital materiality from philosophers, media theorists, digital physicists and literary theorists. There are original and interesting explorations of emerging digital materiality, however it seems to me that these approaches have certain methodological drawbacks, and fall prey to some old metaphysical presuppositions. Through such comparisons, I will address what I call a 'relational materiality', and if possible a 'relational materialism' informed by my analysis of Lyotard's *im/material* in dialogue with some interdisciplinary, contemporary work on digital materiality.

In order to unfold this notion of relational materiality, this article will firstly elaborate on different approaches to digital materiality, notably: 1) digital physics, or even a digital metaphysics, which understands the construction of the digital world as different algorithmic arrangements of the discrete 0 and 1, as outlined by physicists such as Edward Fredkin and Gregory Chaitin; and 2) formal and forensic materiality outlined by Matthew Kirschenbaum, providing a method for the study of materiality. The article will proceed by outlining 'relational materialism' as new approach to digital materiality by examining the theories of Gilbert Simondon and Karen Barad. Finally, after having introduced this new perspective, I will return to Lyotard's analytical model of digital materiality and what one may call the "digital condition of the postmodern" in order to present a contemporary theory of relational materialism.

Digital (Meta-)Physics

When we understand the digital only in terms of 0 and 1, it may intuitively appear to be immaterial. However this is highly suspicious when considering it as foundation of the digital universe that we are living in and the digital objects we are dealing with everyday. When we appropriate Parmenides' concept of *One* to understand the digital metaphysically, the materiality of the digital is under-

1 Matter is considered to be something to be mastered, dominated and controlled.

mined. The ancient Greeks attempted to understand of what things are made, and hence they arrived at water, air, atoms, etc. These efforts consist of a series of attempts to grasp *being* as *One*. It was only until Parmenides that the concept of the One started to appear as a pure metaphysical notion. The digital, which is widely taken as the binary pair 0 and 1, resembles this abstraction and its manifestation also seems closer to other Parmenidesian motifs.

Parmenides asks in Fragment 10, how the sun, the moon and other cosmic beings come into being; in the following, Fragment 11, he responds:

> "[...] since light and night have been given all names, and the names corresponding to their potencies have been given to these things and those, all is full of light and invisible night together, both of them equal, since in neither is there Nothing" (Coxon 2009: 88).

Being is given in two forms, namely light and night, which constitute its genesis; however this does not mean that being can either be decomposed into these two forms or into any other substances. *Being* for Parmenides is "ungenerated and imperishable, entire, unique, unmoved and perfect"(ibid.: 64). It would be naïve to claim that Parmenides' theory of being has anticipated the digital, but nevertheless it seems relevant when thinking of the creation of digital beings. We can virtually say that any digital being – here we can widely refer to different types of file including images, programs, texts, etc. – can be reduced to its binary composition: digital being is the One.

Is the One actual and concrete or virtual and abstract? Both can be affirmed through two different readings, one based on the materialism of Parmenides (and Spinoza) and the other on the monadology of Leibniz. In a talk titled *Parmenides und die Begründung von Ontologie und Kosmologie*, the German physicist Hans-Jügen Treder (1998) suggests to read Parmenides' theory of being as an actual sphere, in which being and thinking are identified, famously claimed by Parmenides in Fragment 4: "[...] for the same thing is for thinking as is for being" (ibid.: 58). In contrast, for Leibniz, what is thinkable [*Denkbarkeit*] is not yet actual. The monads belong to the virtual world according to a pre-established harmony. Despite this difference, the question of the One in the work of Leibniz is decisively Parmenidesian (Häberli 1952: 50-51). The individual monads are unified by the pre-established harmony, which we can also call *a priori*. Looking at the Parmenidesian motif underlined by Treder, we can see that the 'thinkable' part of the computational apparatus always creates and leaves traces; this happens on the level of accumulators, registers, memory devices such as hard disk or database. In thinking, digital beings are created, or rather "identified"; one can probably say this is a truly Parmenidesian concept of being.

If we take Treder's Leibnizian motif, we can see that the virtuality of the digital presents itself as the unity, which actualises itself according to pre-established rules. This approach belongs to what we now know as digital physics, named by contemporary digital philosophers such as Edward Fredkin (1992, 2003), Gregory Chaitin (1987, 2005), Stephan Wolfram (2002) and Konrad Zuse (1967). This digital ontology is at its core a Leibnizian monist metaphysics in

which these theorists replace the concept of the monad with that of automata. It holds the view that the world is discrete and that historical progress can be understood in terms of the logical consequence of the programming of bits. These digital philosophers and their projection of the digital goes beyond machine operations; it becomes a way to understand biology and physics. As Fredkin (wrote, "the fundamental process of physics is computation universal" (1992: 3). Another mathematician associated with the group, Gregory Chaitin makes digital physics' relation to Leibniz much more explicit, and he considers him to be the fundamental thinker who announced 400 years ago the project of the computational universe. Chaitin cites a passage from Leibniz' *Discourse on Metaphysics*:

