

## Education in an Age of Digital Technologies Flusser, Stiegler, and Agamben on the Idea of the Posthistorical

Joris Vlieghe

Received: 4 June 2013 / Accepted: 3 September 2013 / Published online: 26 September 2013  
© Springer Science+Business Media Dordrecht 2013

**Abstract** On the basis of a close reading of three authors (Flusser, Stiegler, and Agamben), I try to elucidate what the growing presence of digital technologies in our lives implies for the sphere of schooling and education. Developing a technocentric perspective, I discuss whether what is happening today concerns just the newest form of humankind's fundamental dependency on a technological milieu or that it concerns a fundamental shift. From Flusser, I take the idea that the practice of writing shapes human subjectivity, as well as our very sense of history and progress, and that with the advent of digital technologies the possibility of a posthistorical era is granted. I confront this idea with Stiegler's analysis of technological tools and practices as strongly materialized memories, which amounts to a plea for securing the link with the particular history behind the technologies we use. Here, education should play a conservative role and take responsibility for using technologies in a correct way. I argue that Stiegler is not wholly consistent on this point and, moreover, that his view precludes the possibility to rethink the very meaning of education under present (digital) conditions. This possibility is opened if we turn to a philosopher which is ruthlessly criticized by Stiegler for being a technophobe: Agamben. I argue, however, that a more detailed reading of Agamben—n combination with Flusser—might show a completely different and far more positive appreciation for digital technology and that this view offers an opening for rethinking what education is all about.

**Keywords** Education · Digitization · Writing as a technology · Posthistory · Flusser · Stiegler · Agamben

The issue I deal with in this article is situated at the crossroads of philosophy of education and philosophy of technology. I am, more particularly, concerned with the increasing introduction and deployment of digital technologies, like iPads, e-communities, and M learning, in the sphere of formal education (schools and universities). This happens at the cost of traditional forms of teaching and learning,

---

J. Vlieghe (✉)  
Laboratory for Education & Society, Vesaliusstraat 2, 3000 Leuven, Belgium  
e-mail: joris.vlieghe@ppw.kuleuven.be

i.e., education based on writing and reading texts, and on direct, face-to-face classroom instruction. This shift has been profusely researched by instructional psychologists. For instance, they try to work out whether the substitution of classroom learning for e-learning affects learning outcomes (e.g., Galy et al. 2011), or whether taking down written notes as opposed to using word processors has a different impact on pupils' levels of attention (e.g., Wood et al. 2012). However, this kind of research leaves a fundamental *philosophical* issue out of consideration, viz. whether the introduction of digital media in the educational sphere may (or may not) fundamentally alter the very meaning of education itself.

With this, I mean that existing approaches take for granted a given definition of education, and merely ask whether the replacement of one set of technologies<sup>1</sup> by another has (positive or negative) effects. However, in this contribution, I would like to raise the question whether the digitization of education has more severe implications, and to argue that this evolution demands us to reconceive the very notion of education. What is happening today is perhaps not so much a transformation *within* education, but *of* education itself. I take education here in the sense Kant meant (1982, p. 11) when he stated that it is *only* through education that we come to be the sort of beings we are. This is to say that the use of different educational technologies might go together with the coming into existence of an altogether different type of human subjectivity. Therefore, I develop in this article a reflection on the meaning of education in relation to the use of technologies, and more particularly in relation to nondigital technologies as opposed to digital ones. Part of my argument will consist in showing that currently there is taking place a fundamental shift, rather than a smooth and continuous change.

I deal with this issue by a careful examination of the work of three philosophers: Vilém Flusser, Bernard Stiegler, and Giorgio Agamben. Although these three authors are related by the fact that each of them were inspired by Heidegger, they are usually not bracketed together. Nonetheless, a discussion between their standpoints can be most fruitful. Flusser and Stiegler share a *technocentric* point of departure. For both these thinkers, the concrete technologies we use in our daily lives are more than means that are just at our disposal: they constitute to a large extent the kind of beings we are. Both also concentrate on the practice of *writing*—which will form a connecting thread throughout this article (keeping in mind that schooling—from its origins in Greek Antiquity—has been an apparatus primarily concerned with the training/perfecting of writing skills). Moreover, they both relate their analyses to the contemporary proliferation of *digital* systems of communication. At the same time, they resist the temptation to cast these newest technologies immediately in a bad light, i.e., condemning them as a great threat for all that is good in schooling as traditionally conceived—a tendency which is all too common among philosophers.<sup>2</sup>

<sup>1</sup> Throughout this article I will use the term *technology* in a very broad meaning. To my view, most human activities are technologically mediated and forms of human action we usually call “traditional” also rely on the use of technologies. With this term, I refer to concrete objects, as well as to practices related to these objects. For instance, writing is a technology, because it relies on specific tools (quills, fountain pens, and keyboards) which are linked to specific activities (scribbling down and typing).

<sup>2</sup> The work of Richard Dreyfus might be illustrative here. He condemns the use of digital media because they pervert the basic conditions under which true education can take place. Among other things, this comprises a direct and unmediated relation between pupil, teacher, and subject matter (see Dreyfus 2001)

In spite of these common grounds, both authors would strongly disagree on other points. This is especially true in relation to the role *history* plays in their respective views. While Stiegler holds a plea to secure a link to the particular (material) history that lies behind the digital technologies that are in vogue today—ascribing a crucial role to the schooling system—Flusser argues that a digital way of thinking might imply new conditions of existence in which history ceases to play any role whatsoever. To make this idea of the “post-historical” more concrete, I turn to the work of Agamben. This might seem a strange move, as Agamben is often perceived as a rabid technophobe, particularly by Stiegler. Nevertheless, I argue that Stiegler's criticisms are not valid and that Agamben's reflections might help to elucidate what is at stake in Flusser's speculations on the posthistorical. Moreover, this confrontation between Stiegler and Agamben will show a shortcoming of Stiegler's own technocentric philosophy. So in the end, my aim is to complement some of Stiegler's valuable insights with those of Flusser and Agamben in order to develop a specifically *philosophical* view on education and digitization

### 1 Flusser: Alphabet-based Versus Digital Thought

In order to better understand Flusser's view on the digital, which—as I indicated—is based on an analysis of different kinds of writing, I first briefly turn to Heidegger's analysis of typewriting in his *Parmenides* lecture course<sup>3</sup>:

The typewriter tears writing from the essential realm of the hand, i.e., the realm of the word. The word itself turns into something ‘typed’. [...] Mechanical writing deprives the hand of its rank in the realm of the written word and degrades the word to a means of communication. In addition, mechanical writing provides ‘this advantage’, that it conceals the handwriting and thereby the character. The typewriter makes everyone look the same. (Heidegger 1992, 80–81)

Even though the typewriter has become a completely obsolete instrument today, Heidegger's considerations are of interest<sup>4</sup>: his remarks express a condescending attitude towards technology that is widely accepted today. The idea is that the use of a mechanical instrument interferes with a direct expression of our thoughts and feelings, and that it therefore prevents a spontaneous and personal use of language. In a sense, writing is by necessity mediated by artificial implements, be it a quill pen or a fountain pen, but for Heidegger these particular instruments appear as further exteriorizations of the set of human behavior we are naturally endowed with. It concerns a facilitation rather than a mechanization of our writing abilities. So, writing with a pen

<sup>3</sup> In his latest book on technology and biopolitics, Timothy Campbell (2011) also uses this example as a starting point. My own conclusions in this article may come close to the affirmative biopolitics he is after. However, my interpretation of Agamben departs from his in substantial respects.

