The homo poieticus and the bridge between physis and techne

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Abstract. The digital revolution, according to Luciano Floridi, brings up again questions about the relations between physis and techne, as it fuels the ancient tensions between nature to be passively observed and known (physis) and practical science or art that somewhat interferes with it (techne). As a consequence, digital technologies put upfront the fact that the agent, interfering with nature, *creates*—rather than simply happens to be in—situations liable to moral judgment. This 'poietic' dimension of agent's behaviour, according to Floridi, makes traditional ethical approaches unsuitable to the new environments created by the digital revolution. Thus, *if* the tension between physis and techne can be dissolved, this will be done, in Floridi's view, by a contructionist ethics. In this approach, the `homo poieticus' himself creates the e-nvironments and situations he is in, and, consequently, he can have an 'ethical grip' on those situations. Following in Floridi's footsteps, the paper makes the case for the following two points. First, the tension between physis and techne is not especially created by *digital* technology, but is raised by technolog*ies*, in general. Second, the homo poieticus is not only the ethical agent, but also the technoscientist, because she creates crafts and knowledge, and the philosopher, because she creates concepts.

1. Physis and techne in the digital area

Very few would deny that the advent of computers radically changed our lives, let alone science and society. Some—notably Luciano Floridi (2008 and 2009)—even equates the 'digital revolution' to the Copernican, the Darwinian, and the Freudian revolutions. The first, putting the Sun at the centre of the universe, radically changed the position of Man and his own perception with respect to Nature. The second, finding common ancestors to various species, vanished the supposed privileged place of Man in the biological kingdom. The third, discovering the unconscious dimension of the mind, made Man realise that he is not fully rational nor transparent, even to himself.

The core change behind the digital revolution is that we are becoming aware of our status of informational organisms *among many others*—an idea that traces back to Alan Turing. In his pioneering paper 'Computer machinery and intelligence' (1950), Turing asked the controversial—perhaps even irreverent—question of whether machines can think, and discussed the imitation game as a test for intelligence. Reading Turing some sixty years later in hindsight, we more easily realise that in his arguments there was more than simply seeds for a new area of research—artificial intelligence—but for an altogether different way of looking at intelligent beings (we, the humans) in relation with ourselves, with the environment, and with the (digital) artefacts we are the creators of.

This is the immense change the digital revolution carries forward. We humans lose our privileged place in an anthropocentric world and slowly become aware and accept that we are *informational organisms*, or, as Floridi says, *inforgs*. Being *inforgs* means that we are not, after all, so different from other intelligent engineered artefacts—in fact, Turing was not embarrassed at all in asking whether machines, that is *things*, *artefacts*, can think and be intelligent. As a matter of fact, we share with intelligent engineered artefacts something essential: the informational environment or, as Floridi says, the *infosphere*. The infosphere is the global space of information, which includes the cyberspace as well as classical mass media such as libraries and archives. If the infosphere is the whole space of possible information, then nature belongs to the infosphere too. Thus, recognising

that we, as intelligent humans, and intelligent engineered artefacts all alike share this space brings upfront the need to reinterpret our position in reality—that is our position in the infosphere.

The strength of Floridi's arguments about the digital revolution is that we don't have to think of post-modern science fiction environments, where humans are de-humanised and AI technology took over. The digital revolution is a revolution that we started living since the pioneering works in information technologies and that is nowadays blossoming—just think of how many 'digital' actions we perform since we wake up in the morning until we go to bed. The digital revolution, in other words, changed at once our interaction with the external world and our views about who we are. Whilst Floridi argued that such a radical change concerns our role as ethical agents, I will further argue that the radical change concerns as well our role as epistemic agents, in the sense of agents that aim to acquire knowledge about the surrounding world, and as agents that engage in poietic, that is *creative* and *productive*, activities.

More importantly, the digital revolution, according to Floridi, brings up again questions about the relations between *physis* and *techne*, meant, respectively, as nature and reality on the one hand and as practical science and creation of artefacts on the other hand. The digital revolution, in particular, is increasingly changing the *physis*, in the sense of the 'off-line' world. Our off-line world made of real physical objects is becoming itself part of the 'digital' infosphere because the distinction between 'on-line' and 'off-line' is itself becoming more and more blurred until it will disappear. Information technologies are creating altogether new *e*-nvironments that pose new challenges for the understanding of us in the world.

But those arguments, I want to suggest, are not confined to the digital revolution. The question of the tension between physis and techne is raised by technology, in general, and in particular by the emerging technologies, such as bio- or nanotechnologies, and consequently by digital technologies too. The digital revolution is in fact a *technological* revolution and as such encompasses extrovert and introvert changes in our understanding of the world, of ourselves, and of ourselves-in-relation-with-the-world. Whilst Floridi emphasises that the fourth revolution is *digital* and that it therefore affects the position and role of man as *ethical agent*, I want to emphasise that the fourth revolution is a *technological* revolution and that it therefore affects the position and role of man as *epistemic agent* engaging in various poietic activities.