> "[...] God has chosen the most perfect world, that is, the one which is at the same time the simplest in hypotheses and the richest in phenomena, as might be a line in geometry whose construction is easy and whose properties and effects are extremely remarkable and widespread." (2005: 3; Leibniz 1686; 1989: 39)

This is fundamental to any program that wants to express this world: it must always seek to be "the simplest in hypotheses and the richest in phenomena" (ibid.). Central to Leibniz' idea of the *Characteristica Universalis* is the question of how to express the world with limited signs. For Chaitin, likewise, it is necessary that the algorithm, which is used to represent a particular set or type of data, should be smaller than these data. Chaitin also made the playful proposition that the name "bit" should be changed to "Leibniz" (ibid.). In the Parmenidesian reading, we can locate a materialism since being *is*, and is real and actual, however, the materiality is not evident since it is concealed by the One. In the Leibnizian reading, the question of materiality is presupposed, but a materialism is almost absent since the philosophers prioritise information over matter and energy (Wright 1988).

For a digital physics to be possible, philosophers have to confront the same question that Plato raised in the *Timaeus*, namely the incompleteness of the ideal and its incarnation. In the *Timaeus*, Plato proposes a third 'genre of being' on top of the other two that he discussed previously – an eternal intelligible pattern and the imitation of such pattern. The third genre, Plato explains "[...] is the receptacle, and in a manner the foster-mother, of all generation" (Plato 360 BCE). I mentioned that the question of materiality is rather vague for philosophers of digital physics, since when they talk about idea (algorithms) and the individual (consisting of bits), they subtly shift the question of the receptacle to that of the memory of the machine, without further commenting on its importance as if it does not demand any explanation. It is undeniable that the computational universe is a fascinating idea, however it remains within the ancient metaphysical paradigm, namely the Parmenidian motif. If we approach the digital universe by taking such Parmenidian motif, what is most invisible is exactly the fundamental matter that is presupposed; hence it remains the most abstract *being* yet to be understood. A different approach towards digital materiality is needed in order to render visible the concrete matter, and to lay out

the groundwork for a materialism to come. Therefore, the question of *maternity* (like the foster-mother) of the digital needs to be further analysed.

Digital Materiality

In contrast to the vague demand of the memory of the machine, as a component of the digital cosmology advocated by philosophers such as Fredkin and Chaitin, media theories argue more precisely for a 'digital materiality'. While being different from the digital philosophers' approaches, these theorists tend not to differentiate the 'immateriality' of the digital and the materiality of its support, hence its condition of being material becomes synonym of its materiality.

Among these proposals, I find Matthew Kirschenbaum's analysis deserving of careful consideration. Instead of claiming that certain matter is the foundation of the digital universe, he starts from the analysis of technical objects; like peeling an onion, he starts by asking what their constituents are. In his book *Mechanisms – New Media and the Forensic Imagination*, Kirschenbaum (2008) describes two types of materiality. One he calls *forensic materiality* and the other *formal materiality*. With forensic materiality, he refers to the method of analysing traces in a computer, going beyond what is visible on the screen. He takes the disk image of the online game "Mystery House" as an example, and demonstrates what he calls a "forensic walk through". Kirschenbaum shows the hexadecimal and ASCII representations of data inside the file with the open source software FishWings and analyses the structure of the disk from track to track and sector to sector. In doing so, he finds traces that are not visible on the screen, for example the disk image also contains remnants of Bob Bishop's *Dung Beetles* game and a ground-to-air shooter *Blitzkrieg*. Kirschenbaum concludes that the Mystery_house.dsk:

> "becomes a multivalent forensic environment, one where all of these different levels of engagement – player, pirate/cracker, postmortem investigator – find their correspondences in the multiple layers of textual events that both drive the game as code and are explicitly thematized within its forensically charged spaces." (Kirschenbaum 2008: 109)

The researcher who performs this forensic analysis, is like a detective who examines the traces of a criminal scene, "every contact leaves traces" as he claimed in talk given ten years ago in the *History of Material Texts* workshop at the University of Pennsylvania (Kirschenbaum 2005). With the notion of 'formal materiality' he refers to the "normative condition of working in a digital environment" (ibid.). He suggests speaking of two types of formal materiality. The first type is the explicit form of digital writing. Kirschenbaum compares this with Nelson Goodman's notion of *allographic objects*; like written text, they fulfil "their ontology in reproduction" (2008: 133). In contrast to the *allographic object* stands the *autographic object*; similarly to a painting, its meaning cannot be explicitly repeated. The difference between Goodman's example of the written text and digital writing is that digital writing has the "state of the

art error detection and correction" which allow it to sustain an ideal allographic environment.