<sup>4</sup> I am aware that in this article I give an oversimplified and much too negative account of Heidegger's views on technology. It might be argued that Heidegger's view is much more neutral. According to such a reading, Heidegger is not opposed to or fearful of technological advancement, but he tries to make us realize how technoscience affects our way of being in the world (because it concerns an influence we easily tend to forget).

is something authentic over and against which typewriting can only be seen as something secondary, a form of writing by default. According to this line of thought, it might even be doubted if one may call typewriting *real* writing: it goes against the very essence of what writing is, it runs counter to the *proper* destiny of “the hand”, and so Heidegger also calls it an *improper use* of our own capabilities. Moreover, if such a degraded activity would become a common practice, we are up against a major cultural crisis, as the very possibility to express and to actualize ourselves as singular living beings is excluded in favor of a large-scale standardization of human existence. Typewriting “makes everyone look the same”, so he claims.

According to Heidegger, we *first* need to define the essential modes of being that are typical for humankind—ascribing to the hand a register of “proper” possibilities—so that *subsequently* we can decide which use of technical apparatuses is authentic. Now, I want to confront this way of looking with the analysis Flusser elaborates in connection with handwriting and typewriting.<sup>5</sup> Most interestingly, Flusser substitutes an anthropocentric perspective for a technocentric one: he claims that the use of particular technologies has ontological priority and that they define what kind of beings we are. It is not so much we, human beings, who shape and invent technological tools, it is rather the case that these tools and the embodied uses we make of them shape and program us. And writing systems play a crucial role in defining who we are.

“The typewriter”, Flusser contends, “is a machine for writing lines from left to right and for jumping back to the left side. Thus, the typewriter is, to some extent, a materialization of a cultural program of ours. If we look at the typewriter, we can see materially, to some extent, how one aspect of our mind works” (Flusser 2013a, p. 3). At first sight, this seems an outlandish claim, as it is far more convincing to state (with Heidegger) the opposite, viz. that handwriting is “closer to our mental structure, and expresses it more directly”. However, Flusser suggests that “we may [equally] hold that the typewriter is more faithful to our mind processes than is longhand writing, and that the irregularities of handwriting are technical imperfections which have been overcome by the invention of the typewriter” (ibid.). In order to understand Flusser's point, we have to consider very carefully the precise kind of embodied gesture writing consists in—not starting (like Heidegger) from the proper destiny of the hand, but looking at the practice of writing in its concrete material reality, i.e., understanding what it means to put “very material letters upon the surface of a very material sheet of paper” (p. 9).

If we hold the more commonly shared view that longhand writing is a more authentic expression of our thoughts than typewriting is, we have to consider writing as a gesture that is analogous to drawing. This is to say that the process of putting

<sup>5</sup> To my knowledge, Flusser does not explicitly comment on Heidegger's remark concerning typewriting. What follows is my reconstruction of a Flusserian critique of Heidegger, or at least of Heidegger's approach towards the invention of typewriting. This approach testifies to a widespread tendency to critically judge (and in this case: to condemn) certain technologies on the basis of the belief that technology operates as an external force which threatens to a smaller or greater extent humankind's most fundamental faculties: as if our capacity to act and think uniquely and freely is contaminated or even destroyed by technology. Flusser, on the contrary, tries to rebut this particular perspective by engaging in concrete analyses of how technologies function. The crux of his argument is that our capacity for thought and action, as well as their possibilities and limitations, depend on the use of particular technologies.

down words on a piece of paper is analogous to artistic creation—i.e., expressing an individual emotion or thought by carefully combining elements. The irregular and singular characteristics of handwriting are then, just like the idiosyncratic style of a painter, essential to the activity of writing. This is to say that typed texts, because of their standardized outlook and austere regularity, are an inferior form of writing. But again, things might be analyzed in the opposite direction. If we, on the contrary,

hold that the typewriter is more faithful to the workings of our mind than is longhand, we consider writing to be a gesture related to conceptual thinking [rather than to drawing]. A far more “material thinking”, to be sure than is “internal” thinking, but still a gesture which puts concepts or their symbols into an ordered sequence. The irregularities of handwriting are then considered to be unwanted accidents avoided by typed writing. The typewriter is thus seen to be a “better” instrument than is a pencil. (ibid.)

This is to say that a more recent and more pronouncedly technological variation of a certain practice, even if it might at first sight seem to be secondary to (derived from, less authentic than) a more exemplary form, might disclose this practice in a way that was unlikely to take place beforehand. As long as we only knew longhand, it was difficult to approach writing “as a gesture”, i.e., as a heavily embodied practice, the sense of which is not so much defined by what we spontaneously think and feel when we perform it, but by the material and technological dispositions that constitute this practice. As long as we only knew longhand, we were too close to the practice of writing to understand it from a gestural perspective. It is *only* with the invention of the typewriter, an apparatus that forces its users to print letter after letter and word after word without any possibility to return, let alone to correct something previously imprinted, that we come to see distinctly what writing (and thus also longhand writing) *as a material and technologically mediated practice* is all about. So, instead of disqualifying typewriting as an improper use of our signifying capabilities, it could also be considered as a more perfected instance of writing. Anachronistically put, *longhand writing is typewriting by default*.

Such a gestural approach not only offers a way to counter a widespread technophobic attitude, which might be read in Heidegger's comments on the typewriter. It implies, moreover, that the use of certain tools, and more precisely tools of a mechanical kind, permits—ironically—to come to terms with the question Heidegger famously asked: “what is called thinking?” (Heidegger 1972). Flusser argues that the gesture of writing also discloses that thinking, or at least the thinking of literate beings, consists in *a diachronic, one-dimensional, one-directional activity*. It is above all a process of linking and ordering ideas according to “linear thought sequences” (Flusser 2013a, p. 10). Once more, for Flusser, the case of typewriting clearly demonstrates that we do not get the point of what writing consists in if we fall back on the analogy of drawing: the thoughts we form while writing are not so much a question of combining pieces into a sketch or picture, but rather of cutting away—just like the sculptor does (ibid.). Writing is a destructive rather than a constructive activity: “[t]o write is a gesture in which the entire attention is absorbed by the effort to force thought into a series of shapes” (p. 17). This is to say that before the technique of writing had been invented and humans could only “think aloud”, they were able only to link their ideas in a rhizomatic and associative way. Their

thought remained “mythical”. The invention of the *written* word, on the contrary, implied a “repression of this ‘natural’ tendency to think aloud” (p. 13), and thus of disciplining (“violating”) undirected streams of thoughts into well-ordered lines of thought. Whereas oral discourse lacks logical stringency, a way of thinking that is conditioned by writing allows for a truly critical attitude to the world. Referring to the alphabetic notation system, Flusser argues:

