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ABSTRACT

This paper explores the theme of education and the posthuman from the perspective of French philosophy. It addresses a crisis in eduction today identified by Michel Serres: now that knowledge is widely and freely accessible through information technologies, what is the purpose of education? A response is developed through three conceptual terms prefixed with 'post': the postmodern, the posthuman, and through the proposed idea of 'postinformation.' The background to the problem is sketched in terms of the 'postmodern,' with reference to Lyotard's influential The Postmodern Condition. A theory of the posthuman, which synthesises Stiegler's 'exorganism' and Floridi's 'inforg', is then sketched in response to Serres' question of who the subject of education is today. The response to the crisis the paper proposes is that the purpose of education today is not to transmit information, but to help shape posthuman subjects able to process it effectively. This means helping them to learn how to navigate the complex informational networks we now inhabit so that they are able to flourish. The concept of postinformation is designed to help facilitate this educational shift in perspective. Postinformation concerns not just informational content, but the constitutive function of information and information technologies.

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Introduction: Three 'post's

In his best-selling book *Thumbelina* (Serres 2015; original French 2012), Michel Serres proposed that there is a crisis in education today, brought about by information technologies. The problem is this: what is the use of education, when knowledge is now widely and freely distributed on the Internet? It is this problem I wish to take up here. While many approaches would of course be possible, I will explore this issue by taking my orientation primarily (though not exclusively) from French philosophy. Moreover, I will structure my inquiry

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through three 'post's: the postmodern, the posthuman, and what I will call 'postinformation.' These three 'post's may be thought of as signposts, markers, or way stations through which I will pass along a surveying, exploratory journey, in the course of which an answer to our initial question will emerge. The *postmodern* frames the issue of education and information technology within a historical perspective, focused around Jean-François Lyotard's highly influential book *The Postmodern Condition*. The *posthuman* focuses attention on the *subject* of education, the one who is educated, and the ontologically changed nature of this subject within the information society. (This topic inscribes this article within the theme of this special issue.) Finally, *postinformation* provides a broad, strategic answer to the challenges raised by reconceptualising what information itself means, such that it can provide an approach to education that responds to the needs of the highly information-rich environment in which the posthuman subject lives. 'Postinformation' is a term suggested by Lyotard, but I give it a more specific and developed meaning here: while information is often thought of as epistemic content, postinformation is a more generalised notion of 'what informs,' or forms, things in general. This notion shifts the idea of education away from the transmission of knowledge, to that of shaping the educated subject as an effective 'information processor,' a posthuman agent capable of flourishing in today's complex informational environments.

Postmodern

In the recent history of French thought, the issue of how education is being transformed by information technologies was notably raised by Jean-François Lyotard in his widely influential book *The Postmodern Condition* (Lyotard 1984). The work was initially titled *The Problems of Knowledge in the Most Developed Industrial Societies*, and was commissioned by the government of Quebec as a report on the contemporary status of knowledge (Lyotard 1979). One of the issues it treats is education, and here Lyotard questions the role of the professor, and of traditional educational institutions, when computers will be able to play the role of information-transmitters. The book had some impact in education theory in the English-speaking world, popularising the question of how information technologies were poised to change pedagogical practice in potentially profound ways (Dhillon and Standish 2000; Peters 1995).[1]

Lyotard's well-known thesis, framing his points about education, is that the postmodern is characterised by 'incredulity toward metanarratives' (Lyotard 1984, xxiv). The modern way of legitimating knowledge (i.e. explaining its usefulness for society) was with reference to encompassing stories about the emancipation of humanity through its development and application. This has broken down: the current form of legitimation is *performativity*, the criterion of the best, most efficient performance of

a system, abstractly determined by an optimal input-output ratio. Lyotard characterises education as *the transmission of knowledge*, and examines the effect of its legitimation by performativity in postmodern societies (47). This model assumes an established body of knowledge to be communicated to the student. The policy of an educational institution will then be formed by giving a coherent set of answers to the following questions: 'Who transmits learning? What is transmitted? To whom? Through what medium? In what form? With what effect?'(48).[2]

In modernity,[3] the goal of education was to transmit a body of knowledge *en bloc* to the youth of the liberal elite, who are shaped by it in such a way that they will then be effective leaders of society in the progress towards emancipation. The kinds of skills taught are determined by a certain model of life, consistent with the ideal of emancipation. Now, in postmodernity, a change in education corresponds to the change in how knowledge is legitimated: from the perspective of performativity, the goal is the effective contribution of the educational system to the optimal performance of the wider social system. This means a change in student, as well as a change in the content of education. Students now come from widely varying social backgrounds, and are of various ages. They are taught a wide variety of skills that contribute to general social performance. This can involve job retraining and 'upskilling' at various stages of life. Education in postmodern societies becomes focused on the *usefulness of skills*, instead of the *truth of ideals*.

According to Lyotard, these changes are already an effect of technology. He traces the origins of the criterion of performativity to the confluence of science, technology, and capital in the Industrial Revolution. More investment in science meant better technology, and better technology meant maximisation of profits. The principle of 'maximisation' came to be modelled on the efficient functioning of machines, and so performativity is in essence a technological criterion for legitimating knowledge (Lyotard 1993).