As I shall discuss thoroughly in section 3, the revolution technology brings in is a shift in the tools to acquire knowledge about the world. As soon as we understood that *intervening* on nature grants us epistemic access to nature and opens up new possibilities for the creation of artefacts, (pure) science ceases to be the privileged lieu for knowledge. The new configuration is that of a *techno*-science, where the *poeitic* aspect is no less important than the *noetic* one.

It is along those lines that, I think, we have to read the considerations that Nordmann (2004) makes about technoscience. Technoscience, he says, is characterised by a shift of focus from representing to intervening, *plus* a change in societal expectations and in the way researchers see themselves. The vocabulary chosen by Nordamm is borrowed from Hacking's well-known *Representing and Intervening* (1983). The choice is certainly not chancy and is in fact well calibrated. Hacking gives us ground to cultivate the idea that the importance of *intervening* on nature lies in the fact that it changed the way we, as epistemic agents, relate with nature. Interestingly, Ihde (1991) even reverses the perspective: he talks about science's embodiment in technology and in the experiment, rather than technology and experiment entering the scientific realm.

Carrier (2004) also investigates the tension and the possible reconciliation between physis and techne, albeit in slightly different terms. He argues for a sort of reconciliation between the two approaches, on the grounds that there is no substantial difference between scientific (theoretical) modelling and modelling in the applied sciences. Carrier's argument ultimately aims to undermine

the view of those who claim the alleged inferiority of the applied sciences, on the grounds that modelling is more local in scope. But, the argument goes, more local models do contribute significantly in theoretical research and are not a distinctive feature of applied science.

I would like to further argue that what is special of the emerging technologies is that they are not only making new discoveries, but are altogether creating new environments. Those environments are at once cognitive—in the sense of the space of knowledge—and applied—in the sense of the space of *application* of such knowledge. Nanotechnologies exemplify this situation quite well. On the one hand, nanoscience is discovering that materials have different properties at the nanoscale and at the macroscale. These new properties are opening up possibilities for a new understanding of matters, because the *same* material displays different properties depending on the scale of analysis, as well as for new applications in domains as different as nanomedicine and the food sector. But for this very same reason new ethical challenges arise. The reason, simply put, is the following. There is uncertain and impartial knowledge about the nano-scale *and* at the same time there is strong enthusiasm and élan for new applications, creation of new artefacts etc. The question arises whether there exist *unknown* risks for health and environment. *Unknown*, because the biological activity of nano-materials depends on parameters that are not considered by classical toxicology. This situation leads the various stakeholders (nanoscientists, technologists, policy makers, lay-people, philosophers) to worry about the consequences of licensing the use of nano-artefacts, for instance.

But perhaps the *ethical* worries arising from the emerging technologies ought to be accompanied and even preceded by *epistemological* worries. It is in this sense that, it seems to me, the new environments created by technology put up front again questions about the relation between `physis', to be passively observed, and `techne', as a practical and applied science. The gap, as it is typically understood, concerns the consequences of our actions on nature. Those consequences may concern nature itself, but also the quality of life of us, who are currently living in this world, and of future generations, who will occupy an environment that we have deliberately altered. This concern for future generations is a natural consequence of the intrinsic projectual character of technology (on this point, see for instance Galimbert 1999, ch.2). Needless to say, actions are also the results of the ethical principles guiding individual as well as societal behaviour. However, the *poietic* dimension of agent's behaviour now makes traditional ethical approaches unsuitable exactly because they neglect it and instead just focus on the behaviour of the agent who *happens to be* in the situation she is in. Thus, according to Floridi, *if* the tension between physis and techne can be dissolved, this will be done by a contructionist ethics, rather than e.g. a virtue ethics, where the `homo poieticus' is himself a creator of the e-nvironment. As Floridi (2009) puts it:

"Fortunately, a successful marriage between *physis* and *techne* is achievable. True, much more progress needs to be made. […] We should resist any Greek tendency to treat *techne* as the Cinderella of science; any absolutist inclination to accept no moral balancing between some unavoidable evil and more goodness; and any modern, reactionary, metaphysical temptation to drive a wedge between naturalism and constructionism, by privileging the former as the only authentic dimension of human life. The challenge is to reconcile our roles as informational organisms and agents within nature, and as stewards of nature. The good news is that this is a challenge we can meet. The odd thing is that we are slowly coming to realise that we have such a hybrid nature. The turning point in this process of self-understanding is what I have defined above as the *fourth revolution*."

Elsewhere, Floridi had suggested that the reconciliation between physis and techne might be provided by the notion of *homo poieticus* (see Floridi and Sanders 2003). The homo poieticus is the ethical agent in the era of technology: he is the *creator* of the situations subject to ethical appreciation. Such a *constructionist* framework goes beyond traditional ethics and is suited to the new environments created by technology. The advantage of a constructionist ethics lies in the fact

that, unlike traditional ethics, it does take into account the genesis and the various circumstances that led the agent to be in the situation she is facing. Instead, traditional ethical accounts, whether in the framework of consequentialism or virtue ethics, take the situation as 'given', so to speak. But this, argues Floridi, neglects what is perhaps the most important feature of the ethical agent it the digital era: her *poietic* skills.