With the help of the alphabet, the mythical babble was leveled so that it could run along a clear line towards an exclamation, question mark or full stop instead of turning itself in circles [...] The alphabet was invented to replace mythical speech with logical speech and so to be able, literally for the first time, to ‘think’. (Flusser 2011a, p. 32)

In that sense, writing is a unique invention which is radically different from *merely* oral language. It is important to stress the word “merely”, because once writing was invented, it also possessed the power to transform spoken language in a more ordered way: when spoken language transmogrifies into written language, it reaches “its full maturity” (2011, p. 32). It teaches “people how to speak properly in the first place” (*ibid.*). Without a system to note language down in a material form it would not be possible to imagine what it means that people actually *speak a language*, like German or English, rather than that they *just speak* (*ibid.*, p. 33): the codification of spoken sounds in a fixed system of writing, allows for the very idea that there should be a standard language with fixed rules, i.e., that there is a “correct” way to speak English, German, etc. As such, there exists also a kind of feedback mechanism between the spoken and the written.<sup>6</sup>

The gist of Flusser's argument is that there is an unbridgeable gap between preliterate and literate cultures. And this is not because written language expresses the true core of what it means to be human beings, but because the invention of specific technologies decides what we are as human beings at a given moment in time. It is *only due to the technology of writing* that thinking, or at least linear and diachronic thought, became possible in the first place: the clarity and orderliness of our thinking is dependent upon the coming into existence of a specific, material, and mechanical practice of jotting down letters and words. Flusser's view therefore implies that linear thought has a *contingent* status: it has a clearly definable starting point in the course of history and probably also an end point. This is to say that before the invention of the alphabet we knew a different type of “thinking”—if we may call it that. All this moreover implies that non-alphabetic notation systems, e.g., ideographic systems like the ancient Egyptian hieroglyphs or contemporary Chinese characters, correlate with different styles of thought: these do *not* “violate” our ideas in the way the letters of the alphabet do (p. 14). More relevant to this article is that the same applies to the use of numbers: “[b]ecause letters are signs for spoken sounds, an alphabetic text is a score for an audible performance: it makes sounds visible. Numbers, on the other hand, are signs for ideas (‘ideographs’), for images seen with an inner eye (2 as a sign for the mental picture of a pair)” (Flusser 2011b, p. 24). *This*

<sup>6</sup> This claim holds against the obvious criticism that before the introduction of mass schooling, which only began in the eighteenth century, most people were illiterate. As soon as the very possibility of written language comes into being, this affects language as such—also the language of the illiterate.



is to say that while alphabetic writing is linked to the one-dimensional logic of the ear, numerical writing mirrors the two-dimensional logic of the eye. When we read an alphabetic text, we obviously deal with an optical reality, but we still have to submit the written to an *acoustic regime*. This concerns a system of ordering that is “line-like”, i.e., one-dimensional (one word coming after another) and one-directional. On the contrary, when we have numbers (or graphs, pictures, or ideograms) in front of us, we understand them as images and as images only. We therefore obey an *optical regime*, which is two-dimensional: without being constrained by one direction, we can pass our eyes over the image in space, going up and down back and forth, and even make circular movements.<sup>7</sup> Moreover, as there is no necessity to force these signs into another medium, our understanding of these signs is much more intuitive than is the case in reading alphabetically structured texts. In other words, the invention of alphabetic writing is to be seen, not only as a moment of demythologization (of the oral culture), but also as an “iconoclastic” move (ibid., p. 31), i.e., a kind of *overcoming of image-based thought*. “Eidos” is substituted by “logos” (ibid., p. 24). Or, as Flusser puts it, “[t]he assault on numbers by letters concerns a violation of numerical by literal thought” (ibid., p. 23).

One might of course raise the objection that, compared to indigenous rationalities, western rationality—as a scientific–logocentric style of thought—is a paramount illustration of a visual, two-dimensional logic. A quick glance at most manuals used in higher education seem to illustrate this clearly: they are filled with photographs, drawings, numbers, equations, graphs, and so forth. Nevertheless, Flusser would argue that they ultimately are *textbooks*, because the eye is still subordinated to the logic of the ear: even if images abound, they are also encapsulated by acoustic, one-dimensional and one-directional, discourse. Scientific texts are still “lines of letters interspersed with islands of numbers” (ibid., p. 24).<sup>8</sup> It is *only* with the advent and proliferation of *digital* media that an image-based rationality might become (again) the dominant cultural code. At this moment, “[t]he detour through language to the sign, such a distinguishing mark of Western cultures (and all other alphabetic cultures), will become superfluous. Thought and speech will no longer be fused, as they were when the alphabet was predominant” (ibid., p. 63). Only then would we really free ourselves from logocentrism.

This is not to say that with the disappearance of the written word, we would stop thinking. We will rather—so Flusser speculates—enter an era in which our thought still follows rules, but not necessarily “logical” rules. After all, we should not forget that “logos” literally means “word” in Ancient Greek, and thus that what we consider to be the universal laws of thought (the rules of logic) are actually bound up with the alphabetical ordering of spoken language (ibid.). It is equally important to stress here that the transition to a post-alphabetical era is not a return to a more primitive culture in which visual images, and thus a two-dimensional logic, dictates how to link and

<sup>7</sup> When the eye scans an image, it ‘can return to an element of the image it has already seen, and ‘before’ can become ‘after’: the time reconstructed by scanning is an eternal recurrence of the same process.” (Flusser 2000, p. 9) The time-experience related to looking at images is circular rather than linear.

<sup>8</sup> Because thought based on writing and two-dimensional thought are structurally different and follow different rules, Whitehead and Russell’s program to reduce mathematics to logics, i.e., grounding a visual mode of thought on an acoustic-discursive one, was doomed to fail (Flusser 2011a, p. 63)

order ideas. On the contrary, we enter the era of *technical images*<sup>9</sup> and this brings along a new way of thinking which Flusser calls *zero-dimensional* (Flusser 2013b). With this somewhat strange expression Flusser means that thoughts are no longer the outcome of linear and discursive processes, but *immediate* results of (complex) *computations*. Instead of having to construct our thoughts step by step and in a well-defined chronological order, we combine in a very short amount of time dots of information, that according to their various values (1 or 0) directly result in new information.

Of course, this is exactly how computers work. But, this is also how our brains operate (Flusser 2011a, p. 145). Just like the mechanical working of the typewriter disclosed a particular way of thinking (linear thought), the concrete, material, modus operandi of digital technologies reveal new possibilities of generating “thoughts”. An obvious counterargument against Flusser's position is that computers cannot “think”: they always need a conscious mind to interpret the results of their computations. But, if one takes seriously the idea that thinking is historically conditioned, it is perfectly conceivable to classify the activity of computation as *real* thought. This is to say that by creating computers we have actually turned over the basic (physiological) structure of our minds to an external apparatus. And precisely this sets our thinking free in ways that were unforeseeable before: instead of thinking linearly, supported by alphabetic technologies (books), we might come to fully adopt “a new calculating way of thinking” (Flusser 2013b, p. 9), supported by external materializations of the neurological structure of our brains (computers).

