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Is There a French Philosophy of Technology? General Introduction

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Abstract

The existence of a French philosophy of technology is a matter of debate. Technology has long remained invisible in French philosophy, due to cultural circumstances and linguistic specificities. Even though a number of French philosophers have developed views and concepts about technology during the twentieth century, “philosophy of technology” has never been established as a legitimate branch of philosophy in the French academic landscape so far. This book, however, demonstrates that a community of philosophers dealing with various issues related to technology and built up on the legacy of the previous generations has emerged. In gathering scholars with quite diverse theoretical backgrounds and matters of concern, this volume outlines a coherent, albeit heterogeneous, philosophical trend. Five chief characteristics are identified in this introduction: i) a close connection between history and philosophy, with a focus on the *temporalities* of technology, ii) the prevalence of the *anthropological* approach to technology whether it be social anthropology or paleoanthropology, iii) a focus on technological objects that we characterize as a “thing turn” *à la française*, iv) the dignification of *technoscience* as a philosophical category, and v) a pervading concern with ethical issues based on the anthropological interpretation of technology and quite distinct from current trends in applied ethics.

Keywords: artifacts, ethics of technology, history of technology, paleoanthropology, philosophy of technology, social anthropology, technology, technological objects, technoscience, thing turn

“Is there, actually, a French philosophy of technology?” The question was phrased in these terms a few years ago by French philosopher Daniel Parrochia, in a paper devoted to examine the setting up and the development of a philosophy of technology in the French-speaking area (including Belgium in particular), from Descartes to nowadays. (Parrochia 2009) In this ambitious paper published in 2009, Parrochia featured and mentioned none of the contributors to the present volume apart from Jean-Yves Goffi and Gérard Chazal. Would it mean that in less than a decade, a new generation of French philosophers of technology has come into existence? And if so, what would be the distinctive features of this emerging community with regard to the previous generations mentioned in Parrochia’s survey?

1 We Have Never Been Philosophers of Technology

At first glance, and despite Parrochia's focus on seminal French contributions to the philosophy of technology that still prove relevant for current research worldwide, the existence of a specifically French tradition is still questionable. As a matter of fact, the philosophy of technology has no institutional existence in the French academic area. Unlike other countries (Germany, the Netherlands, the United States in particular) where the philosophy of technology is established in university chairs, institutes, departments, academic journals, and learned societies, in France there is no academic infrastructure. Until recently, there were no university chairs labelled 'philosophy of technology', and no journals devoted to this topic. Admittedly, a French Society for the Philosophy of Technology (Société pour la Philosophie de la Technique) was created at the initiative of Gilbert Hottois and Daniel Cérézuelle in the early 1990s, on the model of the (North-American and North-European) Society for Philosophy and Technology, but for the last 10 years the Society has been more or less dormant.

Yet the situation seems to be changing: two chairs have been recently created, in Compiègne and Lyons universities, a book series "*L'évolution des machines*" of philosophical studies of technology has been launched by Hermann publishing house, and the French Society for the philosophy of technology is restarting its activities.¹ Interestingly, one might also mention the topic set for the French *Agrégation de philosophie* in 2018: *Travail – Techniques – Production* (work, technologies, production). Despite these encouraging signs however, and despite the long history of philosophical concerns with technology since the seventeenth century in France, there is strictly speaking no such thing as a French tradition of the philosophy of technology.

It does not mean that there were no philosophical considerations about technology in France. A number of individual philosophers dedicated part of their scholarship to technology but they did not attract disciples. Gilbert Simondon and Jacques Ellul, for instance, remain relatively isolated in their lifetimes. For decades, Simondon's works were more familiar to architects, ergonomics engineers, designers and promoters of technological education than to philosophers. And ironically Ellul was more famous in the United States than in France.

While no research school emerged throughout the twentieth century, a number of collectives of thought (something like Fleck's *Denk Kollektives*) are clearly identifiable:

- Within the Personalist movement founded by Emmanuel Mounier around the journal *Esprit*, Ellul and Bernard Charbonneau developed significant views about technology in an attempt to define a third way between Marxism and Liberalism along Christian lines (see Cérézuelle in this volume).
- Invited in the early 1950es at the Sorbonne Institute for the history of science by Pierre Ducassé (maybe the first french philosopher of technology), the "Cercle d'études cybernétiques" was a point of convergence for theorists interested in creating a science of machines (Lafitte, Couffignal, Russo), with a direct influence on Simondon and Canguilhem (see Le Roux in this volume).
- The Institute for Industrial Aesthetics (l'*Institut d'Esthétique Industrielle*) pioneered a vision of design theories and practices different from those that later prevailed in the USA, under the leadership of Jacques Viénot and with contributions by Etienne Souriau, Georges Friedmann and Simondon (see Beaubois and Petit in this volume).
- The University of Lyon, where François Dagognet initiated a sort of "materiological" tradition (Dagognet 1985), on the basis of Bachelard's and Canguilhem's epistemologies (see Chazal in this volume).