Furthermore, Lyotard reflects on the specific role of new technologies of information and communication in education. He suggests that

> [i]t is only in the context of the grand narratives of legitimation – the life of the spirit and/or the emancipation of humanity – that the partial replacement of teachers by machines may seem inadequate or even intolerable. (Lyotard 1984, 51)

Data banks will be the new Encyclopedia, and even '"nature" for postmodern man' (51). However, Lyotard clarifies that education cannot be considered *simply* transmission of information, and that pedagogy will continue to have a place. Students must be taught *how to use* computers, which involves both technical skills in computer science, and skills in the pragmatics of interrogation in order to get the most appropriate responses from the computers when learning with them.[4]

Furthermore, Lyotard proposes that knowledge must also involve inventive capacities – which we can call *imagination* – understood as generating new knowledge by making new connections between existing ideas and fields, putting them together in new ways. This resonates, on the level of the educational institution, with the ideal of *interdisciplinarity*, which promotes the generation of new knowledge through the breaking down of traditional disciplinary distinctions. Lyotard writes:

> [T]he transmission of knowledge should not be limited to the transmission of information, but should include training in all of the procedures that can increase one's ability to connect the fields jealously guarded from one another by the traditional organization of knowledge. (52)

In other writings, Lyotard's work bears on the question of the *subject* of education in the postmodern context through the disappearance of the traditional idea of 'experience.'[5] The notion of 'experience' presents the life of an individual as a narrative, structured according to an accumulative process of growth and development. The heterogenous, external influences of experience are internalised and organised by the subject to form a coherent self and life-story, corresponding to the literary ideal of the *Bildungsroman*. Like the modern ideal of education, this notion of experience is based on a model of life and a body of received knowledge which is transmitted from generation to generation, forming individuals. Knowledge is progressive, and the unique experience of each individual expands the knowledge of the collective, but each individual's life broadly follows a linear and predictable path.

For Lyotard – following and extending the thought of Walter Benjamin – 'experience' has itself broken down under the effects of new technologies. Experience depends on a unification, effectuated by a supposed subject of experience, of the dimensions of perception and conception – in Kantian terms, the faculties of sensibility and understanding. In the Kantian synthesis, legitimate knowledge is only given by the matching of sensible intuitions with concepts of understanding. Without such a sensible confirmation, our reason is adrift in speculation, or worse, transcendental illusion. New technologies, however, have extended the capacities of both reason and perception such that they do not necessarily conform to each other, nor to the world of our everyday 'experience.' Science has revealed micrological and macrological worlds which seem to be fundamental aspects of reality, but are far removed from our experience. Scientific reasoning has posited entities difficult for us to imagine in terms of any perceptual correlate (such as molecules, atoms, and subatomic particles, or the multiple dimensions of string theory), and hypersensitive instruments have extended our perceptions to scales we find it difficult to conceptualise (at both extremes of microphysical worlds and the vastness of the cosmos). Through the developments of

technoscience, knowledge has become divorced from experience, and the subject of knowledge is no longer conceivable on the model of the human subject on the hero's journey.

Moving now to a non-French philosopher (but one of the few who willingly embraced the term 'postmodern'), we can find the problems of the breakdown of experience identified by Lyotard neatly stated in somewhat different terms. Gianni Vattimo presents the degrading effects of information technologies on the traditional knowing subject in terms of *wisdom*. In the essay 'The Wisdom of the Superman' (Vattimo 2006) he suggests that the category of wisdom no longer applies the way it used to because old ways of life are no longer reproducible. He describes the old paragon of wisdom, the Sage, as follows:

> The sage is still someone who possesses the art of living in the ancient sense of the word 'art': a kind of knowing halfway between science and technology, founded on general principles and thus scientific to some degree, but always applicable, and in an innovative way, to specific situations in life: a capacity acquired through experience. We automatically think of the sage as an elderly man, whose gaunt wrinkled face, detached gaze, and slow and solemn speech all bear witness to the wealth of experience that has molded him and taught him the true meaning of life. (126)

Due to the advanced state of technological change, each generation is dealing with very different 'experiences' and modes of life, such that one generation will no longer look back to the previous and see them as models for how to navigate the world. Today, each generation – and even each individual of that generation – has to work out for themselves how to navigate their life, the conditions of which have no sure precedent because the technologies which condition it are so unprecedented. This accelerated pace of change seems to lead to a definitive break with an age now past; an age in which it seemed that '[t]he art of living could be learned because, at bottom, the problems and solutions are pretty much always the same' (127). It is not simply that the technologies themselves bring new technical and practical problems regarding how to use them: they change our very conditions of existence. Communication technologies, for example, bring a vast expansion of horizons regarding multiple and heterogenous ways of life from which we might choose, and advancing biotechnologies bring the possibility of modifying ourselves at the genetic level (127–28). While Vattimo does not directly deal with the issue of education in this discussion, his point about wisdom has direct bearing on the issues raised by Lyotard, insofar as education can no longer be simply understood as the transmission of an accepted body of knowledge, with the aim of reproducing an ideal model of life, from one generation to the next.