In this paper, I also take up the challenge of reconciling physis and techne. The underdeveloped notion of *homo poeiticus*, I will argue, is the bridge between physis and techne. Following in Floridi's footsteps, I want to argue that the homo poieticus is not just the ethical agent. The homo poeiticus is also the technoscientist, as a creator of crafts and of knowledge, and the philosopher, as a creator of concepts. On the one hand, the technoscientist uses technology both as a means to know the world and as a means to create new `objects'. Unlike the Aristotelian scientist that passively observes the world, the Baconian technoscientist is a `constructionist epistemologist' that builds, designs, and models reality to create knowledge. On the other hand, the philosopher, in this perspective, becomes a `conceptual constructionist': facing new epistemological and ethical environments, the philosopher cannot content herself with applying old concepts or perhaps with adjusting them to the new setting. The philosopher has to integrate herself in this `poietically enabling' environment and create new modes of thinking.

The paper is organised as follows. Section 2 presents the figure of the homo poeieticus in Floridi's work on computer ethics. Section 3 extends the notion of the homo poieticus first to the technoscientist, and then to the philosopher. Second 4 closes the paper drawing general conclusions about the relations between ethics and epistemology.

2. The *homo poieticus* in the e-nviroment

As mentioned earlier, Floridi introduces the notion of homo poieticus in the context of what he calls the 'fourth revolution', which is the digital revolution. Notably, Floridi is interested in developing a new ethical approach able to cope with the situations that ethical agents, as inforgs, create in the infosphere.

The reason to look for a new approach is that traditional ethical theories all encounter the same problem. Traditionally, ethical discourse focused on what is right and what is wrong to do in a *given* situation. Floridi stressed the point that hardly any traditional ethical approach considers *how* the ethical agent got into the situation she is in. This is why Floridi groups traditional ethical theories under the label `reactive approaches'. The only aspects that count are the values (in virtue ethics) or the consequences (in consequentialist ethics) of the action taken in a given situation. Nevertheless, the point Floridi wants to make is that behaving morally is not just to be judged *a posteriori* based on values or on consequences. Behaving morally starts much earlier than the moral judgement: it has in fact to do with "constructing the world, improving its nature and shaping its development in the right way" (Floridi and Sanders 2003). Moral behaviour has to do, in Floridi's view, with the *poietic* skills of ethical agents. This poietic dimension is even pushed further (Floridi and Sanders 2003):

"In a global information society, the individual agent (often a *multi-agent system*) is like a demiurge. Her ontic powers can be variously exercised (in terms of control, creation or modelling) over herself (e.g. genetically, physiologically, neurologically and narratively), over human society (e.g. culturally, politically, socially and economically) and over natural or artificial environments (e.g. physically and informationally)."

Thus, what is needed to cope with the poeitic skills of the ethical agent is a 'proactive approach', that is a 'constructionist' approach to ethics. A proactive, rather than reactive, approach emphasises that the agent plans and initiates action responsibly, thus reducing reliance on 'moral luck'.

Moral luck refers to the problem of morally assess an agent for facts, factors, or situations that she has no full control of. In fact, on the face of it, it is an acceptable principle, in any ethical theory, that agents should be morally assessable only for what is under their control (Control Principle). However, everyday life shows that this isn't the case—i.e., that we own full control of the situations we are in. Moreover, everyday life also shows that agents indeed undergo moral assessment in such situations. An apparent *impasse* thus arises because, adhering to a narrow version of the Control Principle, we end up in a situation where we cannot assess anyone for anything (for an introduction and discussion of the problem of moral luck, see Nelkin 2008).

A constructionist ethics can overcome the problem of moral luck because, if moral behaviour is but one of the poietic actions of the agent, then there will certainly be at least *some* factors of which the agent had control of and that led her to be in the situation undergoing moral assessment.

The environment created by the digital revolution is a "poietically-enabling environment, which both enhances and requires the development of a constructionist ethics" (Floridi and Sanders 2003). The moral agent in such an environment is, as Floridi calls it, a *homo poieticus*. The homo poieticus focuses not only on the results of his actions in order to use and exploit them, but also on the processes that lead to those results. Thus, he is truly the 'maker', that is the creator and initiator, of both the situation he happens to be in and of the actions he decides to take. He is not simply a *homo faber*—who uses and exploits natural resources—nor simply a *homo oeconomicus*—who produces, distributes, and consumes wealth. In the infosphere, the homo poieticus himself creates and alters digital constructs. This does not necessarily mean being ourselves the creators of some digital artefact such as a computer program, or of a technological device to get connected to the internet, etc. It may simply mean using any object that takes us into the 'online' dimension. Floridi uses the example of following the instructions of a GPS: in spite of appearance, this simple and now so common action has already an online dimension. But there is more than that. As Floridi says, "as a new social space and digital environment, it has also greatly enhanced the possibility of developing egopoietic, sociopoietic and ecopoietic projects" (Floridi and Sanders 2003), that is, as the words suggest, projects about the individual as a personae, about the social environment she shares with other individuals, and about the larger environment she is in.