¹ Société Francophone de Philosophie de la Technique (SFPT).

- The laboratory COSTECH (Connaissance, Organisation et Systèmes Techniques) founded by Bernard Stiegler in 1993 at the University of technology of Compiègne, which prompted a distinctively ‘technologically constitutive’ approach to the philosophy of cognition (Steiner 2010).

Occasionally French scholars talk about the “Lyon school” or the “Compiègne School.” Such labels are, however, highly questionable. The Compiègne School is known as such mainly in Compiègne University of Technology and by extension in the small area of Humanities researchers working in the two other French Universities of Technology. As for the Lyon School, Jean-Claude Beaune, Parrochia and Chazal significantly pursued Dagognet’s work in Lyon.² All of them share common references to the French historical epistemology, but their concepts and matters of interest remain quite different. Each of them has developed his own specific approach, so that this community is not strictly speaking a ‘research school’. It is worth noting that recently, the university of Lyons welcomed new scholars with great interest in the philosophy of technology (namely Thierry Hoquet and Sacha Loeve, both contributors to this volume), but their theoretical orientations could hardly be viewed as the continuation of Dagognet’s works.

To be sure, many contributors to the present volume explicitly shape their views with reference to the authors mentioned above (Cérézuelle Dupuy and Le Roux are deeply interested in the French cybernetic movement, Beaubois and Petit focus on the industrial aesthetics community, Bontems, Guchet and Loeve often quote Simondon in their respective works on nanotechnology, synthetic biology, and big scientific instrumentation such as the Large Hadron Collider or high-throughput genome sequencing). However, none of them would dare introduce himself as a heir or a disciple of these prestigious predecessors. In this respect, there is a striking contrast with the development of philosophy of technology in the USA or the Netherlands. While (Don Ihde 1995, 2008, 2009; Selinger 2006) and Peter-Paul Verbeek (2006, 2008a) federate a strong community under the label “postphenomenology,” and scholars at Delft University promote the label “The Dual Nature of Technical Artefacts,” (Kroes and Meijers 2006) no identifiable philosophical label could serve as an umbrella term to characterize the French community.

Last but not least, the leading figures in the French tradition never claimed to write about the “philosophy of technology.” Henri Bergson, for instance, was continuously concerned with technology throughout his works. Yet since he considered technology as coextensive to life, and closely connected to science, ethics and politics, he did not identify technology as a specific domain of philosophy. Similarly Canguilhem developed views about technology and life in a Bergsonian mode in his recently published earlier works (Canguilhem 2011; Braunstein 2000). Nevertheless he is viewed as a philosopher of biology rather than as a philosopher of technology. Simondon – whose complementary thesis on “technical objects” (1958) was supervised by Canguilhem – conducted his academic career in departments of psychology. After graduating as an engineer from École Polytechnique, Jean-Pierre Dupuy turned to the epistemology of complex modelling in cognitive, economic and social sciences, not to “philosophy of technology.” Nowadays Bernard Stiegler is first and foremost viewed as a political philosopher. For all of them, technology is obviously a major topic of philosophical investigations, and its study leaves no field of philosophy unscathed – a view shared by most of the contributors to this book. But this did not lead to delineate a specific field of philosophy.

² In the 1980s, Beaune created and directed an important collection of philosophy of technology, still active today, “*Milieux*,” in the publishing house Champ Vallon.

In brief: the philosophy of technology has never been established as an academic sub-discipline in France due to the overarching presence of technology in philosophical reflections rather than to a lack of concern.