Returning to the French context, more recently – and beyond the explicit discourse of the postmodern – Michel Serres has again raised the question of

what education might now mean in the context of new information technologies. This is the issue with which we began. Implicitly echoing Lyotard's evocation of Lasswell, Serres asks: 'What to Transmit? To Whom to Transmit It? How to Transmit It?' And to the first question he answers: *'Knowledge'* (Serres 2015, 11). For Lyotard, as we noted, this involves the need for students to be taught how to most effectively access it. In *The Postmodern Condition* Lyotard also raised the political question of *who* will have such access, and the worrying possibilities that databanks might be exclusively controlled by States, or by corporations such as IBM (Lyotard 1984, 6). While questions of ownership and privacy have certainly not disappeared, from the position in which Serres was writing, some thirty years after Lyotard,[6] some of the most important aspects of these questions had now been answered in obvious ways. Today, with the Internet, all of us in developed countries[7] have access (in principle) to almost all knowledge, almost for free. In comparison to its former, relatively narrow transmission through the lineages of the cultural elites, knowledge has now become widely *distributed*. This context then raises Serres' question with which we began, that of what educational institutions might be for, now that access to knowledge is practically free for all.[8] As we noted above, Serres presents this as *a crisis in education*, which is staring us in the face but which we have not yet progressed very far in addressing:

> We all sense that we urgently need a decisive change in teaching, a change that will eventually have repercussions on the entire space of our global society and its obsolete institutions. [. . .] Yet this change is still far off, no doubt because those who lived through the transition from these final states have not yet retired, and they are instituting reforms using models that have long since been surpassed. (Serres 2015, 13)

Serres does not claim to have the answers, but he provides a few further theoretical coordinates with which to frame the question and facilitate its further exploration. First, he contextualises the issue historically, suggesting that we are now in the midst of a third major mutation in the nature and function of education, following 1) the invention of *pedeia* by the Ancient Greeks, which was the beginning of formalised education based on writing, and 2) the wider dissemination of reading and writing following the printing press in the Renaissance. What governs these mutations in education is the *support* of knowledge. Prior to these mutations, the primary support was the human body itself, which had to store knowledge in the brain and transmit it orally. Our supports are of course now the digital networks in which knowledge is widely distributed. Technological supports also function to *externalise* knowledge, freeing it from the support of any particular body, or any particular book.[9]

Moreover, Serres suggests that the transformation in knowledge is a process which is accompanied by transformations in the knowing subject (or, in the context of education, the student) themselves. Our digital technologies are changing *us* along with our externalised information systems. Serres seems to see this as a felicitous matter of adaptation, writing:

> Above all, we cannot say that students lack the cognitive faculties to assimilate this distributed knowledge, since these faculties have been transformed along with, and because of, their support. (12)

While in broad agreement about information technologies transforming human subjects through the externalisation of knowledge on new kinds of supports,[10] Bernard Stiegler (a former student of Lyotard's) was far less sanguine than Serres about our ability to adequately adjust to our new conditions. Most notably in *Taking Care of Youth and the Generations*, Stiegler expressed a deep concern with the way that social media and related technologies are having a deleterious effect on the very *constitution* of the *capacities* of youth, in particular with respect to attention span and the ability to libidinally invest in long-term, meaningful projects. He argues for a reinvigoration of the role of education in society to provide a counterbalance to these detrimental tendencies. I do not wish to enter into detail regarding Serres' and Stiegler's arguments here, but simply to use their contrasting perspectives to indicate a further problem that is at stake in issues of education and information technology. These two French philosophers are in agreement that the new information technologies *constitute* the subject, but not in agreement regarding with what *effect*. What we think about this issue bears on what role we think education should have in the current era.

In sum: Lyotard's relatively brief treatment of education in *The Postmodern Condition*, along with his reflections in several other texts, establishes a problematic around the issues of the legitimation of knowledge, the purpose of education, and the subject to be educated, all in the context of technological change (and information technologies in particular). Education can no longer be thought of as a process involving a privileged access to knowledge, through which a given body of knowledge and mode of life is reproduced. This provides the 'postmodern' background of Serres' question on the role of education in today's technological context, in which access to knowledge is widely distributed. The next two sections will sketch out an answer to this question.

Posthuman

Given these problems and questions of education and information technologies as I have unfolded them above, how can we conceive the *subject* of education? Serres puts the question in an immediate and pressing form at the beginning of *Thumbelina*: 'Before teaching anything to anyone, we should at least know who our students are. Who, today, is enrolling in our schools, colleges and universities?' (Serres 2015, 1). More broadly, the question is one of how technologies are changing the *ontological status* of *the human in general* today. This question, and the approaches explored here, do not follow the old notion (*à la* Descartes) of the subject as an independent substance, persisting essentially unchanged 'beneath' its epistemic and other interactions with the world. Rather, the subject in question here is one constituted through its interactions and formed of its faculties for interaction, such as thinking, knowing, feeling, acting, and so on. What is the particular 'posthuman' notion of the subject which allows us to think these issues in a way that gains purchase on possibilities for addressing the problems we have seen? I want to suggest a double, complementary approach in terms of two theories of the (post)human: the exorganism, or *exorg*, and the *inforg*. (I will here abbreviate the term 'exorganism' to 'exorg' for no more profound reason than, through the felicity of a homonym, to suggest a conceptual harmony (though not identity) with the *inforg*.)