To elucidate this idea, consider once more Flusser's argument that typewriting is *also* writing and perhaps a materialization of writing *par excellence*. Analogously, one might argue that that computational thought *is also thought* and that it materially shows a new modus of thinking that is made possible when we start to interact with computers, i.e., with extensions of our own encephalic hardware. Another way to state Flusser's point is that we are easily inclined to forget that our logical way of thinking is only possible on the condition that we write alphabetically, i.e., that we rely on a contingent technology that defines what we can and cannot think. Accepting this, however, also implies that other modi of thought actually are possible, and more precisely a thinking supported by a zero-dimensional technological medium. This is *not* to say that computers can think, like alphabetically programmed minds like ours can. On the contrary, this *is* to say that our minds could think otherwise, when supported by a totally different sort of technology which encodes ideas in “mathematical codes” rather than in “letter codes” (ibid., p. 9).

Therefore, it could be argued that the digital allows for sensing *with an accuracy that has never been possible before* what an alternative and nonlinear form of thought would look like. And, this requires a detailed analysis of the “gesture of computing”—just like a “gestural” analysis might reveal what we precisely do when we note down, or print, letter after letter on a sheet of paper (Cf. ibid.). Because we

<sup>9</sup> The technical image is to be distinguished from the traditional image: the last kind of image is far more abstract and only possible *after* the invention of (alphabetic) text, which was itself a reaction to a visual culture. This is to say that texts are abstractions from *traditional* (pre-literal) images (they substitute the conceptual for the concrete) and that *technical* images are further abstractions from texts (Flusser 2000, p.14). Technical images are not depictions of an already-given reality, but precisely visualizations that render abstract computations concrete: *technical images do not represent reality but create reality*.



are still living in a culture dominated by an alphabetic regime, Flusser is well aware of the difficulty to imagine all this concretely. However, in the context of this article, it seems worthwhile to go deeper into his speculation that the advent of zero-dimensional thought has serious implications for the way we relate to history.<sup>10</sup> Flusser argues that, whereas one-dimensional thought is by definition historical, *zero-dimensional thought is ahistorical*. This is because the capacity to have a sense of history in the first place is itself a historical given<sup>11</sup>: historical consciousness depends on the invention of (alphabetic) writing:

In prehistory (the term is accurate) nothing could happen because there was no consciousness capable of conceiving events. Everything seemed to move in endless circles. Only with the invention of writing, with the rise of historical consciousness, did events become possible. When we speak of prehistoric events, we are writing supplementary history and committing anachronisms. (Flusser 2011b, p. 8)

The very idea that there is *progress* or that there exists a *causal* sequence of meaningful *events* (rather than mere “occurrences”) in relation to which we can situate ourselves as historical beings is only possible if we possess and practice the one-dimensional and one-directional skill of writing. Therefore, the transition from an alphabetic to a digital culture also implies the transition towards a posthistorical era: at that point “[w]e can free ourselves from all history, become mere observers of it, and become open to something else—to a concrete experience of the present”(ibid., p. 21). Perhaps it is even better to say that we enter a posthistorical *condition*, because time will no longer be experienced in terms of eras, or even better a *post-posthistorical* condition, as the very idea of history will not make any sense for those who live it.<sup>12</sup> For the fully posthistorical generation, the idea that it is our grounding

<sup>10</sup> As such, Flusser’s ideas are on a par with a recent interdisciplinary initiative which European scholars have taken in regard with the issue *what it means to be human in a hyperconnected era*. In their Online Manifesto (European Commission 2013), they argue that, with the increasing use and development of ICT, we are faced with a far reaching alteration of the most basic conditions of human existence, and that this change will have implications in all domains of life. In this context, Luciano Floridi developed the idea of *hyperhistory*, which comes, I believe, close to what Flusser is discussing (Floridi 2012, p. 129). The focus of Floridi’s analysis is the way in which *information* is dealt with. The gist of his argument is that under *historical* conditions (i.e., since the invention of writing techniques) information has become the object of ever more perfected systems of *recording* and *transmission* of information, whereas the *hyperhistorical* era we are entering today is fundamentally characterized by the endeavor to optimize the *processing* of information. These concern operations that are markedly different, and therefore it might be that in the hyperhistorical era humankind will have to be regarded in completely new terms.

<sup>11</sup> Historical consciousness only arose with the invention of writing and not, as we usually believe, with earlier forms of notation, like inscriptions in stone. These inscriptions had some “historical” meaning, as they were meant to commemorate great deeds. Nevertheless, they are only *monuments* that require contemplation of the past. To be able to have a sense of progress, the invention of *documents*, i.e., a form of writing that forces the writer/reader to jump from one word to the other, is required (Flusser 2011b, pp. 17–21).

<sup>12</sup> Just like the term prehistory is an inadequate term, because obviously the *prehistorical* era is a defined period of time *in* history, the term posthistorical is ambiguous: it is at the same time a historical period, and yet it is an era in which the notion history no longer makes sense. As Floridi (2012, p. 129) suggests, terms like prehistorical, historical, posthistorical, or hyperhistorical “work like adverbs”, meaning that they capture more “*how* people live, [rather than] *when* or *where*”.

in history which gives direction to how we should live our lives has become utterly meaningless:

We no longer imagine that we are in chains (for example chains of causality, or in a bustle of laws and regulations), and that freedom is the effort to break those chains, but rather that we are immersed in an absurd chaos of contingencies, and that freedom is the attempt to give this chaos shape and meaning. (This reshaping of the question ‘freedom from what’ into ‘freedom for what’ is extraordinarily characteristic for the rupture in our thinking. (Flusser 2013b, p. 10)

In the next section, I will oppose this idea to the views of Stiegler. He shares with Flusser a similar technocentric point of view. With this, I mean that it is the use of particular technologies which decides what we are as human beings. A technocentric point of view is opposed to an anthropocentric account of technology, which merely sees technological tools and practices that are at the disposal of a human being, the essence of which can be defined without any reference to technology. But, at the same time, Stiegler will argue from this particular point of view that a disconnection between technology and history (which Flusser predicts) poses a great danger. More precisely, this disconnection lies for him at the roots of what he senses as a contemporary crisis in education.

## 2 Stiegler: the Material History of Technology and the Crisis in Education

According to Stiegler's analysis (1998), the resources on the basis of which we are constituted as subjects are not lying in some transcendental potential all humans essentially share (e.g., a universally shared capacity to think), nor in our genetic potential. If the last were the case, it would be very difficult to explain why contemporary (wo)man is so different from *Homo neanderthaliensis*, as both share more or less the same DNA code (ibid., p. 146). If humankind is the product of evolutionary processes, it is not only mutations in “genetic memory” which act as a driving force behind these, but also changes in “technological memory”.<sup>13</sup> More concretely, the cortical brain zones of both species are identical at birth as they share the same genetic code. However, the same brain zones are quite different when we compare them at the age of 20. For instance, the visual cortex of contemporary (wo)man is differently structured and this results from many years of reading practice, i.e., from relating to the world by using a specific technology. In Stiegler's words, the brain gets “literalized” or at least an “alphabetical grammatisation of the brain” takes place (Stiegler 2012, p. 4). Reading is a technique that transforms the neuronal pathways of our brains in one way rather than in another.