The second type of formal materiality, according to Kirschenbaum, can be seen in standardised formats such as JPEG, MPEG and predefined logic of the application. In the footnote of the introduction, Kirschenbaum (2008: 9) refers to Johanna Drucker's definition of materiality in *The Visible Word: Experimental Typography and Modern Art, 1909–1923*. For Drucker, materiality is considered as "two major intertwined strands: that of a relational, insubstantial, and non-transcendent difference and that of a phenomenological, apprehendable, immanent substance" (ibid.). In other words, materiality is defined by the dialectics of the objective reality and the subjective experience (varying from subjective to intersubjective). Kirschenbaum (ibid.) however, criticises that Katherine Hayles and Drucker's notion of materiality is only limited to what he calls 'forensic materiality'.

Even though Kirschenbaum's analytic method of layering is very relevant and the methodology of grounding his theory in objects is plausible, his critique of Drucker and Hayles' concept of materiality still has to be reconsidered. The feminist theorists attempted to extend the notion of materiality from technical objects to embodiment, which exceeds the material scheme of technical objects upon the point of their invention (Hayles 1999). Kirschenbaum's approach rather emerged from the tradition of textual studies. In contrast, Drucker and Hayles have suggested a larger scope in order to look at the question of materiality. While Kirschenbaum is probably right to say that Hayles misses "the computationally specific phenomenon of formal materiality, the simulation or modelling of materiality via programmed software processes" (2008: 9), a similar critique cannot be applied to Drucker's analysis of typography, since 'formal materiality' is exactly the condition of any phenomenological experience.

We can also observe that what characterises Kirschenbaum's analysis is a *regression* from the abstract concept of the digital to the endless layers of concrete matters. This can be read in great contrast to digital physics. Rather than starting from the *One*, Kirschenbaum starts with the *Many*. Unlike digital physics or digital philosophy which addresses the composition of bits, Kirschenbaum's approach seeks a material base on which the digital can be recognized and embedded, through the decomposition of objects. 'Regression' however does not imply that this is a 'bad' development; instead, it indirectly avoids addressing the digital by addressing its conditions. For example, one can go from one condition to an outer condition layer by layer, and finally one will end up at the level of silicones, and probably also further to the sources of energy, etc. However, the speculative question remains, until when and to which level shall the forensic operation proceed?

Furthermore, one will find that this analysis can actually be effectively applied to any type of technical object, and does not necessarily contribute to the clarification of the digital. Gilbert Simondon mentions a similar insight: with regards to the manufacture of a needle in Great Britain, he writes that, without exaggeration, the quality of the needle expresses the degree of perfection of the nation's industry (Simondon 2012: 90). However, in the thought of Simondon,

there are two important concepts that lead to a third inquiry into digital materiality. The first concept is relation; the second concept is concretisation, which effectively sublates the difference between the digital and the support of the digital, which characterise the above approaches. As a point of departure from digital physics and digital textuality, I would like to outline a *third* and *progressive* approach of analysis based on a particular reading of Simondon, which I am tempted to call a 'relational materialism'. The last example on XML that Kirschenbaum gave in order to explain formal materiality would be a perfect example to understand relational materiality.

Relational Materiality

While we can see that the two abovementioned approaches either start with or end up with substance, this approach is an attempt to move away from substance to relations. Or more precisely, the aim of such relational materiality is to overcome the hylomorphism proposed by Aristotle, and to see how the development of technicity distances itself from this analysis.

Hylomorphism is a substantialist thinking: in this context, being can be comprehended in terms of matter and form. The problem of the substantialist view is that it limits the question of becoming to the realm of predicates; in other words, there is only change in quality and quantity but not substance. The concept of substance as essence [*ousia*] refers back to Aristotle. In *Categories*, Aristotle (350 BCE a) calls this the support [*hypokeimenon*] and later in *Metaphysics* (350 BCE b) it is called form [*eidos*]. I see relations as the possibility to overcome this substantialist view, since a relational analysis will *displace* substance from the centre of being (however substance as a concept is hardly eliminated and it is still central to some construction of formal ontologies). This possibility can already be seen in Aristotle's own writings. Aristotle in *Categories* describes *Relative*, 'towards something' *(τὰ πρός τι)*, as one of the 9 accidents of the substance. By the end the section, the Stagirite doubted if substance is itself relative – he tried to show that primary substance is self-sufficient (e.g. man, horse), but he was not quite sure about secondary substance (e.g. hand, head): "[...] it may be questioned whether it is true that no substance is relative, as seems to be the case, or whether exception is to be made in the case of certain secondary substances" (Aristotle 350 BCE a). In *Metaphysics* Book V, Aristotle continues his analysis of three types of relations: identical relations (e.g. whiter, twice, longer), causal relations (heating and being heated) and psychological relations (knowing and the object to be known). Here it is worth repeating the questions posed by the medieval metaphysicians resulting from the interpretation of Aristotle's *Metaphysics*: what kind of *being* are relations? The peculiarity of relation (in comparison with other accidents) provoked his interpreters, notably Thomas Aquinas and Duns Scotus to name relation the weakest being (*ens debilissimum*). We can reiterate the question posed by the realists and reductionists of the medieval theologians: is relation 'real being' in the sense of substantial beings (which is a *res*), or just like other accidental beings (which have *esse*),