In Floridi's view, the 'homo poieticus' is a successful way of describing the ethical agent in the 'cyberspace' (as well as in the world 'out there') because it goes beyond the approach of 'situated action ethics' by appreciating the artefacts and the new technology, as well as the creator of these new artefacts. In other words, a constructionist ethics suits the emerging information technology exactly because it puts up front its main characteristics: the *creation* of a special kind of artefacts—the digital artefacts.

Galimberti (1999) insists that the origins of man's poeitical skills are to be seen in the intrinsic biological and instinctual incompleteness of man, leading him to develop technological tools and methods to overcome this situation. It is thus in this sense that techne is the very essence of man. The thesis of an instinctual incompleteness of man, leading him to develop other skills to survive in the world, has been anticipated by a number of thinkers from Plato to Bergson, passing though Aquinas, Kant and Nietzsche. The Greeks had illustrated it vividly in the myth of Prometheus. Prometheus steals from Ephesto and Diana technical wisdom and fire and gives them to man in order to supply a lack: contrary to other races, man is naked, barefoot, and defenceless. But Prometheus could not give man the practical and political wisdom, as these were with Zeus.

In the next section I want to argue that there is much more about the homo poieticus. Whilst Floridi focused on the homo poieticus as the ethical agent, I want to develop further this notion and suggest that the homo poieticus is also a technoscientist and a philosopher.

3. The *homo poeiticus*: technoscientist and philosopher

The technoscientist

The Greeks were perhaps the first who tried to study the world *scientifically*, that is independently of religious questions. The Greeks were in fact interested in finding the physical principles governing the *cosmos* (Ficham 1993). Many would agree that Aristotle has indeed been a pioneering scientist, especially in the field of biology. Many others would argue, though, that science—at least in its modern acceptation—could not begin until some 'basic principles' of the Aristotelian method had been discarded. In particular, Aristotle and his scholars at the lyceum carried on scientific investigations through empirical observations and collection of facts.

The idea that the natural world is known by passive observation is in sharp contraposition with the modern conception of science and of scientific method. Arguably, more than in discarding the basic principles of the Aristotelian method, the main change in modern science concerned the introduction of new *tools* to acquire knowledge. One such new tool is *experimentation*. For Aristotle, experimentation is not a means to acquire knowledge but just a means to illustrate knowledge already acquired (for a discussion, see Harris 2005, ch. 1). The scientist, according to Aristotle, aims to establish the 'first principles'—science is *episteme*, that is knowledge of the physis through its contemplation (theoria). On the contrary, science is not *techne*, that is a practical or practically oriented science. In other words, science is characterised by *noetic* goals. *Poiesis*, instead, is confined to the arts, to *techne*, and does not allow reaching the upper kingdom of *episteme*.

Let us now make a very long jump forward in time. Since the Scientific Revolution (ca 1550-1700), the natural world is a world that the scientist actively interacts with and manipulates in order to both know and create. The shift is from an 'organic' view of the cosmos, typical of the Greeks and perpetuated in the Middle-Age, to a 'mechanical philosophy' whereby bright and pioneering scholars such as Francis Bacon, René Descartes, Galileo Galilei and Isaac Newton started to develop. The change has been so profound that 'science' does not just connote 'knowledge' and 'understanding', but embodies, rather than opposes, also *practical* skills (Ficham 1993). It is in fact with Bacon that science becomes a *scientia operativa* (Klein 2008 and 2009): to come to know about the world the scientist does not just passively observe it, but she interacts with it. The modern scientist is a *maker*; she performs experiments, namely she actively manipulates factors to find out what causes what (Ducheyne 2005). Experiments, in Bacon's view, are tools to acquire new information, but also tools to test theories according to Galileo (Fichman 1993).

Making experiments is thus a way to make, build, construct truth—this is in opposition to an ancient truth of physis to be simply discovered. The tension between physis and techne is thus lucidly explained by Galimberti, who sees a deep difference between the way the Greeks and the Moderns mathematise Nature. He says (1999, p.313):

"In this respect the difference is abyssal: whilst for the Greek mathematics is the order of nature in its making itself manifest (aletheia) to man, for the scientist in the Modern age mathematics is the order that man assigns to nature, forcing it to respond to the anticipated hypotheses."[1]

In sum, there are two major innovations introduced by scholars of the Scientific Revolution: (i) in order to know we need to make, and (ii) what we know is going to be of some practical use. These are, in short, the strongholds of the concept of *techno*science. As a corollary, the *technoscientist*, as I will discuss next, is a *homo poieticus*, that is an epistemic agent that creates both crafts and knowledge.

[1] "Qui la differenza è abissale: se per il greco la matematica è l'ordine della natura nel suo manifestarsi (aletheia) all'uomo, per lo scienziato dell'epoca moderna è l'ordine che l'uomo assegna alla natura, costringendola a rispondere alle ipotesi su di essa anticipate" (My translation.)