When Stiegler uses the expression “technological memory”, this might erroneously suggest that technology, although important in its own right, is merely a support of our “true memory” (a private and intimate depository of mental representations) and therefore only a memory in a derivative sense. As if there is first our real, internal

<sup>13</sup> The technological memory is fully located in the external milieu. It exists literally “outside” (*epi*) ourselves and yet it decides how our species (*phylon*) looks like. Hence Stiegler calls it “epiphylogenetic memory”

memory and that by analogy we might call a technological object *also* a kind of memory. However, Stiegler means something completely different, viz. *that technologies constitute memories in and of themselves*. Organizers or databases are not just extensions or supports of a human faculty called memory: as concrete and material technologies that store information, they are literally to be seen as memories. This would mean, vis-à-vis the practice of writing, that memory is not only exteriorized and captured in particular *writings* (e.g., in a canon of literary texts like the Bible), but that the concrete *practice of writing* is a memory itself. It is in the concrete activity of tracing lines of ink on a sheet of paper, or for that matter of coding letters into sequences of digital units, that the past is stored and might be present at this very moment. Taking this perspective, *every* technological invention—be it tools (shovels, mugs, or cell-phones) and practices related to it (to shovel coal, to sip wine, or to send a text message) are memories *themselves* (or “hypomnemata”; Stiegler 1998): not merely as bearers of intellectual content that could exist independently of these concrete technological manifestations, but *precisely insofar they are material artifacts* (Cf. Barker 2009).

What is more, the thing we usually regard as our “true memory” is constituted on the very basis of the tools and practices we invent. Constraintively as it might sound, diaries, USB keys, and other technologies are the original memories without which memory in the sense of a mental capacity cannot come into being. *The human condition is above all a prosthetic condition*, meaning that the existence of an artificial milieu precedes and conditions our very constitution as subjects. In that precise sense, Stiegler defends a radically technocentric position. To refine this thesis, Stiegler relies on the work of Gilbert Simondon (1958), who sharply argues against *any* notion of stable identity (like subjectivity or individuality), holding that there are only processes of “individuation”: there exist no individuals that possess a fixed essence and that remain self-same over time; there are only processes of becoming that, at a given time in history, give rise to never stable configurations. Moreover, this *becoming-subject* is dependent upon others and upon a history that precedes us: individuation is always “co-individuation” and “trans-individuation” (Stiegler 2010b). Individuation is not an affair confined to the borders of the individual, closed upon him- or herself. To be more precise, Stiegler argues that individuation is dependent upon an older generation that secures the continuation of a communal, technological heritage. It is in interaction with this particular legacy that we become what we are. This is, however, not a plea for conservatism (conservation of the past as an end in itself), as individuation is a never ending and open process. It is rather in view of the possibility of further transformations that the past should be conserved. It is at this point that the educational system plays a crucial role.

This is because our dependency on technology is a double-edged sword. All technologies are “pharmaka”, i.e., meaning that—like medicines—both cure and poison at the same time. This is to say that concrete technologies are not by definition good ones or bad ones: all depends on the way in which they are used. Therefore, one and the same condition which makes individuation possible might at the same time cause the most dangerous aberrations. This is, more precisely, because we may use concrete technologies according to either *long* or *short circuits*. Long circuits of use refer to a mode of relating to technology in which we are not mere users or consumers of a technology, but co-producers or co-constructors. This means that during the

learning process in which we gain mastery over the technology at hand, we also assume and appropriate the whole history that lies at the basis of the very existence of the apparatus we use—and ideally we add something to it for the following generations. To give some concrete examples: gaining mathematical insight and skill is not a matter of intellectual intuition or understanding.<sup>14</sup> On the contrary, it is mediated by concrete tools and embodied practices related to these tools: in order to understand the Pythagorean Theorem, we need a blackboard and chalk, or paper and pen, to visualize spatial relations—and we also need to draw the appropriate lines ourselves. Moreover, we first have to learn the definition of the triangle and of the right angle, the axiom that the sum of the angles in a triangle is  $180^\circ$ , and so on. These steps cannot be omitted: acquiring basic geometrical insights is a necessary step to take in order to achieve more complex insights. Learning math is thus a *long*-circuited process (Stiegler 2010b). However, as it regards *pharmaka*, the technologies in question might be used in a *short*-circuited way. This occurs when students merely apply the theorem, without having it constructed themselves. This is to say that they skip the basic steps that ground this insight. And so pupils only learn to apply such formulae to solve real-life problems, instead of learning to carefully (re)construct, respecting the material history behind them.

The same can be said about the technology of writing. Stiegler regards this practice as a heavily embodied activity that is dependent upon concrete material conditions which result from contingent historical evolutions and inventions (Stiegler 2006, p. 174–175). Furthermore, if we recall to mind the endless period spent in primary school to learn to master calligraphy, we can fully understand that this also concerns a long circuit. By repeating over and over again the same gestures, we eventually succeeded in correctly reproducing the characters that have been used by the generations that precede us. What then about typing on a typewriter, or for that matter, on a keyboard? These are not necessarily short-circuited practices (i.e., pseudowriting), as long as we first learn to write by hand and *thereupon* acquire the skill of typing—which of course also demands quite some effort. Short-circuiting only occurs when we *merely use* a keyboard, i.e., when we have no knowledge of the hardware and software which makes letters appear on our screens when we press the appropriate keys. Then, we apply a technology without any productive contribution ourselves: our own capacity to produce written language is delegated to the machine. The same could be argued in relation with reading. While writing consists in “grammatization” (Stiegler 2008, p. 155), i.e., the spatialization of a temporal flux (of words and thoughts), reading consists in the opposite operation: material signs, on the sheet of paper in front of us have to be “recoded” in strains of thoughts. That is why we can only read if we are able to write. Reading is always an act of

<sup>14</sup> This should be understood as a criticism towards an intellectualist account of learning which is predominant in western conceptions of education and which finds its paradigmatic expression in Plato's famous story of Socrates leading the ignorant slave-boy to insight by asking him step-by-step and with an increasing level of complexity the right kind of question). Stiegler shows exactly that if we focus on the concrete didactical steps that are necessary to gain mathematical insight, Plato's claim that gaining insights consists in “remembering” (*anamnesis*) ideas that are latently present in our mind no longer holds true. *Only* when the slave boy is asked *to draw* a square in the sand before him and to subdivide it by *physically* drawing perpendicular and diagonal lines (forming a rhomb that is exactly half the surface of the original figure), he gains geometrical insight. In other words: acquirement of new knowledge is *by necessity* dependent upon exterior or artificial media.

coproduction. When watching a film, in contrast, there is the risk that all coproductivity disappears: after all, it is the DVD-player and not we which retemporalizes the encoded signs on the data carrier (ibid., p. 156). “The apparatus simultaneously dispenses with the necessity of acquiring any knowledge, as well of accomplishing any action” (Stiegler 2010a, p. 50). In that precise sense, consuming film images is a short-circuited activity. In order to use films in another, long-circuited, way, we should develop more refined practices that urge the viewer to engage actively with the film material, such as indexing, commenting, and sharing her observations and criticisms with others. *Youtube* might be a case in point (Stiegler 2010a). But then again, as every technology is in itself a double-edged sword, i.e., a *pharmakon*, *Youtube* might easily be used in a brainless, pure consumerist and passive way. Just like people who “read” a book without actually *reading* it—which is again a form of short-circuiting: it elbows out the whole background that makes reading possible in the first place (Stiegler and Rogoff 2010).