This approach combines a *generally technological* approach with a *specifically informational* one, to allow us to see contemporary human subjects as they are constituted by information technologies. As a grounding for his notion of the inforg, Luciano Floridi outlines an admittedly hesitant account of the informational nature of the self (Floridi 2013, 217–21). This account traces the emergence of the self through three 'membranes': the organic, the cognitive, and that of consciousness. This emergent account is supposed to answer the traditional problem of individuation, i.e. what unities the different aspects of the self? What is notably lacking from this brief account is any role given to technology in the emergence of the self; technologies are then construed as being 'technologies of the self' if they have an *effect* on these membranes (i.e. on embodiment, cognition, or consciousness). The work that adding the theory of the exorg to Floridi's notion of the inforg does here is to highlight the role of technology in the original constitution of the human, and the human self, demonstrating that technologies are there from the start in any notion of the human self. This then gives a much stronger grounding for the contention that the (post)human self is *re-ontologised* by the effects of new technologies. With the theory of the exorg, we see how technologies play a role in individuation, and how the individual is in part a product of the information-technological world in

which they develop. With the exorganism, technology plays an important part of what the organism *is*.[11]

The theory of technologies as *exteriorisations* of the functions of the organs of the human body is fairly well-known. The most prominent source of this theory is André Leroi-Gourhan (1993), but we also find versions in Serres and Alfred J. Lotka. Serres explains what he calls 'exo-Darwinism' – the pursuit of evolution by technological means – as follows:

> It took millions of years for birds to grow wings and feathers; in a few months, we build an aircraft. This gain in time defines technology fairly well. The invention of the first tools caused us to leave evolution so as to enter into culture. [. . .] when making a tool is enough, the body changes little if it uses the tool. This is what I call the exit from evolutionary laws: unloading its body of the obligation to slowly obey them, *Homo sapiens* loads its rapid productions with them. [. . .] Exo-Darwinism is what I call this original movement of organs towards objects that externalize the means of adaptation. (Serres 2019, 39)

Stiegler, while profoundly influenced by Leroi-Gourhan, increasingly drew on the theory of 'exosomatisation' proposed by Lotka, and elaborated by Nicholas Georgescu-Roegen (1971). Lotka introduced the idea of technologies as 'exorganic' means of evolution in his 1945 paper 'The Law of Evolution as a Maximal Principle.' Here he seeks to define the *direction* of evolution, viewing the evolutionary process within a systems-theoretic framework, and from the broad perspective of 'the changing distribution of matter among the various organic species and their inorganic environment' (Lotka 1945, 194). Lotka's proposal is that the direction of evolution may be defined according to the increase of the total energy flux through the system compatible with the system's constraints (the 'maximal principle'). The idea of 'exosomatic evolution' is introduced in order to qualify the special way in which the *human species*, distinct from all others, has unique constraints which are not exclusively defined by genetics (the 'internal' constraints of the bodies of biological individuals). He explains:

> The one outstanding exception [to the constraints of evolution being defined by genetics] is the human species. Here evolution, especially in more recent times, has followed an entirely new path. In place of slow adaptation of anatomical structure and physiological function in successive generations by selective survival, increased adaptation has been achieved by the incomparably more rapid development of 'artificial' aids to our native receptor-effector apparatus, in a process that might be termed *exosomatic* evolution. (188)

The 'receptor-effector' apparatus referred to here explains the way that an individual of a species (which Lotka conceives abstractly as an 'energy transformer') deals with its environment. Receptors receive environmental input and represent it internally, while effectors are structures in the

individual which trigger actions, allowing it to affect its environment. Technologies are then, effectively, presented as *externalisations* of the receptor-effector structures; artificial aids which carry on organic functions outside the body, and which form unique kinds of constraints affecting the evolutionary process.[12]

Drawing on the notion of exosomatic evolution in Lotka and Georgescu-Roegen, Stiegler extends it – synthesizing it with his reading of Gilbert Simondon – in his own conception of the 'exorganism.' There are three types of exorganism that he specifies: *simple exorganisms* are individuals, *complex exorganisms* are larger aggregates of simple exorganisms (such as social institutions and systems), and *planetary exorganisms* are even larger and more pervasive exorganisms in which the former two are embedded and by which they are constituted, for example global technological platforms and structures such as the Internet (Stiegler 2018, 133). In general, the term 'exorganism' refers to an organism as it is constituted by, through, and with the exosomatic artificial aids which are the exteriorisation of certain organic functions. In the current context, in which we are asking the specific question 'Who is the subject of education?', the answer would seem to be the *simple exorganism*, the individual. However, we must keep in mind that the simple exorganism is not an independent 'atomic individual' in the liberal humanist sense; it is always-already constituted through and with complex and planetary exorganisms. We will see in the final section below that this complex constitution of the exorganism has important implications for how we should approach the education of the posthuman subject.

While the theory of the exorganism explains modification by technologies in general, Luciano Floridi's notion of the 'inforg' focuses on the way that our general ontology and philosophical anthropology are being transformed by *information* technologies specifically. The idea of the *inforg*, or *infor*mational *org*anism, is that of a being who essentially exists in, and interacts with, an informational environment. It is a general way of reconceiving organisms and their environments, but it also points to a transformation in human existence which will have reached its maturity when we no longer distinguish between life 'on line' (information-technological environments) and 'off line' (the world of organic sense perception, etc.). Floridi calls this hybrid state *onlife*, and suggests that soon humanity will no longer be able to distinguish, in an ontologically meaningful way, life online and offline. We will understand our fundamental reality (whatever its physical or technological support) as informational in nature, and our interactions with it as information processing.[13] Among other things, this fundamental change will paradoxically both *increase* our capacity to design and manipulate our environment, because of the powerful capacities of computing technologies, and *reduce* human narcissism by decentring the human: although we will retain a special degree of agency and responsibility, we will understand ourselves as one kind

of inforg among other kinds, which include artificial agents which also inhabit the infosphere (webbots, 'artificial intelligences,' etc.).[14] Although Floridi does not embrace the term, we can see this as one profound way in which we might understand the posthuman.