or even weaker, meaning that they exist only as *ratio* or *modus essendi* (reason, mode of being) (Decorte 2003)?

It was not possible to demonstrate the materiality of relation (as *res*) in the time of these medieval thinkers, and it remained largely a speculation and an attempt to solve the trinitarian problem (e.g. Henry of Ghent against Giles de Rome, Duns Scotus against Henry (Decorte 2002): "to explain how in God the persons are identical with the divine essence, yet different among themselves" (ibid.: 311). If we can talk about a relational materialism, it is because relation as a real being that is made possible by a general tendency of technology, consisting in the materialisation of all sorts of relations by rendering the invisibles visible and in measurable forms. For example, writing puts thoughts and perceptions on paper; pulleys, wheels and chains concretise imaginary movements in mechanical terms; the vapour engine instantiates flows of energy in the relations between water, fuels, pipes and gears; one could give similar examples for electricity, nuclear energy, etc. While in the digital environment, we can observe a more intensive process of materialisation of relation, in terms of *data* (I will come back to this later).

Materialism in general did not pay much attention to relational materiality. Among the contemporary materialists, Karen Barad is probably closest to this conceptualisation. In her article *Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter* (2003), Karen Barad opened with a critique of the linguistic turn that once reigned over the humanities in the 20th century: "language has been granted too much power … the only thing that does not seem to matter anymore is matter" (2003: 801). To acknowledge the importance of language is to admit the central role of the intellect in the determination of matter. Barad moves from interaction to intra-action of matter. And in order to do so, she proposes a "robust account of the materialisation of all bodies – 'human' and 'non-human'." The best example of intra-activity that Barad gave on various occasions is the dual nature of light as both wave and photons. The exclusive phenomenon is caused by the intervention of the apparatus (which is also matter): a double-slit experiment shows the wave phenomena of light while the microscope shows corpuscular characteristics of light photons.

Barad was not the first to show this example in order to explain a micro-materialism; Gaston Bachelard has already elaborated on this within his concept of *phenomenotechnics*. I will not have enough space to fully explore the concept of relation according to Bachelard and Simondon but to put it in a nutshell: both Bachelard and Simondon renounced the concept of substance, Bachelard proposed to replace substance with "exstance" (Lecourt 2002: 25); Simondon claimed that even the Kantian noumena is relational (Simondon 2005: 83). It was not until Simondon, a great reader of Bachelard, that this materialist dimension of relations started to take a new shape. Unfortunately Simondon refuses to be a materialist, an approach he identifies as reductionist (Simondon, 2005: 159). The critique of materialism is largely based on the fact that Simondon understands Marxist critique as a reduction of economic conditions, without looking into the question of technicity, and for Simondon the solution against alienation has to be comprehended through the understanding of technologies.

Further on, in the course of the 'relational turn' at the beginning of the 20th century, a similar movement occurred in analytic philosophy. Bertrand Russell, in *The Principles of Mathematics* (1937), dedicated several chapters to relations. Russell criticised the fact that mathematics has inherited the philosophical error that an object has to be thought of in terms of subject-predicate propositions. Instead Russell proposed to move relation out of the Aristotelian ontology:

"This view is derived, I think, probably unconsciously, from a philosophical error: it has always been customary to suppose relational propositions less ultimate than class-propositions (or subject-predicate propositions, with which class-propositions are habitually confounded), and this has led to a desire to treat relations as a kind of classes." (Russell 1937: § 24)

Let us consider a simple example: "Heidegger knows Bertrand Russell" or "I am taller than you" – it is impossible to think of these statements in terms of subject-predicate class-proposition ('I' and 'Russell' cannot be reduced to a class-proposition; besides, both of us belong to the class "human being"), but there is still a need for an independent mathematical treatment of such statements. As Russell suggests, they could be expressed in the form 'xRy', in which 'x' is understood as the *referent*, 'y' as the *relatum* and 'R' as the *relata* (ibid.: § 29). It seems worth pointing out the implications of this regarding the development of a relational database. Such thinking gave rise to a relational calculus, which was further developed in modern mathematics and computer science into two branches: Tuple Relational Calculus and Domain Relational Calculus. The Tuple Relational Calculus was introduced by the mathematician and information scientist Edgar F. Codd in the 1960s. It is part of the relational model, which in turn is the foundation of the Relational Database.