2 Technique and Technology

This paradoxical situation is rooted in historical and linguistic specificities of French culture. The phrase “philosophy of technology” is a German invention, not a French one. Not only German scholars have made extensive use of “*Philosophie der Technik*” and “*Technikphilosophie*” ever since Ernst Kapp’s *Grundlinien einer Philosophie der Technik* (1877),³ but the current generic term of “technology” denoting a specific category of human activities is itself a German invention. As historians of the phrase “technology” have argued, its current meaning derives from a translation and adaptation of the German term “*die Technik*” rather than from the eighteenth-and-nineteenth-centuries notion of “technology.” (Schatzberg 2006, Marx 2010)

While *die Technik* referred to industrial arts and their material means of production, *die Technologie* (*la technologie* in French)⁴ was concerned with the *study* of these activities. It literally meant the *logos* of *technè*, the “discourse on arts.” This tradition of “techno-logy”⁵ initiated in the European Encyclopedist movement (Ames 1629; Alsted 1630; Wolff 1735) and institutionalized in the German universities during the cameralist period (Beckmann 1777, 1806) is instantiated in the innumerable volumes of dictionaries and encyclopedias published in Germany and in France between 1700 and 1900. (Krünitz 1773–1858; Lenormand 1819, 1822–1835; Leca-Tsiomis 1999; Stalnaker 2010) By the end of the nineteenth century, this use of the term *Technologie* declined. Technology was despised as useless literature and sacrificed on the altar of progress. (Mertens 2010, 2011) It was supplanted by a variety of fashionable notions such as “applied sciences,” the political economy of machinery, championed by Andrew Ure’s and Charles Babbage’s in England, by the scientific organization of work prompted by Frederick Taylor in the US, and last but not least, by *die Technik* in Germany.

Die Technik was the object of engineering. It became a keyword of German engineering culture in a context of promotion of engineers as a distinctive social class,

³ See for instance Franz Reuleaux, *Kultur und Technik* (1884), Eberhard Zschimmer, *Philosophie der Technik: vom Sinn der Technik und Kritik des Unsinnns über die Technik* (1914), *Technik und Idealismus* (1920), *Deutsche Philosophen der Technik* (1937); Friedrich Dessauer, *Philosophie der Technik. Das Problem der Realisierung* (1927); Otwald Spengler, *Der Mensch und die Technik* (1931/1932); Manfred Schröter, *Philosophie der Technik* (1934), *Deutscher Geist in der Technik* (1935), and Eugen Diesel, *Das Phänomen der Technik* (1939).

⁴⁴ A similar use of “technology” is also attested in English until the late nineteenth century. Thomas Blount’s *Glossographia* defines technology as “a description of crafts, arts and workmanship” (Blount 1670), The New World of Words as “a description of arts, especially the mechanical.” (Phillips 1706) See also Jacob Bigelow’s *Elements of Technology* (1829), where “Technology” refers to his book and “the useful arts” to its subject matter. The term had also a similar meaning when the Massachusetts Institute of Technology was founded in 1861.

⁵ For the sake of readability, we here use the term “technology” in the loose meaning it has acquired in today English language. However, the distinction between “*technique*” and “*technologie*” continues to make sense in France for a number of scholars as exemplified in a number of chapters in this volume. In some cases, “technology” denotes a higher degree of systematicity than technique, and will translate for instance Ellul’s use of “*la technique*” or “*le système technique*,” while “technics” or “techniques” stand for the plural “*les techniques*.” When it means “the study of technologies,” as in Leroi-Gourhan’s or Simondon’s uses, some contributors have chosen to render the French “*technologie*” by “techno-logy” and some by “Technology,” with the capital “T” denoting the discipline rather than its subject matter.

and a matter of lively debates stirring the *Verein Deutscher Ingenieure* (VDI, the Association of German Engineers, founded in 1856). These discussions at the VDI gathered together engineers with philosophers such as Eberhard Zschimmer or Friedrich Dessauer and revolved around the spiritual meaning of *die Technik* and its relation with *Kultur* (Hård 1998). The relation between *die Technik* and modern capitalism was also a recurrent topic in the early twentieth century German school of economic sociology (Schmoller, Simmel, Sombart, Weber).

In this period, there was no equivalent term available in French to discuss the spiritual meaning of the industrial arts as a whole. Significantly, while Bergson's *Creative evolution* (1907) is full of terms such like "artificial," "constructions," "industry," "instruments," "inventions," "fabrication," "functional," "machine," "manipulation," "manufacture," "mechanisms," or "tools," it contains not a single occurrence of "*la technique*," whereas one finds two occurrences of "*la technique*" in *The Two Sources of Morality and Religion* (1932).