I propose that we can synthesise these perspectives of the exorg and the inforg, of technologies as having *externalising* and *internalising* effects, by understanding the former as the general movement of technologies, and the latter as the specificity due to *information* technologies. While all technologies externalise the functions of the organs, effectuating the artificial evolution of exo-Darwinism, information technologies externalise the functions of the brain or mind, that organ whose specificity is to hollow out or open up an interior 'space' in which the world is experienced. With some degree of paradox, perhaps, *information technologies produce this interiorising effect in the exterior world*, through the mediation of external, technological objects. When Floridi speaks of the inforg, he describes the processes through which we enter semantically meaningful worlds, such as online environments and virtual realities, as if they are external 'portals' through which our minds pass to enter into other 'worlds' which operate informationally; that is, with the semantising (that is, meaning-making) qualities of our 'internal' minds.

The word 'information' is etymologically derived from the Latin *informare*, a term Cicero used in connection with the Greek Epicurean term *prolepsis*, which refers to ideas in the mind, formed from experience. Our information technologies may, then, be understood as external means with which this process of idea-formation – previously the exclusive purview of the 'organic' internalisation process – becomes externalised. Information technologies are *externalised internalisations*. The inforg is, then, the contemporary avatar of the exorg; its current evolutionary state, in exo-Darwinian terms. This confluence of the internalising and externalising tendencies of information technologies, of the *exorg* and the *inforg*, is how I propose here that we understand the term 'posthuman.' The exorg and the inforg are different, but arguably complimentary, concepts, which emphasise different aspects important for an understanding of the human 'reontologised' by the information revolution. This gives us an answer to the question of *who* the contemporary subject of education is: it is *the posthuman inforg-exorg*.

Floridi emphasises the increasing pervasiveness of information technologies in our lives today as a material condition governing the emergence of a new paradigm, in which beings in general are increasingly understood on informational models. He specifies Alan Turing's innovations in computing as ushering in this informational turn (see Floridi 2014, chapter 4).

With a different emphasis but in a complimentary way, for Serres the historical specificity of this 'informational turn' can be dated to the

emergence of Information Theory from thermodynamics, which established a new universal (information) to act as the basis for a new paradigm, just as the latter had for the nineteenth-century with the universal concept of heat.[15] Serres sees a certain ontological 'levelling' as the result of the pervasive and powerful concept of information, which gives us a new way of seeing the world:

> Bacteria, fungus, whale, sequoia – we do not know any life of which we cannot say that it emits information, receives it, stores it and processes it. [. . .] Crystal, and indeed rock, sea, planet, star, galaxy – we know no inert thing of which we cannot say that it emits, receives, stores and processes information. [. . .] Individuals, but also families, farms, villages, cities and nations – we do not know any human, alone or in groups, of whom we cannot say that they emit, receive, store and process information. [. . .] Because information circulates universally within and between the totality of all existing things, we really cannot say that we are as exceptional as we think we are. (Serres 2017, 13)

Information is, then, one important avenue via which the 'posthuman' might be understood, insofar as the latter suggests a decentring of the human, and an expansion of our vision of the world to include multiple agencies.[16] In the final section, to which we now pass, I want to take up this idea of the posthuman in terms of the conceptual and technological transformation according to information, and, from this perspective, consider a possible answer to the problem of education in its technological crisis.

Postinformation

I wish to describe a move from a model of education that is 'informational' to one that is 'postinformational.' It is this move that will provide an answer to Serres' question. The term 'postinformation' is one merely suggested by Lyotard, in passing, at a presentation for a group of computer scientists in the early nineteen-eighties. After critiquing the idea of information as a reductive notion, implying simply the transmission of existing content without a creative component, he suggests that computer technologies should be directed towards a 'postinformational' role:

> the niche, so to speak, that French industries would have to occupy would be that of enlarging and making more complex the treatment of language (post-informational and postcommunicational) – for example, the analysis, the formalization, the committing to memory of persuasive rhetorics, of 'musics,' of inscriptions of movement (kineographic techniques, such as kinetic holography), and so forth. (Lyotard 1993, 18)

As suggested here, Lyotard understands 'information' as a specific treatment of language, one which takes a propositional form and deals with the transmission of facts (In this, he is effectively following Heidegger.[17] Both he and Heidegger base their understanding of information largely on

Wiener's 1950 book *The Human Use of Human Beings*, the classic popularisation of cybernetics.). Lyotard distinguishes an informational, communicational model of language from an 'ontological' one. In the former, language is seen simply as a means of communication for already-constituted concepts and semantic meanings. In the latter, language plays a constitutive role in the formation of concepts and meanings (Lyotard 1986). A 'postinformational' treatment of language, for Lyotard, then refers to the ontological dimension of language, and he is here broaching the issue of how computers and other 'information technologies' might be understood to play a role in the constitution of meaning. The most obviously linguistic aspect Lyotard refers to here is 'rhetoric.' This ontological dimension extends, however, to artistic and other forms not usually associated with language, such as music and kinetics. This suggestion is no more than a very brief one.