Relation still consists of one of the core philosophical questions today; furthermore it emerges from a pure metaphysical concept to a concrete and material concept. In fact, Barad is critical of Russell's notion of relation, since she announced that: "I present a relational ontology that rejects the metaphysics of *relata*, of "words" and "things" (Barad 2003: 812). However Barad is a science scholar, but not a technology scholar, and this is the limit of her thinking when she reproaches the linguistic turn and overlooks that even language is taking a new form of materialisation, especially in databases, in artificial intelligence, and, in the semantic web. If an operational and modulative metaphysics is grounded in relations, as Simondon and Gaston Bachelard have shown, then we will have to confront immediately the media technologies and the political economy of such relations. I further propose to understand relations in terms of what Simondon calls concretisation, by which what is non-material becomes material, notably causalities.

In the following, I will explain the basic idea that Simondon laid out in the first chapters of the *Du mode d'existence des objets techniques*: namely that the evolution of technical objects can be understood in terms of technical elements, technical individuals and technical ensembles. Technical objects are the assimilation of nature to the extent that they are becoming natural objects. Simondon's

concept of technical objects is however limited. Simondon lived at a time when the principles of quantum physics were used for the development of electronic devices, hence his examples are often focused around diodes, triodes, tetrodes, pentodes, etc., whereas today this is generally taken for granted. His understanding of technical object is also limited by the working principles of these devices, which depend mainly on physical contacts. Let us consider a diode: the operation of a diode depends on the transmission of electrons from the anode to the cathode, so is a triode, which in addition to the anode and cathode, puts a gate in between them to amplify the current. The physical contact as the foundation of the reciprocal causality is displaced by a causality operated through data. I use the word "displace" instead of "replace", since it is not really replaced, we can never replace a causality based on physical contacts, but rather within the dynamic of the technical development, it becomes less and less the core part.

Each epoch has its own media technologies of concretisation. The epoch of the digital is the epoch of the concretisation of relations in terms of data and metadata (i.e. data about data). Data (which for me is essential to the understanding of the digital) becomes the new material medium of operation. It is for this reason, that I separate digital objects from technical objects according to Simondon, though my reading of digital objects inherits the spirit of Simondon's analysis. When we consider the development of the relational database and the technical lineage of mark-up languages from GML, SGML, HTML, XML, and Web ontologies as proposed by the semantic web, we see that the question of relations stands out above other concerns. Let me quote the example by Kirschenbaum which he uses to demonstrate his notion of formal materiality:

```
<objdesc>
<source>
<objdescid>
<objtitle>
<title><hi rend="i">The book of Thel</hi></title>
</objtitle>
<role>author,</role>
<role>inventor,</role>
<role>delineator,</role>
<role>etcher,</role>
<role>printer,</role>
<role>colorist,</role>
</organisation>
<organisation> Catherine Blake <role>printer</role>
</organisation>
<imprint>
<publisher>William Blake</publisher>
<pubPlace>London</pubPlace>
<date>1789</date>
</imprint>
[...]
```

As we can see in this example – which is a description of the *Book of Thel* in the William Blake Archive in XML format – a large set of metadata is used to identify and describe people, objects, places, etc. Every piece of information is explicitly annotated. I emphasise in this sense the semantic technologies, especially the semantic web proposed by Tim Berners-Lee in the 2000s. The core idea of the semantic web is to build a system in which all the data can be structured according to predefined schemes or web ontologies. As I have shown with the abovementioned example, the ontologies or schemes define already "publisher", "publication date", "role" and hence it will be possible "[...] to automatise the search of information and to ease the navigation of data" (Tim Berners-Lee 1998). Everything on the web can be regarded as a resource, and is denoted with an URI (Universal Resource Indicator). In other words, we could say that it is a web of logic; however, this does not mean that the web should become a consistent logical system (since it also produces problems of ambiguity). Instead it is a web of materialised relations, which can be the URI or the comparison between any two attributes, even when the relation only says "different from".

Immaterial Materials

In the previous sections, we have seen two approaches towards digital materiality, one from the bottom/*One*, and one from above/*many*. In addition to these two approaches, I suggest a third one, namely a 'relational materiality' which attempts to avoid the conception of matter as substantial. We now arrive at the question: to what extend is the concept of the digital significant? And, how does it relate to Lyotard's concept of 'the immaterial' at all? The notion the relational materialism outlined previously provides us with a lens through which we can consider Lyotard's proposition anew. Drawing on Lyotard, I will claim that a relational materialism is only explicit under digital conditions, since relation has been always considered to be mediated – it is grasped by a subject that comprehends it. In contrast, for digital materiality, the subjective grasp of relation is no longer the condition and this materialism is rendered visible through digital concretisation.