The substantive denomination "*la technique*" has not been used in French language until the interwar period. "Technique" was used either as adjective qualifier, as in "*les termes techniques*" ("technical terms"), or as a term calling for a complement of the noun, as in "*la technique de la peinture*" ("the technique of painting") or "*la technique de la maçonnerie*" ("the technique of masonry"). In the latter cases "technique" is oblivious of its Greek roots *technè* that prevailed in "*technologie*" and closer to the Late Latin *techna* (trick, deceit), with a pejorative connotation of pedantry and sophistication. Thus, whilst Germans philosophers and engineers considered *die Technik*, in France the term of "arts" still prevailed. In the absence of an appropriate term it was unlikely that technology could emerge as a specific field of philosophical investigation.

It was Alfred Espinas, who pointed out this linguistic lacuna, which he characterized as a major limitation, in *Les origines de la technologie* (1897) – "*technologie*" meaning "philosophy of technology" or "technical thought" for Espinas:

We could give to the useful arts the name of "techniques" so as to distinguish them from the arts meant to produce aesthetic emotion. This word of "technique" has unfortunately a rather restricted meaning among us. We say *the technique* of education, the technique of such or such fabrication, and we so designate the operating processes or, in general, the special parts of the industrial arts (...) [i.e. the methods of fabrication] rather than these arts themselves; we shall have the greatest difficulties to say *les techniques* instead of the "useful arts," especially if (...) the groups of superior rules (...) such as politics and morality, must be counted among the arts and thus become techniques. There would be nevertheless some advantage in being able to designate so, as the Greeks did, the conscious and thoughtful practices that are to a certain point in opposition to the simple practices or customs that establish themselves spontaneously before any analysis. (Espinas 1897: 7–8)⁶

Beyond language limitations, another reason why French philosophers were not interested in the promotion of a philosophy of technology is their strong attachment to the project of a techno-logy instantiated in the *Encyclopédie* edited by Diderot and D'Alembert. The encyclopedic ideal flourished during the interwar period in the multi-volume project of the *Encyclopédie française*, edited by French historian Lucien Febvre. (Poirot-Delpech 1988) And to a certain extent, this project together with the various conferences organized by the Centre International de Synthèse (Gemelli 1987) can be viewed as an alternative to the philosophy of technology promoted by German supporters

⁶ Espinas could read German, and few pages below, he referred to Kapp's theory of "organic projection" (On Espinas see Goffi in this volume; on Kapp see Hoquet).

of the Nazi regime such as Eugen Diesel and Manfred Schröter (Bontems 2009). In France, the multidisciplinary science of techniques has been rejuvenated in the 1930s through a convergence of initiatives: Social scientist Marcel Mauss developed views and methodological insights about “*les techniques et la technologie*” (1927–1928, 1948) and energetically campaigned for increasing the place of Technology in the “miscellaneous” section of the journal *L’année sociologique* (Schlanger 2012). Marc Bloch and Febvre, who founded the journal *Annales d’histoire*, dedicated a special issue to “Technology, History and Life” (Bloch 1936), where André-Georges Haudricourt, a linguist, botanist and ethnologist, published the first of a series of technological papers. Their endeavors have been reinforced by André Leroi-Gourhan in ethnology and prehistory (Leroi-Gourhan 1943, 1945, 1949, see Lenay in this volume), and later on by the proponents of “*la technologie comme science humaine*” (“techno-logy as human science”),⁷ namely François Sigaut, an agronomist and historian, together with Haudricourt (Sigaut 1985; Haudricourt 1987). Even though these disciplines were claiming a systematic and general techno-logy, their leading figures knew little about the history of technological thought⁸ until its rediscovery by a group of young historians and philosophers working at the Sorbonne’s Institut d’Histoire des Sciences et des Techniques from 1963 to 1965 under the supervision of Canguilhem. (Guillerme and Sebestik 1966; Morère 1966; Sebestik 2007).