Let us consider the creation of crafts first. The technoscientist produces the `objects of technology', e.g. computers, nuclear weapons, medical devices. In general, those are humanly fabricated artefacts. Traditionally, Lewis Mumford proposed a categorisation of technological objects that included utensils, apparatus, utilities, tools and machines (see for instance Mumford 1934). Later on Mitcham (1994) added to Mumford's categorisation also the following: clothes, structures, and automata or automated machines. This list of technological artefacts includes 'tools of doing' and 'tools of making' alike. Needless to say, there are interesting remarks to make about the distinctions between `tools of doing' and 'tools of making'. Also, one may debate about alternative categorisations of technological tools. Much can indeed be learned from the phenomenology of artefacts investigating, for instance, their personal or societal effects, or the way they may extend human capabilities and, consequently, alter our experience with the external world (Ihde 1979). But I will not enter those debates here. What interests us the most is that technological objects—crafts—are the products of the *poietic activity* of the technoscientist. In other words, the technoscientist is essentially a homo poieticus. Although Floridi's homo poieticus was essentially a creator of e-nvironments, it is legitimate to extend the notion to the technoscientist because he also *creates*.

But there is another aspect of the poietic activity of the technoscientist that is of relevance here: the technoscientist creates *knowledge*. This, we shall see, is somehow the *trait d'union* between the homo poieticus in his role of technoscientist and of philosopher.

Let us then turn the attention to the creation of knowledge. As before, concerning the creation of artefacts, Floridi does not explicitly consider the homo poeiticus to be a creator of knowledge. Yet, some insights about the technoscientist and his poeitic activity in constructing knowledge can be found in Floridi's philosophy of technology. More specifically, those insights spur from the kind of epistemology that is part of his philosophy of information. Floridi is in fact interested in the relations between the natural world and information (Floridi 2010, ch. 2). Such relations will be specified within what he calls *constructionist epistemology*. Let us step back.

Recall, the digital revolution is about our being *inf*orgs in *info*sphere. This means that *information* is key in understanding ourselves, the world, and ourselves-in-relation-with-the-world. It will be worth clarifying what is meant by 'information' in Floridi's philosophy. The first thing worth noting is that information does not merely stand for 'data'. Instead, information, according to Floridi, encapsulates truthfulness, which means that information itself has already a semantic dimension. Of course, that's quite a step, and Floridi (2010, ch. 4-5) offers a number of arguments in support of this strong thesis. Consider now the relation between information and the natural world. The question ultimately concerns the localisation of information: whether there can be information without informee, and whether information can be naturalised in the sense of the semanticisation of data. This is a concern for epistemology, and not a new one. There is a sense in which, in fact, Kant, the German idealists, and the British empiricists were trying to do just that: to understand how we know what we claim we know about ourselves and about the external world (if there is any).

Whether this thesis about the semantic character of information is defendable is certainly an important problem, albeit orthogonal to the issue I am concerned with here. True, in Floridi's account, constructionism is the epistemology *for* information, but arguably what he takes constructionism to be is general enough to be possibly endorsed also by those who do not spouse his account of information. In fact, ultimately, the epistemic goal to be a constructionist is to hold a particular view of knowledge and of knowledge building. In a constructionist approach, knowledge is the designing and modelling of reality; consequently, we, as epistemic agents, aim to design and model the features and behaviours of reality into meaningful patterns as we experience it.

Let me explain further. To hold a constructionist view in epistemology means, in Floridi's account, to put information on the threshold, as special relation/interface between nature and inhabitants. But

this can be generalised further. Constructionism is to be understood in terms of an overall approach to reality. The constructionist epistemology implies an object-oriented treatment of information. Let me phrase this idea in a vocabulary that is perhaps more familiar to the reader. Although there is some objectivity and independence of existence of information (and therefore of the external world), the way we come to know the external reality depends on the agent's modes of modelling and designing it. With the Copernican and Darwinian revolutions, we probably lost our privileged location in the physical and biological realms, but we are still in a position to claim, with Kant, our centrality in the construction of knowledge of those realms.

There is a fairly recent tradition of philosophers and sociologists of science stressing this aspect of construction of knowledge and reality. One of those is Don Ihde (1991). He notices that contemporary science, unlike ancient science, is technologically embodied. In contemporary science, instruments mediate and make possible to acquire knowledge. This is, in essence, the core idea behind *instrumental* realism. Knowledge of the real, in other words, passes through instruments. In the same vein, Ian Hacking (1993) discusses the role of microscopes to see small-size entities. We, as philosophers of science, should indeed worry about the functioning of the microscope because it is the microscope, as an *instrument*, that allows us to find out about the real (micro) world.

Another voice in this 'constructionist choir' is Mario Bunge (1979b). He cogently argues that knowledge, for the technoscientist, is an intermediate goal, a means. The technoscientist mitigates a form of 'epistemological realism'—also shared by the 'pure' scientist—according to which the external world does exist and can indeed be (at least partially) known, with an instrumentalist or pragmatist attitude. Such an instrumental attitude is quite normal, given the objective of obtaining 'practical' results. Thus, the technoscientist and the 'pure' scientist may well be interested in the same scientific object or phenomenon, but whilst the object of study will be a *Ding an sich*—a thing in itself—for the pure scientist, it will be a *Ding für uns*—a thing for us—for the technoscientist.