I would like to take up this suggestive term here and give it a clearer meaning, more specific to the current context. To do so, I will first define what I have in mind by 'informational' education. As I intend it here, this refers to learning and teaching understood as a communication process, where a given body of knowledge ('information') is transmitted from the teacher (or from a teaching aid of some kind, such as a book or computer) to the learner. This is of course strongly associated with the 'modern' ideal of education according to Lyotard, as we have seen above, but it extends also to a still-influential way of understanding education in a postmodern context (i.e. that of the performativity of the social system rather than of the emancipation of humanity). Education is then understood as the progressive accumulation of knowledge by the student, and the role of teaching is understood in terms of the appropriate transmission of such information. Such a model is implied, of course, in pedagogical approaches based on 'rote learning,' memorisation, the 'incorporation' of an existing cannon, and so on. It is also a model involved in the *cybernetic* approach to education, in which 'information' became a key term. Here, the basic idea of information transmission is retained, but it is complexified by the theorisation of feedback processes as facilitating teaching and learning (ideas which of course remain popular today, having outlived the popularity of cybernetic theory).[18]

Following Lyotard's suggestions, the key point is that with the informational approach to education, the information itself is held to be independent of the teachers and learners. Considered as a mere 'message' transmitting 'facts,' information stands at a distance from the idea of language as a dynamic and creative force, which helps to shape the meaning of the things it refers to, as well as the mind of the student educated in 'letters' and the culture of which they are a part. This informational approach then differs from others which are also very prevalent in the history of education, which understand it as a process of *formation* of the student. Such is, for example, the model of *Bildung* in the German tradition, which is consonant with more

'ontological' approaches to language, such as Wilhelm von Humboldt's.[19] With the latter, an important supporter of the ideal of *Bildung* in education, the ideas that language shapes the meaning of the world and that education cultivates and shapes the learner find a significant consonance and resonance. We have already seen, however, that modes of life associated with *Bildung* have progressively disappeared in the current era, declining with the modern notion of 'experience.' Following Vattimo's formulation noted earlier, education can no longer be understood as the imparting of 'wisdom,' since knowledges and modes of life are transforming too quickly under the influence of information technologies to be considered simply transmissible from generation to generation. We can thus reformulate the problem we are dealing with here – that of the purpose of education today – as follows: can we conceive an *ontological* mode of education which is appropriate to the *posthuman*? The answer I venture here, and will now briefly outline, is that we can do so by reconceiving information technologies in 'postinformational' terms.

The term 'postinformation' does not indicate something *other than* or *after* information, but is rather a different way of conceptualising information itself.[20] 'postinformation' replaces the idea of information as the transmission of a fixed content (the 'communication' model) with the idea of the formation and transformation of forms, of any and all types. 'Postinformation' moves information away from the privileged model of 'propositional' language and 'epistemic content' it has often been given in the philosophical reception of Information Theory. Despite his concerns with the 'reontologising' effects of information, it is Floridi who has provided one of the most influential statements of information in such terms, known as the 'General Definition of Information' (GDI), which defines *semantic information* as *well-formed, meaningful data* (Floridi 2011, 83–4). He contends that this formulation simply clarifies what is usually meant by information (in most computer science textbooks, for example). He usefully also clarifies the philosophical approach to analysing information that he follows:

> Philosophical analyses usually adopt a propositional orientation and an epistemic outlook, endorsing, often implicitly, the prevalence or centrality of factual information [. . .]. They tend to base their analyses on cases such as 'Paris is the capital of France' or 'The Bodleian Library is in Oxford'. (Floridi 2015)

Against this model of information as fixed propositional content, 'postinformation' moves beyond a 'formal' model – which conceives information *as composed* of forms (or 'well-formed,' in Floridi's GDI) – to seeing information in its etymological sense, as that which *in-forms* forms. What informs forms, and transforms forms, is not necessarily itself a form, but can be conceived in various ways as some kind of force, event, or plastic principle.

One way to approach this notion of postinformation (staying close to Lyotard and the postmodern) is through poststructuralism, where postinformation would share something in common with all those principles or quasi-principles which are designed to point to the limits of, and supplement, structural explanation (where 'structure' can be understood here as more or less synonymous with 'form'). Another way would be to draw on the more explicit, alternative formulation of 'information' in philosophers such as Raymond Ruyer, Simondon, and Serres, where the term already serves such a role.[21] Drawing out these sources is beyond the scope of this paper. However, it is relevant to note that there are deep, though not well-known, resources within the French tradition for transforming our understanding of information, towards what I am calling postinformation.

The key point is that postinformation incorporates the *constitutive* role of informational processes, and sees information in terms of the systems in which it operates, the beings which process it, and the effects it has on constituting them. From this perspective, information does not just consist of *messages*, but of *potentials for formation and transformation*. Despite the history of much of the philosophical literature on information technologies missing this dimension,[22] as we have noted, this understanding is arguably quite close to our actual experience of 'information technologies' today. Computers (and other ICTs) are not simply logical, semantic, or epistemic engines; they are multimedia devices which are used to form and transmit images (both still and moving) and sounds, as well as texts, and they are used for all kinds of 'meaning making', including such things as music and video production, social media, and discussion platforms. The plural, multisensory ways in which meaning is constructed in the world has increasingly been adopted and adapted with such technologies – for example, the explosion of 'multimedia' personal computers in the mid-90s, the development of electronic pens for sketching on tablets, the compression of sound files making possible portable mp3 players, and so on. Information technologies are increasingly expanding and altering methods of meaning-making which affect not just the 'messages' we are able to produce, send, and receive, but the 'selves' that are formed by and through these processes.