One major distinctive feature of these French approaches to techno-logy compared to other twentieth-century traditions of the philosophy of technology is the rejection of a functionalist view of technology and, instead, an effort to understand and to evaluate technology *per se*. Tools, objects, machines, operations, and gestures, are scrutinized for their own sake rather than as means for external ends or for the purpose of the moral evaluation of these ends. However the concept of technological objects is promoted as a necessary mediation *to understand the Human*, in keeping with the tradition of Encyclopedism, which ambited to constitute a human *paideia* through the circular survey of all the arts and fields of knowledge. Simondon in particular was a big fan of Diderot’s *Encyclopédie* and claimed to promote a new techno-logical Encyclopedism. (Simondon 1958: 105) And Dagognet adopted the profile of an encyclopedist as he wrote dozens of volumes about a broad variety of topics. (Parrochia 2011) In a nutshell, there was no room for a philosophy of technology in the French culture and language. Significantly, André Lalande’s *Vocabulaire technique et critique de la philosophie*, a dictionary that remained the reference work for all philosophy students in the French academic system throughout the twentieth century, explicitly states that “*La technologie est la théorie ou la philosophie des techniques*” (“techno-logy is the theory or the philosophy of techniques”). (Lalande 1902–1947: 1107) In this case, a philosophy of technology would just be a redundancy.

3 An Emerging Community

This book, however, aims to demonstrate that, in the absence of institutional status and international visibility, a new community of philosophers focused on issues related to

⁷ It is also partly along these lines that the Universities of Technology (Universités de Technologie) were created in France in the 1970s. The project modeled after the Massachusetts Institute of Technology consisted in combining engineering sciences with the Humanities in order to overcome the French divide between engineering schools and universities. These universities were meant for training a new generation of “engineers-philosophers,” also called “technologues” (Deforge 1985; Lamard and Lequin 2005).

⁸ To our knowledge, Mauss never referred to Johann Beckmann, for instance.

technology has emerged. To be more precise, this volume is less a mirror image of this emerging community, than a sort of catalyst. It will make the works achieved within this community (more) accessible to an international readership, and at the same time help the constitution of this community. In gathering various scholars with quite diverse theoretical backgrounds and matters of concern this collective volume displays a coherent, albeit, heterogeneous, philosophical trend. Due to the limited format of this volume, and to the demand of the series editors, we did not solicit contributions from authors who were already well known among English-speaking scholars such as Bruno Latour or Michel Serres for instance. Priority has been given in particular to young scholars who explore original pathways in questioning technology. We only included translations of two seminal papers by Bernard Stiegler and Gilbert Hottois (in an augmented version) that were not hitherto accessible in English, and a republication of a paper by Jean-Pierre Dupuy because of his structuring role in the French studies of contemporary technoscience.

What are the distinctive features of this emerging community? Let us go back to Parrochia's 2009 characterization in order to identify potential changes. He mentioned two major trends: A descriptive and historical approach and a social-anthropological approach to techniques.

i) *Concerning the former*, contemporary French philosophers are more or less following the historical pathways opened up by Bertrand Gille (1978, 1979) and Maurice Dumas (1962, 1965, 1971), or the historical epistemology approach developed by Bachelard, Canguilhem and Serres among others. In stark contrast to the analytical approach carried out in a rather ahistorical manner within the framework of the Dual Nature of Technical Artefacts program or to the post-phenomenological approach, many chapters in this volume still keep Canguilhem's historical epistemology in the backstage. However, the traditional focus on the history of technological concepts and objects is shifting toward a concern for the genesis and lifetime of objects which results in the central notion of the multiple temporalities of objects (see in particular Bensaude Vincent in this volume), with a strong reference to evolutionary models. Here, the pioneers are Bergson, André Leroi-Gourhan and above all Simondon, but also Serres and Stiegler. Contrary to Heidegger claiming that modern technology prevents us from authentically experiencing our temporal condition, several contributors to this volume rather claim that technological objects display temporalities of their own – new “timescapes” according to Bensaude-Vincent. They challenge evolutionary approaches and open the way to an investigation of the regimes of temporality in technology (see also debates around the concept of Anthropocene, Stewart in this volume).

ii) *Concerning the sociological and anthropological approach to the philosophy of technology*. French scholars have undoubtedly been sensitive to sociological works, in particular to the Actor-Network Theory (ANT) carried out by Madeleine Akrich, Michel Callon and Bruno Latour at the Centre de Sociologie de l'Innovation of the École des Mines de Paris. In this respect, the emerging French community is following the international mainstream, given that the ANT and its US counterpart – the Social Construction of Technology (SCOT) (Pinch and Bijker 1984, Law et al. 1987) – inspired numerous philosophical works over the past decades, in particular Verbeek, Andrew Feenberg (2000, 2003), and the “empirical turn in the philosophy of technology.” (Brey 2010)