The idea that for the technoscientist the object of study is a *Ding für uns* can be found already in Heidegger's discussion of technology (Heidegger 1954). Heidegger extends his idea of 'being-in-the-world', already developed in *Being and Time*, to technology in terms of 'being-in-the-world-*to-make*', thus emphasising the poietic aspects of human activity. What is more, Heidegger establishes a link between techne and episteme. Heidegger thinks that both 'reveal' or 'disclose' some truth, the difference lying in *what* and *how* they reveal. The revealing of episteme lies in the sense of a theoretical truth, that is the truth of physis *simply* to be discovered (aletheia), whilst the revealing proper to techne has to do with poiesis, that is with a bringing-forth, viz. revealing through instrumentality (on this point, see also Galimberti's discussion (Galimberti 1999, ch 34)). However, Hedegger is against a reduction of techne to mere poeisis of artefacts. In fact, the essence of the technological is in 'enframing', in disclosing meaning through its 'instrumental' sense.

Interestingly, then, *techne* is not anymore in sharp opposition with *physis*. A difference between the two remains and it amounts to the different role the technoscientist, on the one hand, and the pure scientists, on the other hand, give to *episteme*, that is to knowledge. Whilst the latter conceives of knowledge as understanding of the principles regimenting reality *independently* of the use of such knowledge, the former is not only concerned with what can be practically taken out from this knowledge—the artefacts—but also conceives of knowledge as intervention on nature.

The philosopher

What characterises the homo poieticus is his making, producing, not only (digital) artefacts but also knowledge through technoscience. I want to further argue that 'making' involves also different and, perhaps, higher spheres of the processes of 'making': producing and using thought and ideas.

Again, the seeds are in Floridi's work and hopefully the discussion that will follow will give them manure to grow. Floridi (2010, ch. 1) embraces a particular view of philosophy, namely as *conceptual*

engineering: "Philosophy is the art of identifying conceptual problems and of designing, proposing and evaluating explanatory solutions."

In this perspective, philosophical investigation is neither fully logico-mathematical nor fully empirical. This view clearly goes against early stances à la Carnap (1935) and Reichenbach (1951), but also against very recent formal trends in philosophy—see for instance the work of groups in Tilburg, Leuven, or Konstanz, just to mention some scattered over Europe.

Reichenbach (1951, p. 123), for instance, had expressed his viewpoint about the need for logical analysis of scientific problems thus:

"It was not until our generation that a new class of philosophers arose, who were trained in the techniques of the sciences, including mathematics, and who concentrated on philosophical analysis. These men saw that a new distribution of work was indispensable, that scientific research does not leave a man time enough to do the work of logical analysis, and that conversely logical analysis demands a concentration which does not leave time for scientific work—a concentration which because of its aiming at a clarification rather than discovery may even impede scientific productivity. The professional philosopher of science is the product of this development."

Although it is sharable that *rigour* is needed both in scientific and in philosophical investigations, another matter is to push this position too much towards a complete reduction of philosophical investigation into logico-mathematical procedures. This seems to be the direction taken by (some) leading scholars in the formal trends in philosophy (e.g., formal epistemology). Witness, for instance, Hannes Leitgeb interviewed for *The Reasoner* (4(4), www.thereasoner.org):

"I just realized I had never considered before whether there was any common thread that runs through the whole of my work. If there is one, then it is on the more methodological side really: I like to apply mathematical methods in order to solve philosophical problems. I call this 'mathematical philosophy'. Very occasionally one has some cool mathematical theorem, and one then looks for the right sort of problem to which it could be applied. But in the great majority of cases one simply comes across a philosophical theory or argument or thesis or maybe even just a clever example, and some mathematical structure presents itself—well, 'presents itself' after a lot of work!"

This, needless to say, reminds us of the Leibnizian *Calculemus*. But perhaps there is more than just creating theorems in the activity of the philosopher: the poiesis of *thought*, that is of concepts and of ideas. This is the view of philosophy that Floridi advocates, and that can generally be labelled as *conceptual contructionism*. This position has eminent precursors in the recent history of philosophy. It is arguably in this sense that Bertrand Russell's comments on the use and value of philosophy are to be interpreted. He says (Russell, 1912, ch. 15):

"Philosophy is to be studied, not for the sake of any definite answers to its questions since no definite answers can, as a rule, be known to be true, but rather for the sake of the questions themselves; because these questions enlarge our conception of what is possible, enrich our intellectual imagination and diminish the dogmatic assurance which closes the mind against speculation; but above all because, through the greatness of the universe which philosophy contemplates, the mind also is rendered great, and becomes capable of that union with the universe which constitutes its highest good." (Quote from the online version of the book http://www.ditext.com/russell/rus15.html, accessed 4th May 2010.)