Datum, means given; the French word *donnée* retains this meaning. However, what is now data is no longer given, but has to be mediated, as if this data is already considered as relations. To extend this claim from a technological change to a change in cultural forms, Lyotard's conceptualisation of the relation between the immaterial and the postmodern opens up something profound. This is not because Lyotard has anticipated the technological transformation in the last 30 years, but rather because he provides at the same time a systematic approach and an ontological critique. As I mentioned in the introduction of this article, the *Immatériaux* is not immaterial, but rather a new material, as already indicated in the original title of the exhibition which translates *New Material and Creation*. Nonetheless it is a *new* material, new in different senses; it is not only technologically new, it is also conceptually new. In the catalogue of the exhibition, we read, "*prisoners of the materialism of industrial revolution, the immaterial*

materials suffer from their invisibility" (1985: 16). The modernist sees himself as the master and creator of matter, and the industrial model pursues the same dream as the modernist, to master, to control, to manipulate matter, in order to produce commodities more efficiently. Behind this view is also an anthropocentrism in which the material is slave to the human being. On the contrary, this new materiality puts this anthropocentrism into question by affirming a reality in which anthropocentrism seems obsolete.

To invent a new concept of matter, is also to reinvent a new metaphysics and probably also a technological (post-)humanism in the spirit of Simondon (though there is no trace that Lyotard has read Simondon). Hence Lyotard preferred to conceptualise it as interaction rather than creation, as he writes

> "[...] if you say creation, that means that you prohibit the other metaphysics that I evoked earlier: a metaphysics in which, precisely, man is not a subject facing the world of objects, but only – and this 'only' seems to me to be very important – only a sort of synapse, a sort of interactive clicking together of the complicated interface between fields wherein particle elements flow via channels of waves" (Lyotard 1984: 9).

What does Lyotard mean by interaction here? Interaction signifies an ontology of transmission of message without end, in which

> "man is not the origin of messages, but rather sometimes the receiver, sometimes the referent, sometimes a code, sometimes a support for the message, or sometimes the message itself and the plasticity of human means that this famous communicational structure looks like not something stable but instead something on which the identities can no longer be fixed" (ibid.: 10).

The question of language was fundamental to the conceptualisation of Lyotard's formulation of new matter, especially since telecommunication technology had created a new materiality of language between senders and receivers, and more fundamentally served as the foundation of the postmodern turn. Furthermore, one can speculate that the concept of interaction exists far before the digital. For what reason does it re-emerge? My postulation is that the digital renders visible and makes explicit a relational materialism: that the reflection on language allows Lyotard to develop an ontology of the material or immaterial according to the model of telecommunication. The new materiality, as we can see, has to be mapped in the telecommunication model according to these 5 categories.

1. Matériau (support): by what medium speaks the message;
2. Matériel (receiver): to which destination speaks the message;
3. Maternité (sender): in which name speaks the message;
4. Matière (referent): of what speaks the message;
5. Matrice (code): in what way speaks the message.

What underlies these 5 categories of *Mât* is relational. It demonstrates a frame work to understand the abstract concept of the digital in concrete and material terms. There are several important points one should keep in mind. Firstly, the maternity is no longer taken as the pure receptacle, which has to be shaped by the idea, but rather it takes the form of a sender. Secondly the new material is distributed throughout different components which cannot be separated; among them there are two relations: one is from the sender *(maternité)* to the receiver *(matériel)*, the other is from the message to its referent *(matière)*. Such a relationality is carried by the support *(matériau)* according to the coding or rules of coding *(matrice)*. Thirdly, I would like to reflect on the *referent*, since it is also probably something we may want to update after Lyotard.

Gottlob Frege in his famous article *Sense and Reference* [*Sinn und Bedeutung*], distinguishes words according to 'sense' and 'reference'. For example, morning star and evening star have different senses, but they all have the same reference which is the Venus (Frege 1948: 211-212). In this conception, the referent is always something outside, it is not carried by the sense, but rather the sense only points it to the reference. For Frege, *Sinn* and *Bedeutung* merely operate on the level of signification, but it is only in the new material that Lyotard sees the transformation of language. Namely, the most systematic medium of signification is turned into materialised computational operations. In a documentary dedicated to *Les Immatéraux*, towards the very end of the film, Lyotard proposed that "language is the most immaterial system that matter has succeeded in forming" [*le langage est le système le plus immatériel que la matière ait réussi à former*] (Lyotard 1986). We may suspect that Lyotard wrote this in the spirit of the "linguistic turn" that Barad criticised, however, when re-contextualising it in the relational materiality that I have described, language takes a different form. We can probably simply replace the word "language" in Lyotard's quote with the word "digital", since underlying the abstract and immaterial concept of the digital is the most concrete and material system.