A more distinctive French characteristic is the importance of anthropology, and especially of paleoanthropology. Most French scholars share the conviction that

technology has been constitutive of the human condition. This anthropological orientation goes on with persisting references to Leroi-Gourhan – an ethnologist and prehistorian who still suffers from little international fame. He was nevertheless a major reference in the works of French scholars ranging from Simondon, Gilles Deleuze, Stiegler (1994); Serres, Franck Tinland (1997a, b); Dominique Bourg (1996), and Guchet (2005), or, in this volume, Lenay). Even Latour, who used to mock the “third-rate biology” of technological evolutionists (1992: 2), came to take on a sort of “paleoanthropological turn” with laudatory reference to Leroi-Gourhan, in particular in *Cogitamus* (Latour 2010). Quite surprisingly Leroi-Gourhan is as influential as Simondon among French scholars, but while the latter enjoys international fame (despite the fact that English translations of his major works are not available yet), the former is still scarcely quoted in English papers – even though a translation of Leroi-Gourhan’s major opus, *Gesture and Speech* (1964, 1965), has been available since 1993! Hopefully this volume, and in particular Lenay’s chapter, will remediate to this regrettable lack of international visibility.

This “anthropological turn” should not be mistaken for a comeback of “human nature.” Dupuy’s chapter for instance speaks of human *condition*, not of human *nature*. It is definitely not an essentialist approach that would assume an ontological distinction between human beings and the rest of the world. On the contrary, in interweaving technology and anthropology French scholars try to avoid both essentialism in their account of what is human and “anthropologism” in their account of what is technology. As they assume that technology is not specifically human and begins with animals, they do not draw a clear-cut boundary between animals and humans. It is on this non-essentialist basis that they address the thorny issue of what distinguishes Humans *among* other living beings – the so-called “anthropological difference.” (Tinland 1997a) Baboons for instance do have technologies as well as a complex social life. But baboons’ technologies and baboons’ societies remain rather disconnected. (Latour 2001) In other terms it is not technology *per se* but the *way* it supports collective life, which seems to be constitutive of the Human.⁹ It is in this sense that Leroi-Gourhan, Simondon, Serres, Stiegler, Lenay among others share the view that technology is “anthropologically constitutive,” to quote Lenay’s “*these de la Technologie Anthropologiquement Constitutive/Constituante*.” (Lenay et al. 2002) This “TAC thesis” underlies several approaches presented in this volume together with the widely shared conviction that technology is not neutral. While the non-neutrality of artifacts has been asserted on the basis of political considerations (Winner 1986) or moral arguments (Verbeek 2006), French philosophers tend to give a paleoanthropological significance to this non-neutrality. Technological evolution shapes the conditions of possibility of human experience in ways that could have been otherwise (see Stiegler in this volume). In this respect, the TAC thesis should not be mistaken for technological determinism. (Steiner 2010)

Once again, there is a striking and pervading influence of Bergson on the French community. Bergson claimed that technology articulates two dimensions of the human condition, the biological and the socio-political ones: tools continue the motion of life through non-organic means, but industrial machines open novel ways in the evolution of man, thus prompting great moral and political challenges. Canguilhem argued that Bergson was a major conveyor of a “biological philosophy of technology” in the French area (Canguilhem 1952), which is instantiated in Canguilhem’s approach, in Jacques

⁹ Or else for Dupuy it is not technology *per se* but *its metaphysics* which is constitutive of the Human.

Lafitte's (1932), Leroi-Gourhan's, Simondon's and even, to some extent, in Serres and Lenay.¹⁰ In this respect, French scholars alongside German philosophers of technology distinguished themselves by the importance they confer to biology in their accounts of technology whereas biology is *not* the core of reflections on technology worldwide, with the exception of Tim Ingold, who is more an anthropologist than a philosopher, by the way.