Nevertheless, Russell doesn't tell us yet what the philosopher does exactly. Gilles Deleuze and Felix Guattari (1994) are instead much more specific about that. The philosopher, they argue, *creates concepts*. Philosophy is not just contemplation, reflection, or communication. Those are activities that any discipline or science can do without claiming to do *philosophy*. Here is the lengthy passage from *What is philosophy?* (Deleuze and Guattari, 1994, p. 5-6):

"More rigorously, philosophy is the discipline that involves *creating* concepts. […] We can at least see what philosophy is not: it is not contemplation, reflection, or communication. This is the case even though it may sometimes believe it is one or the other of these, as a result of the capacity of every discipline to produce its own illusions and to hide behind its own peculiar smokescreen. It is not contemplation, for contemplations are things themselves as seen in the creation of their specific concepts. It is not reflection, because no one needs philosophy to reflect on anything. It is thought that philosophy is being given a great deal by being turned into the art of reflection, but actually it loses everything. Mathematicians, as mathematicians, have never waited for philosophers before reflecting on mathematics, nor artists before reflecting on painting or music. So long as their reflection belongs to their respective creation, it is a bad joke to say that this makes them philosophers. Nor does philosophy find any final refuge in communication, which only works under the sway of opinions in order to create 'consensus' and not concepts."

What the philosopher does is to find new concepts that explain and account for the phenomena around us. Given the ever-changing character of reality, we cannot believe that philosophy finds eternal and ever-lasting concepts. As the world changes, so do the concepts we philosophers create to make sense of it. Paradigmatic examples of concepts created by philosophers in the past are, in the eyes of Deleuze and Guattari, the *I* of Descartes, that is the concept of self, or the concept of One and the concept of Idea in Plato's philosophy. Deleuze and Guattari employ the term 'contructivism' exactly to denote this philosophical activity of making up concepts.

Consider now present-day philosophy. Philosophy of information invented concept of *infosphere* and *inforgs*. Philosophy of technology invented concept of *techo-science*. The corresponding sciences could not invent those concepts. The reason is that such concepts are the answers to *philosophical* questions about the surrounding phenomena, not of scientific problems. At best, scientific disciplines can give new names to scientific objects or phenomena, but those aren't philosophically loaded *per se*, or *per* the reflection of the scientist. To give another example, scientists—notably von Bertalanffy (1968)—introduced the concept of 'system' and made a start in what is now called system analysis or systemics, but *philosophers*—e.g. Bunge (1979a and 2000)—created the concept of 'system' to explain a new approach to reality and knowledge.

This 'constructivism'—or 'conceptual constructionism' as Floridi rather calls it—can also be thought of, as mentioned above, as *conceptual engineering*. Consider again the new environments created by technology, in general, and by emergent technologies, in particular. The 'engineering' character of technologies goes beyond the creation of tools and artefacts—it calls for a *conceptual engineering* because the concepts philosophy created in the past are not fit anymore to explain all the novelties we are confronted with. Alfred Nordmann (2004) puts this idea in this straightforward way:

"The ontological indifference of the technosciences needs to be complemented by a philosophical concern for the constructions of reality."

The new environments are not just the creation of the digital world, or the discovery of a world at the nano-scale that significantly differ from the world we live in. It is also rethinking the relation between science and society, that is between the scientific community and various stake holders. For instance, Ibo van de Poel (2009) interprets nanotechnology as a 'societal experiment': nanotechnology is not to be done just in the labs in isolation from the world. Instead, the lab is the whole scientific and societal environment, which includes, for instance, public debates between lay-people and regulators. Hence, here is another example of conceptual engineering: the 'old' concept of experiment cannot account for the new environments created by nanotechnologies. A new concept—'societal experiment'—had to be created to cope with these novelties.

This is in line with the philosophical challenge Carl Mitcham posed to various historical reconstructions of technology. Whether the development of technology is told in internalist (that is

from the point of view engineers themselves) or externalist (that is from the point of view of humanists interested in the influence of technology on society) terms, what is of utmost importance is what ideas or concepts characterise the 'new' human making.

It will be worth noting, before closing this section, that the layman is a homo poieticus too. Although we can certainly identify the tasks and features of the homo poieticus in his clothes of the specialised ethical agent, or technoscientists or professional philosopher, we shouldn't jump to the false conclusion that poiesis is a feature that just belongs to 'academic' agents, so to speak. The layman is a homo poieticus too, in the way he interacts with world around him and with his peers, in the way he reasons about ordinary decisions and everyday issues. In other words, there is indeed continuity in our activities as homines poietici since we wake in the morning as laymen until we enter our labs of techno-science or of philosophy.

4. Ethics meets epistemology

So far, I presented the homo poeitucus in the clothes of the ethical agent and I argued that he also wears the clothes of the technoscientist (who creates artefacts and knowledge) and of the philosopher (who creates concepts). In this final section I would like to draw some conclusions about what I think is *really* at stake, philosophically speaking, in this reconciliation between physis and techne, through the figure of the homo poeiticus.

Let me start with an insightful quote Carl Mitcham. He says that, even in making history of ideas about technology, this should be "the study of how different periods and individuals have conceived of and evaluated the human making activity, and how ideas have interacted with technologies of various sorts" (Mitcham 1994, p.116).

Now, the homo poeiticus allows us to do just that. As a 'maker', the homo poieticus embodies the many aspects of the human making activity: the creation of situations liable to be morally assessed, the creation of crafts and knowledge, and the creation of (philosophical) concepts.