We are now in a position to answer Serres' question. From a postinformational perspective, we can see education not simply as the transmission of messages (knowledge), but as an important influence in shaping posthuman 'exorg-inforgs,' who must learn to process information. In more conventional terms, we can answer Serres' question by saying that education is not today primarily a matter of teaching information or knowledge content, but of teaching students how to relate to, filter, think about, and use the information they already have abundant access to. This is an answer quite close to a 'common sense' perspective, even though we have traversed

some rather abstract theory to arrive at it. It is of course well-known today that there are significant problems arising from the 'unregulated' information circulating in society, such as misinformation and the phenomenon of 'post-truth.' This is the breakdown of knowledge in digital semantic environments because information circulates without and beyond the constraints of the capacities for critical thought and discernment of many of its users, leading to misinformation, 'conspiracy theories,' and a generalised disaffection with governments and expert opinion. It is well-recognised that education can and should play a role in mitigating this situation.

Postinformational education must include this, but also go further by recogning that it is not just abstract knowledge that is the problem, but the way the technologies which spread it impact on self-formation. Some of the dangers of broad access to information without educational constraints and affordances for self-formation are quite evident: Stiegler (2010) has highlighted, for example, the vulnerability of everyone (but especially the young) to what he calls 'psychopower', the harnessing of attention through digitised marketing techniques, which can more intimately and insidiously form and exploit desires than any previous advertising techniques. As previously noted, this concern for 'self-formation' is not so far from the idea of education as 'formation' (a term still frequently used by the French), or *Bildung* (for the Germans), of which there is a long tradition, even though the question of how students today can be 'formed' may have radically altered.

Following the indications outlined earlier, education as 'formation' can be understood to have altered precisely because there is no longer a fixed 'form' that either knowledge or the subject of knowledge (the student[23]) may be thought to take. Rather, education today might be understood to have the task of *facilitating* students to use information technologies to *form themselves*, in ways which will potentially differ quite radically from student to student. This capacity of ICTs has been recognised by both Floridi and Stiegler (among others), and explicitly related to what Michel Foucault called 'technologies of the self', which enable a constructive 'writing of the self.' As Floridi puts it,

> ICTs are, among other things, egopoietic technologies or technologies of construction of the self. They significantly affect who we are, who we think we are, who we might become, and who we think we might become, once our philosophical anthropology is updated to take into account an informational ontology. [. . .] ICTs are the most powerful technologies to which selves have ever been exposed. They induce radical modifications (a re-ontologization) of the contexts (constraints and affordances) and praxes of self-poiesis (Floridi 2013, 210, 221).[24]

And according to Stiegler:

> Radio, television, computers, and the internet are new forms of 'spiritual instruments,' as Mallarmé said of the book. As such, they pertain to

> *hypomnemata*—techniques of memory and communication—that in Ancient Greece, and then in Roman Antiquity, supported the life of spirit, that is to say, what Michel Foucault calls the 'writing of the self,' the condition of 'the governance of self and other.' [. . .] [I]nformation and communication technologies are precisely spiritual technologies, and this means that they just as much raise again the question of memory techniques, which Foucault analyzed in the sense of techniques of the 'writing of the self' (Stiegler 2014, 6, 13).[25]

The Greek and Roman 'technologies of the self' of which Foucault wrote engaged earlier forms of technology, and related techniques: reading, writing, memorisation, meditation and mental exercises, along with physical habits and practises. All of these could be harnessed to develop a particular type of self through disciplined repetition. As Floridi and Stiegler have recognised, the information technologies we use today have similar 'ego-poietic', or self-creating, potentials.

Education today must foster in students a critical understanding of information technologies, which will help them form themselves as competent inforgs, selves able to process information and operate effectively in complex informational environments. Such a self is not formed once-and-for all, but is an ongoing process throughout life, and part of this formation must include the ongoing capacity for further self-formation, or 'updating.' The complexity of the situation with regard to the formation of the self is well-described by Stiegler's idea of the 'exorganism,' which we synthesised with the inforg above: the simple exorganism, the 'individual,' is in constant circuit with the higher-level and much larger complex and planetary exorganisms. From an informational perspective, these circuits are information flows, and the exorganisms are themselves types of information-processors. The individual exorg, understood today as an inforg, must be able to co-constitute with these informational processes without becoming overwhelmed, learning to function in a way that is decentred, but with effective agency. This then is the import for education, telegraphed earlier, of the complex constitution of the exorganism that I have added to Floridi's theory of the inforg: education must prepare the posthuman subject to navigate these complex information-technological contexts, in what is effectively an ongoing process of self-formation and re-formation throughout life, as technologies update, and as the individual follows their unique path of information access within this changing complex.

Precisely how such a 'postinformational' approach to education might develop specific strategies and address specific problems is beyond the scope of this paper. My aim here has been to outline a broad approach, which proposes a particular interpretation of how we might understand the purpose of education in the posthuman context through reconceptualising 'information' as what I have here called 'postinformation.' As such, this paper has intervened in the problematic through designing, engineering, or creating a concept (on the basis of existing suggestions),[26] in the hope that

this new concept might better facilitate our understanding of education, and respond to its current crisis.