In addition to its historical and anthropological approach to technology, the French emerging community can be distinguished by two specific themes of investigation: *technological objects* on the one hand and *technoscience* on the other hand.

iii) A “thing turn” *à la française*: The phrase “thing turn” refers to the impressive number of recent publications in various fields of scholarship that have been dealing with things, artifacts, instruments, collections ... Mundane things such as zippers (Friedel 1994) or speed bumps (Latour 1994) are dignified as research objects: they deserve detailed empirical studies, which sometimes raise big philosophical issues. In this world of worldwide phenomenon, things have put on considerable weight. Since Langdon Winner's influential article about the bridges on Long Island in New York (Winner 1986) artifacts have a political load and an entry ticket into the field of moral philosophy (Latour 2002; Verbeek 2008b), even though Winner's example proved factually inadequate (Woolgar and Cooper 1999). Anthropologists such as Arjun Appadurai (1986) and Igor Kopytoff (1986) have loaded commodities with social potential and cultural meanings in response to their treatment by Marxist philosophers, and a number of scholars reconsidered the activity of design in light of the dispositions and contrivances of materials. (Ingold 2013) In addition to their cultural and social loads artifacts carry emotions and affects, embedded in their sensory properties and appearance as well as in the stuff they are made of. (Miller 1998; Daston 2004) The prescriptive power carried by artifacts has raised interesting issues about their intentionality since they co-shape human behaviors and regulate their relation to the world. (Idhe 1993; Verbeek 2008a) Scientific objects are credited with more special powers: Instruments not only carry the theoretical knowledge embedded in their design and construction but they also generate knowledge and meaning. (Baird 2004) According to Daston (2000) historical entities scientific objects do not only make up the world, they also have the potential to subvert classical metaphysics because they undermine the classical dilemma between realism and constructivism. Their historicity determines a specific ontology, which is not amenable to the either/or, real/unreal categories of classical metaphysics. And the object-oriented ontology developed by Graham Harman (2011) suggests that this is not a privilege of scientific objects only.

Edmund Husserl's famous injunction “back to the things themselves” (Husserl 1900–1901: 168) seems to come to fruition when things compete with the transcendental subject in the academic world! How and to what extent does the French emerging community participate in this silent Copernican revolution?

First the “thing turn” has been initiated by Simondon with his concept of “technical object” (1958) and further carried on by Dagognet (1985, 1989) who claimed that the objects better revealed the nature of the human mind than the subjects themselves. Dagognet invited philosophers to study the most mundane objects of daily life (1985, 1993). In a different perspective, social anthropologists developed extensive studies of mundane objects in eco-museums (Bonnot 2002, 2014) even providing a fine-grained

¹⁰ The younger generation of scholars (for instance Thierry Hoquet in this volume) – intends to overcome this biologically-rooted approach to technology, but in so-doing they acknowledge the overarching importance of biology in the French tradition of the philosophy of technology.

description of their “situatedness.” (Julien and Rosselin 2009; Montjaret 2014) The chapters in this volume display a wide range of such objects: Video games (Triclot), plastics (Bensaude-Vincent), huge scientific instruments (Bontems), objects of industrial design (Beaubois and Petit, Vial), objects of technoscience (Bensaude-Vincent et al.), nano-objects (Guchet, Loeve), bio-objects (Guchet), screens (Vial). Most of them shape their philosophical insights on the basis of a close empirical examination of objects: how they come into being, and are maintained, what they do, how they shape social relationships, how they interact with the world around them.¹¹ It is worth noting that most of these French contributors to the “thing turn” *à la française* attach importance to the conceptual distinction between thing and object – thus the right expression to label their empirical orientation would rather be “object turn,” provided that the “object” is not reduced to a mere *vis-à-vis* of the “subject.” Equating this divide and Heidegger’s opposition between “*Ding*” and “*Gegenstand*” would be misleading. Mostly epistemological considerations have motivated the “object turn” in the French philosophy of technology. Indeed, due in part to the perennial pregnancy of Bachelardian epistemology, which has no sympathy for the concept of thing, French philosophers of technology mainly state that philosophical studies on technology should begin with the shaping of suitable concepts of technological object. More specifically, the “thing turn” *à la française* is characterized by the attempt to shape a robust concept of technological *object* distinct from the concept of *artifact*. What is at stake in the distinction between objects and artifacts?

Artifacts, i.e. man-made objects, are usually defined in contrast to natural entities. In the post-phenomenological framework as in the analytical framework of the dual nature (both physical and intentional) of technical artifacts, artifacts are viewed as “mediations” between humans and technology, and the main focus is on how users and designers relate to technology. To be sure, these contemporary developments challenge the metaphysical divide between subjects and objects: in Verbeek’s approach, subjects are distributed, and they are shaped by non-human entities. However, the post-phenomenology framework remains overly anthropometric in the sense of a man-measure of all things. The French emerging community is by contrast kin to investigate how technology relates to non-human entities in the world. A nanomachine for instance is much more than an artifact that mediates humans-world relationships: it comes into being in the material world and interacts with other material entities at a length scale out of reach of direct human perception and action. Plastics interfere with temporalities that extend far beyond their lifetime as human commodities. (see Bensaude-Vincent in this volume) So technological objects should not be considered only as *arti-facts*, i.e. artificially made. They have to be described in a worldly perspective as inhabitants of the planet. It is plausible that the relevance of Simondon in current research is due to his attempt at reshaping the concept of technological object as a being of its own that has its own way of relating to the world. (see Guchet in this volume).