Considering the example of data technology, we can see that the referent is materialised and rendered explicit. To a certain extent, it is similar to what Kirschenbaum writes about Nelson Goodman's distinction between the allographic and the autographic object which was mentioned before, but here the referent is even more explicit and systematic. For example, the semantic web is a constant process of integrating all materials, no matter what granularity, into resources, and each resource is given an URI (Universal Resource Indicator). So for example, now the morning star and evening star can all become resources such as their referent Venus, and these relations can be named by predicates, for example *_is* or *_refers_to*.

If this logic is well followed, then we can see that such a relational materialism does not only follow a *progressive* development of technicity, but also embeds a resistance against the modernist and substantialist view of matter. If human beings can also be interpreted through the *Mât*-system, on the one hand we see that they become unmasterable since they are no longer created, but rather emerge through interaction. On the other hand, when human beings become part of this system, they are within it and part of it, and therefore human

beings are no longer able to elevate themselves to any 'transcendent' plane. In order to generalise this connection without losing specificity, one could say that a relational materialism is only possible, if 1) nature is progressively overcome and transformed in material terms (this is another aspect of the maternity of matter – the materialisation of relations which turns significations into material connections: matériau, matière, matrice), and 2) the receptacle itself becomes relational, in the sense that it can be analysed in terms of relations which are real, and such relations find their common medium with the embodied experience, which in turn affects its own structure.

A relational analysis is close to what Kirschenbaum calls formal materiality, since most of these relations emerge from formal structures. However, we have to consider not only how structures determine relations, but also how relations determine structures: the inter/intra-action between 1) and 2) that traverse two orders of magnitude. This recursive relationality was firstly foregrounded by the theory of feedback in cybernetics; however, such feedback should not be understood as general term, but rather according to the scale, order and magnitude of the investigated object (e.g., social networks, nanotechnology, synthetic biology, etc.). It would have been impossible to analyse the same type of relations in the time of steam engines, but it is possible with regards to digital writing which possesses a totally different order of granularity. It is also due to this reason, that Kirschenbaum's reading of Drucker's materiality as mere forensic materiality is not justified – since with this 'organic form' materiality has become richer than just data records. By organic form, I mean the reciprocal relation between relations and the structure. Moreover, for Drucker, the materiality of embodiment is relevant (which this is not the case for Kirschenbaum). If we acknowledge this rapport between relations and technologies, it seems possible to derive an analytic tool based on this formulation (between relations and matter), which goes beyond any dogmatic account of digital materiality.

Conclusion

This article aims at explaining why there is a need to propose a new critical lens through which to look at digital materiality, and to show what this analysis could look like. Due to the limited scope of the article, many detailed scholarly arguments had to be omitted. The first section shows how approaches in digital physics or digital metaphysics start from the abstract notion of the binary – which tends to blur the question of materiality, and leaves us with an obscure materialism without materiality. Subsequently, the (re)interpretation of digital materiality as described by Kirschenbaum shows another approach which moves from the abstract notion of the digital towards its material and concrete support. By showing the limits of both approaches, this article intends to delineate a relational materialism compatible and coherent with the technologies and history of thought. The reason for drawing on Lyotard's analysis is not simply that he already had some insights into these issues 30 years ago, but rather that for Lyotard the immaterial carries a political agenda which he calls the postmodern condition.

Lyotard's materialist analysis tries to destabilise modernist thinking and proposes a sensibility towards the new material which opens a new way of thinking and acting compatible with the techno-logical. The mediation of the immaterial, allows him to develop a new metaphysics of interactivity that competes with the Cartesian and other metaphysics of creation. The decline of the modern is not solely caused by this technology; instead, this technology is itself a product of the modern that both negates and is symptomatic of the modern. If there was a "digital condition of the postmodern" in Lyotard's concept of the immaterial, which I described in the last section, then the question is how this digital condition could be situated within a lineage of technicity besides confirming its newness. And when trying to understand the materiality of the digital 30 years after the attempt of Lyotard, it is not only important to show that a new materiality is given, but also to comprehend what is at stake in such a conception of the digital. This article is hence also a proposal to highlight a materialism stemming from this analysis of materiality. It is beyond the scope of this essay to analyse the stake of the postmodern, however it is somewhat evident that such a condition becomes profitable and that its criticality is also in the process of disappearing. In considering material relations, we see that the harvest of 'useful' relations in the digital milieu is crucial to any social, economical and political program, for example to 'public' services like Google, Facebook, Amazon which develop correlations based on the relations between customers/friends and their behaviours for marketing purposes; moreover, secret services use the same technologies to identify suspicious individuals/groups and suspected terrorists. Through this analysis of relational materiality a new understanding of 'immateriality' and digital materialism emerges which is based on relations rather than substances.