Notes

1. More recently, Derek R. Ford has taken up Lyotard's wider work in relation to education in *Inhuman Educations* (Ford 2021).
2. Lyotard is here following Harold Lasswell's famous model of communication.
3. In *The Postmodern Condition* Lyotard gives some crude historical periodisations which he later sought to complicate. 'Modernity' here is that period roughly between the Enlightenment and the end of the Second World War.
4. It is interesting to note that this issue has recently come to the forefront again, with the importance of understanding how to write effective prompts for generative AI systems such as ChatGPT.
5. The argument that I outline in the following may be found in the Introduction and second essay in Lyotard 2014.
6. To repeat, Lyotard's *Postmodern Condition* appeared in 1979, Serres' *Thumbelina* in 2012.
7. Here it is important to emphsise that the problems of education outlined by Lyotard and Serres, and which we are treating here, are those which pertain to the most 'developed' countries. Globably, in October 2023, it was estimated that 65.7% of the world's population had Internet access. See: https://www.statista.com/statistics/617136/digital-population-worldwide/#:~:text=As%20of%20October%202023%2C%20there,population%2C%20were%20social%20media%20users.
8. Serres, *Thumbelina*. The Internet was effectively launched in 1990. Lyotard did have some familiarity with one of its precursors, the French Minitel system, which was substantially used in the exhibition *Les Immatériaux* which he directed at the Pompidou Centre in 1985.
9. Serres gives no references, but the thesis of externalisation is frequently attributed to André Leroi-Gourhan, a major influence on Bernard Stiegler, to whom we are about to turn.
10. Without, as far as I am aware, either philosopher ever engaging with the work of the other.
11. A complimentary theory of technological individuation, which we unfortunately do not have space to go into here, is provided by Stiegler's revisionary reading of Simondon. This would potentially provide more of a bridge between Floridi's 'emergence' account of the informational self, and Stiegler's later philosophy of the exorganism, about to be discussed. In a manner that is in some ways comparable to Floridi's three-membrane model, Simondon charts individuation through the physical, biological, and psychosocial domains, and Stiegler integrates technical objects (which Simondon treated in a separate work) into psychosocial individuation. See Stiegler 1998.
12. Interestingly, Lotka already presents these exosomatic aids as what Stiegler will call 'pharmacological'; that is, they contribute both to the flourishing and the endangerment of the human species (significantly, he was writing towards the end of World War 2).
13. See Floridi 2013, 8–18; Floridi 2014, chapters 3 and 4.

14. Floridi emphasises these aspects in different places, and does not seem to acknowledge that they potentially pull in different directions. On the increased agency of the inforg to create reality, see Floridi 2011, chapter 1. On the decentring of the human subject and the undermining of human narcissicism brought about by information technologies, see Floridi 2014.
15. See Serres 1977, especially the section 'Troisème génération: le moteur informationnel.' The classic of Information Theory is Shannon and Weaver 1949.
16. This accords with Joris Vlieghe's following definition (for example): 'posthumanism, as I take it, is a view on the interconnectedness between human affairs and the many non-human aspects of reality that support these. [. . .] As humans we can only make sense of the world and ourselves in it against the background of an understanding of reality in which humankind is but one category of beings that posesses a capacity to act' (Vlieghe 2021, 78–9).
17. For his clearest statement on information, see Heidegger and Gregory 1998.
18. In 1967, Raymond Ruyer noted that one of the biggest areas of growth of cybernetics over the last several years had been pedagogy. He cites the *Bulletin de l'association de Pédagogie Cybernétique* (Gauthier-Villars), and a special issue of the journal *Europe*, May-June, 1965 (Ruyer 2023).
19. Again see for example Heidegger and Gregory 1998.
20. Note that I am making a strategic terminological choice here, for sake of clarity. 'Information' (as we are about to see) is a highly contested term, with multiple theories laying claim to its meaning, so what I am terming 'post-information' here might just as well be described as 'information,' provided we are furnished with an appropriately clarifying definition.
21. See Ruyer 2023, Simondon 2020, and Serres 1982.
22. This is relatively clear in the Anglo-American tradition but also implied in the critiques of information by continental philosophers such as Heidegger and Lyotard, who contrast information – understood as a kind of technological treatment of language – with 'ontological' language (Floridi is a complex case, as his theory of semantic information seems narrowly epistemic, but he also invokes ontological information in many contexts, such as the informational nature of selves discussed in this paper).
23. I have focused here on the student as the posthuman subject of education, following Serres in asking who students are today and how they can be educated. Yet the teacher is also, of course, a posthuman subject of education, and many of the points mentioned here – such as the emphases on broad access to knowledge, and on life-long and continual self-formative engagements with information – point to a breakdown, or at least complexification, of the old distinction between teacher and student. Today the student is to a large extent self-taught, and the teacher is a perpetual student.
24. Floridi references Foucault for the phrase 'technologies of the self' in Floridi 2014, 238.
25. See also Stiegler 2010, especially section 35.
26. On the idea of philosophy as conceptual design (and its close relation to creation and engineering) see Floridi 2019. Given the importance of Floridi's work to the preceeding reflections, it is worth noting that he has also refelcted on the crisis in education brought about by information technologies, with a somewhat different (though I think not incompatible) conclusion than I have pursued here. See Floridi 2014, 79–86.

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