Seen from the eyes of the homo poieticus, technology can be conceived of, with no further tension or contradiction, both as 'knowledge'—that is, as a means to acquire knowledge about technological artefacts as well as natural objects—and as creation of artefacts in the strict sense of the Greek τεχνη or of the Latin *ars*. But in a constructionist perspective, technology can also be conceived of as an activity. Mitcham (1994) lists the following as possible technological activities: crafting, inventing, designing, manufacturing, working, operating, maintaining. Here, the activity may concern the 'action of making' or the 'process of using'.

Once we refer to the *purpose* or *end* to which the technical artefact is used for, this action is ipso facto subject to ethical evaluation. The challenge of ethical theory in response to the rise of technology is not only to enlarge its scope in order to cope with new situations—think of issues raised with regards to the environment (e.g., nuclear weapons) or to the individual (e.g., cloning, transplants), or to the consequences of information society (e.g., individual privacy, corporate security). The challenge is also, as Floridi rightly noticed, to change the ethical theory in order to cope with the roles—technoscientist, ethical agent or philosopher—man has in the era of technology. There is one word that summarises those roles—this is *poiesis*.

The original tension between physis and techne lied in forces apparently pulling in opposite directions: passive observation of the world *versus* active manipulation of it. But technology is to be seen as an opportunity for the agent to better know and act upon the world around, not as the guilty responsible of such tension. Technology asks new questions with respect to 'classical' epistemology. Interestingly enough, many of the questions and worries technology raises (and, particularly, emerging technologies such as bio- or nanotechnology), crucially depend on *what* we know about these emergent spaces of possibilities. Until we don't make clear *how* we can know about the new

environments created by technology, any ethical appreciations, especially if anchored to traditional ethical accounts, will be partial and inappropriate.

In other words, if a constructionist ethics is needed (according to Floridi) for the poietic environments created by the digital revolution, a constructionist epistemology is in turn needed for a constructionist ethics (according to arguments hereby given). The reason is that, to say it with Floridi, "the chances of constructing an ethically good x increase the better one knows what an ethically good x is, and vice versa. Constructionism depends on a (satisfactory epistemic access to, or understanding of, the) relevant ontology" (Floridi and Sanders 2003).

Floridi is not an isolated voice in promoting this summit between epistemology and ethics. For instance, Ferrari (2010) urges a contextualisation of the ethical discourse within the ontological, epistemological, socio-economic, and political reflections. Ferrari's arguments are tested against the specific case of nanotechnology; she is particularly interested in discussing the limits of ethical approaches, such as consequentialists or deontological approaches, that frame all issues in terms of cost-benefit analyses. The consequentialist, for instance, cannot make reliable predictions (due to the high uncertainties at the nanoscale) and therefore can't perform reliable risk – benefit analyses. To this pars destruens, Ferrari (2010) joins a construens pars:

"A rigorous unpicking of the ways in which trust informs the work of scientists, affects their social embeddedness, and plays a role in the social construction of technology is still lacking."

Her overall conclusion is thus that epistemological issues do have a bearing on ethical issues. The main epistemological issue she identifies is, for the case of nanotechnology, the following:

"The absence of a commonly accepted definition of nanotechnologies has precise epistemological implications, because it influences the setting and legitimisation of scientific research areas and therefore the scope of the research."

But this situation is not confined to nanotechnologies. Her argument, in fact, generalises to technolog*ies* in that "the setting of goals clearly has ethical implications, because goals and aims are shaped by society and because goals are matters of research policy—in particular through priority-setting."

Floridi, recall, urged to work towards a successful reconciliation between physis and techne. The stumbling block seems to be, though, the non-neutral character of techenology. Galimberti (1999) cogently argues that the non neutrality also stems from the fact that techne is already the environment we are *in*, not simply the object of our choice. To be sure, the tension between physis and techne arose because the Moderns, by manipulating Nature, overstep its insuperable limits. In the Greek world man cannot dominate the order of Nature but just 'revealing' it. It is for this reason that revealing the truth (a-letheia) of Nature (physis), that is contemplating Nature (theoria), leads to the kind of knowledge that regiment human action and production (praxis and poiesis). This was the origin of the supremacy of theory over praxis in the Greek world. As Galimberti accurately tells again: for the Greeks there cannot be correct technological or political action without knowledge of the immutable laws of Nature.

But the situation has changed. On the one hand, techne, that is poieis, also contributes to acquire knowledge of the physis. On the other hand, science and technoscience do not discover immutable and eternal truths. Yet, with due amendment, we should follow the advice of the Greeks: sound knowledge of the world positively contributes to make better decisions and to take better actions both in technological and political contexts.

In sum, a successful marriage between physis and techne, to echo Floridi, is not only achievable, but also utterly desirable. The reason is not only a 'restyling' of the ethical agent with the clothes of the

homo poieticus, but also the need of an improved awareness of the technoscientist with respect to her poietic skills. Those two should not travel on parallel tracks that never cross. Instead, they should aim to cross paths to improve our experiences of moral agents and of technoscientists. One may then wonder how to make those tracks cross one another. It seems to me that it is the task of the 'conceptual engineer', i.e. of the *philosopher*, to engage with such a poietic activity.

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