However, a long-circuited practice of reading implies that as a reader “you individuate yourself by reading this book because reading a book is to be transformed by the book. If you are not transformed by the book, you are not reading the book—you believe that you are reading” (ibid., p. 4). True reading means that one engages with a text *as if* one could have been the writer of the book oneself: one appeals to the same capacities an author has to use to write this book. Moreover, one relates the text to other texts and authors, and forms one's own critical ideas. Only on these conditions individuation can be said to take place. Again, individuation means that something truly new may occur, viz. the reader is literally someone else after having read the book. And, this is not a question of self-realization (of discovering and actualizing a deeper essence or truer self), but of *self-transformation*. Moreover, what is at stake is also co-individuation (i.e., it happens together with the author or with other readers of the same book) and trans-individuation (i.e., it happens together with the preceding generation that has made an interpretation of this book possible). When these processes of individuation cease to take place, so Stiegler argues, what follows is a large-scale and (in our digitized and therefore globalized times) even planetary “proletarianization”. Whereas in Marx' days this term referred to the alienation of the producer from the labor she had to perform, today we are confronted with a *proletarianization of the consumer*, who is reduced to a mindless herd—animal that has lost any sense and knowledge of how to live her life. The doom scenario that we might have to face is an extreme case of collective “disindividuation” (Stiegler 2010a, p. 54).

Elaborating on Adorno and Horkheimer's critique of cultural industries, Stiegler shows that there have *always* been social forces that aim to exploit this fundamental dependency between subject constitution and the prosthetical milieu we find ourselves in. In *Classical Antiquity*, for instance, sofists took abuse from the recently developed technology of alphabetic writing, pushing aside its potentially edifying and emancipatory force. It is therefore no coincidence that the “school” was precisely invented in the Athenian city-state in the fifth century BCE: “skholè” was not in the first place invented as an organized form of socialization, but a “therapy”, i.e., a system that took care for the young generation and that fought a constant battle against the possible misuse of the technology of writing (Kambouchner et al. 2012, pp. 20–21). *Today*, we are faced with industrial companies, like Amazon, Facebook, and Google, that in a similar way exploit the new information technologies, which could be the vector of (trans)individuation. Video-sharing websites, online encyclopedia, wireless connectivity and GPS-locating

systems, and so forth *might* facilitate collaborative, democratic and emancipatory, production processes which fundamentally transform the society we live in. But mostly, we merely use them in such a way that they become the means of our own subordination to the laws of a consumerist economy (“psychopower” and even “neuropower”, see Stiegler 2012).

There is thus *always* the danger that so called “programming industries” (Stiegler 2008) address us as users who have no active or coproductive role to play and who have no consciousness whatsoever regarding the historical–technological conditions behind the technologies we use. Therefore, *any* society needs a counterforce, to which Stiegler refers as “programming institutions”. The school is a paramount example: although it programs in a certain sense the new generation, pupils also get the opportunity to really individuate (and thus to *transform*) themselves. Again, there is no contradiction for Stiegler between the imposition of a certain tradition and true emancipation: individuation is co- and trans-individuation, and this means that change is only possible by continuing a line (“gramma”) that is “already there”. As such, the case of writing is not merely an illustration among others: it is paradigmatic (Stiegler 2009, p. 110). Obviously, traditional writing techniques are increasingly pushed into the background, as keyboards and screens have come to mediate the new generation's relation to the world. This is however, no cause for alarm. These new technologies are, like all technologies, *pharmaka*. And, this means that they contain *intrinsically* the potential for the best and for the worst. It is up to the elder generation to respond to this in an adequate way. In that respect, digitization does not imply fundamental changes.

As such, the educational system should seriously take into account that we live in a digital era, without taking a petty-minded attitude (Kambouchner et al. 2012). The issue to deal with is not whether we *should or should not* introduce digital media in education, but all the more how we *can* use them in such a way that the new generation gets the opportunity to continue the process of transindividuation rather than becoming victims of a process of generalized proletarianization. What is above all needed is that we realize the need for raising *digital literacy* in the young. We should prevent that the future generation deals with keyboards, touch screens, word processors, search engines, and so forth, as mere consumers, but as a part of long circuits of transindividuation. Just like in the case of writing and reading this demands a (long and intense) education (ibid.).

### 3 Agamben: Digital Technology and the Ungovernable

Therefore, it is no use, so Stiegler claims, to take an outright negative attitude towards digital technologies. It is for this reason that Stiegler (2008, p. 285–299) reproaches the Italian philosopher Giorgio Agamben, when he writes

It would probably not be wrong to define the extreme phase of capitalist development in which we live as a massive accumulation and proliferation of apparatuses. It is true that, ever since *Homo sapiens* first appeared, there have been apparatuses; but we could say that today there is not even a single instant in which the life of individuals is not modeled, contaminated, or controlled by



some apparatus. In what way, then, can we confront this situation, what strategy must we follow in our everyday hand-to-hand struggle with apparatuses? (Agamben 2009, p. 15)

For Stiegler, a quote like this—with its use of militaristic metaphor—abundantly illustrates Agamben's markedly technology-opposed mentality: there is no doubt that he is an orthodox technophobe who defines the impact of technologies on subject constitution one-dimensionally in terms of capture and distortion (Cf. De Boever 2010). Just like for Heidegger (in his critique of mechanical writing), Agamben seems to imply that the use of technological devices *necessarily* hinders us in leading an authentic life. Moreover, this is a fate we cannot escape: today we are faced with an absolute, irreversible, and catastrophic control by digital devices. Anyone who believes that we might turn the situation out right and use these newest technologies as a means for progress is led astray by the technological discourse that keeps them captivated. The next quote, so Stiegler argues, illustrates Agamben's point:

[h]ere lies the vanity of the well-meaning discourse on technology, which asserts that the problem with apparatuses can be reduced to the question of their correct use. Those who make such claims seem to ignore a simple fact: if a certain process of subjectification (or, in this case, desubjectification) corresponds to every apparatus, then it is impossible for the subject of an apparatus to use it 'in the right way'. Those who continue to promote similar arguments are, for their part, the product of the media apparatus in which they are captured. (Agamben 2009, p. 21)