References

Aristotle (350 BCE a): Categories, translated by E. M. Edghill (http://classics.mit.edu/Aristotle/categories.html).

Aristotle (350 BCE b): Metaphysics, translated by W. D. Ross (http://classics.mit.edu/Aristotle/metaphysics.html).

Barad, Karen (2003): "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter." In: Signs: Journal of Women in Culture and Society 28, pp. 801-831.

Berners-Lee, Tim (1998): The Semantic Web as a language of logic (www.w3.org/DesignIssues/Logic.htmlReference).

Centre Georges Pompidou (1985): Les Immatériaux, Vol. 2, Paris: Centre G. Pompidou.

Chaitin, Gregory (2005): Leibniz, Information, Math and Physics (http://arxiv.org/abs/math/0306303).

Coxon, Allan H. (2009): The Fragments of Parmenides: A Critical Text With Introduction and Translation, the Ancient Testimonia and a Commentary, Athens: Parmenides Publishing.

Decorte, Joe (2002): "Relatio as Modus Essendi: The Origins of Henry of Ghent's Definition of Relation." In: International Journal of Philosophical Studies 10/3, pp. 309-336.
Decorte, Joe (2003): "Relation and Substance in Henry of Ghent's Metaphysics." In: Guy Guldentops/Carlos G. Steel (eds.), Henry of Ghent and the Transformation of Scholastic Thought, Leuven: Leuven University Press, pp. 3-14.
Fredkin, Edward (1992): "Finite Nature." In: Proceedings of the XXVIIth Rencontre de Moriond (http://digitalphilosophy.org/wp-content/uploads/2012/08/finite_nature.pdf).
Fredkin, Edward (2003): "An Introduction to Digital Philosophy." In: International Journal of Theoretical Physics, 42/2, pp. 189-247.
Frege, Gottlieb (1948): "Sense and Reference." In: The philosophical Review, 57/3, pp. 209-230.
Häberli, Paul (1952): Philosophia Perennis: Eine Zusammenfassung, Berlin: Springer.
Hayles, Katherine (1999): How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics, Chicago: Chicago University Press.
Hudek, Antony (2015): "From Over- to Sub-Exposure: The Anamnesis of Les Immatériaux." In: Yuk Hui/Andreas Broeckmann (eds.), 30 Years after Les Immatériaux: Art, Science and Theory, Lüneburg: Meson Press, pp. 71-91.
Kirschenbaum, Matthew (2005): "'Every contact leaves a Trace': Computers Forensics and Electronic Textuality" (http://lte-projects.umd.edu/mgk/blog/LeavesATrace.pdf).
Kirschenbaum, Matthew (2008): Mechanisms: New Media and the Forensic Imagination, Cambridge: MIT Press.
Lecourt, Dominique (2005): L'épistémologie historique de Gaston Bachelard, Paris: Vrin.
Leibniz, Gottfried W. (1989 [1686]): Discourse on Metaphysics and Other Essays, translated by Daniel Garber/Roger Ariew, Indianapolis: Hackett.
Lyotard, Jean-François (1984): "Après six mois de travail..., Dossier 1994033/666, Centre Pompidou Archive." In: Yuk Hui/Andreas Broeckmann (eds.), 30 Years after Les Immatériaux: Art, Science and Theory, Lüneburg: Meson Press, pp. 29-66.
Plato (360 BCE): Timaeus, translated by Benjamin Jowett (http://classics.mit.edu/Plato/timaeus.html).
Russell, Bertrand (1937): The Principles of Mathematics, London: Allen & Unwin.
Simondon, Gilbert (2005): L'Individuation à la lumière des notions de forme et d'information, Paris: Jérôme Millon.
Simondon, Gilbert (2012 [1989]): Du mode d'existence des objets techniques, Paris: Aubier.
Treder, Hans-Jürgen (1998): "Parmenides und die Begründung von Ontologie und Kosmologie." In: Gerd Laßner (ed.), Die Zahlen der Physik, Berlin: Trafo-Verlag, pp. 57-62.
Whitehead, Alfred N. (1967): Adventure of Idea, New York: Free Press.
Wolfram, Stephen (2002): A New Kind of Science, Champaign: Wolfram Media.

Wright, Robert (1988): "Did the Universe Just Happen?" In: The Atlantic Monthly (www.theatlantic.com/past/docs/issues/88apr/wright.htm).
Zuse, Konrad (1967): "Rechnender Raum." In: Elektronische Datenverarbeitung 8, pp. 336-344.