Here, Agamben seems to say that a correct use is unimaginable because technology is *always* and *in and of itself* leading us astray. Now, for Stiegler Agamben's considerations are exemplary for the prejudices many people today share vis-à-vis (digital) technology. First, critics like Agamben do not understand that every technology is a *pharmakon*: they solely stress the negative side of it, i.e., that it might lead to improper use (Stiegler 2008, p. 296). Agamben only decries technology's repressive dimension, and does not appreciate the constitutive role of the apparatus. As such, Stiegler reproaches Agamben for being a noncritical Foucaultian: he forgets that power always has a productive side (Stiegler et al. 2011, p. 41). Second, Agamben does not see that the ultimate responsibility for the actual situation does not reside in the technological practices themselves, but in the way in which the cultural industries (psycho- and neurotechnologies) have programmed us to use them (Stiegler 2008, p. 295).<sup>15</sup> Because of these two mistakes, Agamben can only draw the most dystopian conclusions: as long as we live under the spell of technology, any dream of freedom and happiness remains forever utopian. In other words, there can never exist something like true freedom *within* technological conditions (as Stiegler would argue). Humankind can only regain its freedom by an emancipation *from* apparatuses (Cf. De Boever 2010, p. 17). Moreover, within his framework, it is extremely difficult to see how the deadlock we find ourselves in might be avoided and, in the end, Agamben does not do more than invoking a reference to something

<sup>15</sup> In that sense, Agamben would endorse a form of techno-determinism (whilst Stiegler merely professes technocentrism).

“ungovernable”—something that ultimately escapes the processes of technology-driven (de)subjectivation (Agamben 2009, p. 24).

Nonetheless, I believe that Stiegler denounces Agamben's perspective too hastily and, moreover, that his line of criticism is inappropriate for two reasons: because the things with which he reproaches Agamben actually apply to his own position and because his criticism vis-à-vis Agamben is based on a one-sided reading. Thus, in the remaining parts of this article, I reconstruct a confrontation between Stiegler and Agamben on these two points. However, the purport of understanding correctly what Agamben has to say is not merely academic. My main point is that in the end, the Stieglerian approach excludes the possibility of an alternative and entirely positive way of looking at education in a digital age, which might precisely be found in the thought of Agamben (when rightly interpreted). In a profound sense, Stiegler remains stuck in a traditional and nonproductive definition of education, whereas Agamben's view—which may actually refine the idea of the posthistorical we met in the work of Flusser—allows to reconceive the educational altogether.

My *first* objection concerning Stiegler's opposition towards Agamben is that the baseline of the criticisms he vents actually applies to Stiegler *himself*. With this, I mean that in the end it is not Agamben, but Stiegler who is the true technophobe. This is a strong claim, but if we have a look at the concrete examples and arguments he advances, it becomes clear that Stiegler's analysis rests on the sharp divide he draws, again and again, between proper and improper uses of technology. For instance, there is a correct and an incorrect form of doing mathematics: the proper way consists in constantly being aware of the history behind the techniques one applies, while the improper way consists in merely using formulae to solve practical problems. Similarly, whereas the superficial reading of a book is no “real” reading, only a reading practice that requires the reader to take the demanding perspective of a writer properly deserves the name “reading”. The same applies to digital literacy: one should carefully distinguish digital reading which is supported by traditional forms of literacy from the proletarian consumption of screen-texts.

It should of course be admitted that this opposition between proper and improper no longer refers to a fixed human essence. The criterion to distinguish authentic and an inauthentic way to use technologies only relates to whether or not we are respecting the material and historical conditions that lie at the basis of the technologies we use (long- versus short-circuiting). At this point Stiegler's views are quite revolutionary. Nevertheless, these views also lack consistency. This is because Stiegler presupposes that education *should* be about the perpetuation of a given cultural framework: the existing generation has to take responsibility for the new one by including it in an ongoing historical process. Admittedly, Stiegler stresses the structural openness in this process of (trans)individuation, but for him newness is *only* allowed if it somehow serves the historical continuity of an existing chain of generations. In that sense, he does refer to a dimension all true education should *essentially* have, and moreover this calling of education remains stuck in a reactionary position. Yet, this is not easy to match this with the technocentric standpoint he claims to adhere to. It seems problematic to me to claim simultaneously that our constitution as subjects is dependent upon contingent technological conditions *and* that education should consist in preserving an existing frame of reference across the changing of generations. At this point, Stiegler contradicts himself: defending a far-

reaching historization of humankind, education seems to escape all this and to remain unaffected by history. Again, this criticism is not merely academic. Such a view precludes the possibility to rethink the whole idea of education in view of fundamental changes in societal and cultural conditions. My point is that Agamben (and Flusser) permit precisely to do this.

And so I come to a *second* criticism regarding Stiegler's comments on Agamben. When Agamben claims *that there is no correct use* of technology, Stiegler draws the conclusion that for him *there can be only incorrect use*: technology *inevitably* alienates us from our true destiny. However, Agamben's claim can be understood in a more profound sense: he might also be saying that under present societal and cultural conditions *it is no longer possible to discern between correct and incorrect uses*, i.e., between proper and improper ways to relate to technology. Any "correct" use is ruled out, because we find ourselves in a situation *beyond* correct and incorrect use. What Agamben, according to my reading of this passage, is trying to say comes thus close to Flusser's idea that with the proliferation of zero-dimensional technologies we enter a *post-historical* "age": history no longer possesses the force to decide how we should give shape to our individual and communal existence. In other words: the way in which we relate to the world and how we use things (technical objects and practices) in this world is set *free*—in the double sense that we are freed *from* a normative framework that decides upon proper and improper uses and that we are free *for* a future that might be markedly different from the world in which we live in the present. In a very old sense of the word, this setting-free could be termed *educational*.

Moreover, this positive reading of the impossibility of (in)correct use grants a more adequate understanding of Agamben's reference to the "ungovernable" (Agamben 2009, p. 24). For Stiegler, the introduction of such an imprecise and free-floating phraseology reveals a serious shortcoming in Agamben's position: rather than conceiving a true alternative, Agamben is said to be cloaking himself in mystical silence (Stiegler 2008, p. 299). However, this "ungovernable" might equally refer to the possibility of *free use*. In my reading, Agamben is arguing that precisely today, under digital conditions, we have the possibility to take a new and fully affirmative stance towards our existence.<sup>16</sup> This is to say that more than ever before, we are able to experience our lives in such a way that we no longer deem it necessary to refer to a dimension beyond our concrete, day-to-day lives. This quest for a transcendental justification of existence has (within the western tradition at least) always been linked to ideas of historical progress and the teleological unfolding of human destiny. So, what may be happening today is then not so much the "end of history" (ibid., p. 23), but all the more an invalidation of the belief that history matters, which grants the possibility of a completely different form of life.

<sup>16</sup> It is a trope in Agamben's philosophy that at the climax of a process of alienation something radical new becomes possible—to which he also refers as the "messianic". As Prozorov (2010, p. 1057) comments: "[o]n a number of occasions in different contexts, Agamben has asserted the possibility of a radically different form-of-life on the basis of precisely the same things that he initially set out to criticize. Agamben paints a convincingly gloomy picture of the present state of things only to undertake a majestic reversal at the end, finding hope and conviction in the very despair that engulfs us. [...] Agamben's coming politics is manifestly anti-utopian and draws all its resources from the condition of contemporary nihilism".

## 4 Conclusion

In sum, although I completely endorse Stiegler's technocentric approach vis-à-vis the issue of education and digitization, I also believe that his position lacks consistency. If one takes wholly seriously the idea that the human condition is a prosthetic condition, it seems odd to approach the possible uses of educational technologies on the basis of an ideal that remains unaffected by fundamental changes in the technologies that define who we are as human beings. If this is the case, it would have been far more consistent to claim that fundamental changes take place which also affect the idea of education itself. This is to say that the current situation allows to reconceive the educational *beyond* fixated meanings (such as the continuation of the identity of an existing historical chain of generations). Moreover, this way of looking might be educational itself, because it affirms completely Kant's idea that humankind is "educatable", i.e., that the outcome of the process through which people get raised is not given beforehand. That is why Stiegler's approach might be complemented by the ideas of Flusser and Agamben, because these authors allow to conceive the coming into being of an unforeseen way of relating to ourselves and the world: due to the proliferation of digital media a post-historical generation might see the light of day. This would concern a liberation in a very profound sense: not a liberation within a progressive (linear) historical framework that promises more freedom as times goes by (and generations succeed one another), but a liberation from this framework itself, which implies forms of existence that are perhaps unconceivable at this very moment, but which imply fundamental changes in the way in which we relate to ourselves, others and the world.

## References

- Agamben, G. (2009). *What is an apparatus?* (D. Kishik & S. Pedatella, Trans.). Stanford: Stanford University Press.
- Barker, S. (2009). Transformation as an ontological imperative. The [human] future according to Bernard Stiegler, *Transformations* 17. [http://www.transformationsjournal.org/journal/issue\\_17/article\\_01.shtml](http://www.transformationsjournal.org/journal/issue_17/article_01.shtml). Accessed 29 May 2013.
- Campbell, T. (2011). *Improper life. Technology and biopolitics from Heidegger to Agamben*. Minneapolis: University of Minnesota Press.
- De Boever, A. (2010). The Allegory of the Cage: Foucault, Agamben, and the Enlightenment. *Foucault Studies*, 10, 7–22.
- Dreyfus, H. L. (2001). *On the internet*. London: Routledge.
- European Commission (2013). *The Onlife Manifesto. Being human in a hyperconnected era*. Accessed 9 Aug 2013.
- Floridi, L. (2012). Hyperhistory and the philosophy of information policies. *Philosophy and Technology*, 25(2), 129–131.
- Flusser, V. (2000). *Towards a philosophy of photography* (Anthony Matthews, Trans.). London: Reaktion Books.
- Flusser, V. (2011a). *Does writing have a future?* (Nancy Ann Roth, Trans.). Minneapolis: University of Minnesota Press.
- Flusser, V. (2011b). *Into the universe of technical images* (Nancy Ann Roth, Trans.). Minneapolis: University of Minnesota Press.
- Flusser, V. (2013a). The gesture of writing. <http://www.flusserstudies.net/pag/08/the-gesture-of-writing.pdf>. Accessed 29 May 2013.
- Flusser, V. (2013b) Crisis of linearity; [http://www.google.be/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CDAQFjAA&url=http%3A%2F%2Fgwk.udk-berlin.de%2Fdownload%2Fos\\_bodenlos\\_zielinski%2FFlusser%2520-%2520Crisis%2520of%2520Linearity.pdf&ei=](http://www.google.be/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CDAQFjAA&url=http%3A%2F%2Fgwk.udk-berlin.de%2Fdownload%2Fos_bodenlos_zielinski%2FFlusser%2520-%2520Crisis%2520of%2520Linearity.pdf&ei=)

- FnCjUdvzJoe50QWTiIDIAg&usg=AFQjCNGh7Pcue2irX3hI-uIEhNC2YjLdHg&bvm=bv.47008514,d.d2k. Accessed 29 May 2013.
- Galy, E., Downey, C., & Johnson, J. (2011). The effect of using e-learning tools in online and campus-based classrooms on student performance. *Journal of Information Technology Education, 10*, 209–230.
- Heidegger, M. (1972). *What is called thinking?* (Glenn J. Grey, Trans.). New York: Harper & Row.
- Heidegger, M. (1992). *Parmenides* (André Schuwer & Richard Rojcewicz, Trans.). Bloomington: Indiana University Press.
- Kambouchner, D., Meirieu, P., & Stiegler, B. (2012). *L'école, le numérique et la société qui vient*. Paris: Mille et une nuits.
- Kant, I. (1982). *Ausgewählte Schriften zur Pädagogik und ihrer Begründung. Besorgt von Hans-Hermann Groothoff*. Paderborn: Ferdinand Schöningh Verlag.
- Prozorov, S. (2010). Why Giorgio Agamben is an optimist. *Philosophy Social Criticism, 36*(9), 1053–1073.
- Simondon, G. (1958). *Du mode de de l'existence des objets techniques*. Paris: Aubier.
- Stiegler, B. (1998). *Technics and time, 1: the fault of Epimetheus*, trans Richard Beardsworth & George Collins. Stanford: Stanford University Press.
- Stiegler, B. (2006). *La télécratie contre la démocratie. Lettre ouverte aux représentants politiques*. Paris: Flammarion.
- Stiegler, B. (2008). *Prendre soin de la jeunesse et des générations*. Paris: Flammarion.
- Stiegler, B. (2009). *Technics and time 2: Disorientation* (Stephen Barker, Trans.). Stanford: Stanford University Press.
- Stiegler, B. (2010a). The carnival of the new screen. In P. Snickars & P. Vonderau (Eds.), *The YouTube reader* (pp. 40–59). Stockholm: National Library of Sweden.
- Stiegler, B. (2010b). Conférence sur la formation à l'attention. Accessed December the 27th 2010. [http://www.youtube.com/watch?v=PGnKlDwnhm0&feature=player\\_embedded](http://www.youtube.com/watch?v=PGnKlDwnhm0&feature=player_embedded). Accessed 29 May 2013.
- Stiegler, B., (2012). Fifth class of seminar 2012, 30 May 2012, part 2. Ecole de philosophie (Epineuil). <http://www.google.be/search?&emsg=NCSR&noj=1&ei=s-tMUKGcKciltAbX6IC4Bg>. Accessed 29 May 2013.
- Stiegler, B., Rogoff, I. (2010). Transindividuation, E—flux, 14. <http://www.e-flux.com/journal/transindividuation/>. Accessed 29 May 2013.
- Stiegler, B., Lardeux, A., & Beth, S. (2011). La part du reste : pour une économie de la contribution. Un entretien avec Bernard Stiegler. *Altérités, 8*(1), 26–41.
- Wood, E., Zivcakova, L., Gentile, P., Archer, K., De Pasquale, D., & Nosko, A. (2012). Examining the impact of off-task multi-tasking with technology on real-time classroom learning. *Computers and Education, 58*(1), 365–374.