iv) *Technoscience as a philosophical category*: Early in the 1980s, Gilbert Hottois has drawn the philosophers’ attention toward the practices of Big Science. He coined the compound term “technoscience” precisely to refer to scientific research where

¹¹ For some, such as Charles Lenay, Vincent Bontems or Mathieu Triclot, doing philosophy of technology even goes through *making technological objects*. Triclot practices machine learning and game design, and Lenay is working for years on the conception of tactile communication systems, both in French Universities of Technology while Bontems has developed with Vincent Minier some digital devices of scientific mediation in a technological research organisation (CEA). Their developments are not some practical applications of their theoretical views, but operative ways of addressing philosophical issues.

technology is embedded both as a milieu and as a driving force. But this concept escaped to its author as Hottois reminds us in this volume. (Hottois) The concept of technoscience became extremely fashionable, when used in various contexts and with various meanings by scholars who have been associated with postmodernism in the 1980s, – such as Latour, Jean-François Lyotard, and Donna Haraway. As the concept gained in extension its comprehension shrunk. Among philosophers the phrase “technoscience” lose most of its load of meanings and came to be more or less reduced to Bachelard’s notion of “phénoménotechnique.” (Rheinberger 2005) However in the 2000s, a number of European philosophers of science including some of the contributors to this volume have reinvested a notion whose meaning was diluted through its multiple re-appropriations. Their philosophy of *technoscience* invites a revision of both our epistemological and metaphysical categories. In particular, by unfolding the multiple modes of existence of technoscientific objects it suggests a shift from epistemic pluralism to ontological pluralism. (Bensaude-Vincent et al. in this volume);

v) Finally, there is a strong tradition of *ethics of technology* in the French speaking area instantiated in Belgium by Hottois (1982, 2004), Geneviève Pinsart (2003), and Céline Kermisch (2011), in Switzerland by Bernard Baertschi (2005), in Quebec by Marie-Hélène Parizeau (2010). In this volume, ethics is a core topic in Dupuy’s Goffi’s, Catherine and Raphaël Larrère’s, Michel Puech’s contributions, and a peripheral issue in other chapters (Bensaude-Vincent, Guchet, Hottois, Loeve). However, the ethical questions raised by technology do not delineate a specific subfield that could be labeled “applied ethics” (i.e. an ethics applied to technology). In this respect, French scholars converge with the current international trend to challenge ELSI approaches (Ethical, Legal and Societal Impacts/Implications) that became mainstream in ethical debates (especially around the Human Genome Project and nanotechnology initiatives worldwide). Just as a number of their colleagues in other countries, the contributors to this volume do not express their ethical concerns in the anticipation of potential consequences of current technological research and development. They rather consider what a flourishing human existence could be in a technological environment (Puech in this volume), or try to disentangle the ethical implications of different concepts of technological action (Dupuy, Larrère and Larrère). Their ethical views are closely related to anthropological issues: cybernetics (yesterday) and converging technologies (today), Dupuy argues, offer nothing else than deconstructing the subject of humanism, his place in the world and his responsibility. Biotechnology and nanotechnology, Larrère and Larrère argue, blurs the divide between two views of technology (fabricating and piloting) that used to carry major anthropological significance in human history. Bensaude-Vincent raises ethical questions about how the multiple temporalities of technological objects interfere with human temporalities – a topic of anthropological relevance, undoubtedly. Guchet addresses the question of norms in technology through a critical analysis of current approaches that overlook its anthropological dimension, namely approaches that fall under the label “philosophy of artifacts.” Also note that ethical concerns are never divorced from political issues (see for instance Loeve). So, the contributions gathered in this volume address ethical issues from anthropological or historical standpoints, together with a close examination of the ontological status of technological objects. Here, ontology, anthropology and ethics are closely intertwined: The entanglement of these three components characterizes the French contributions to the philosophy of technology. This is at least the main message carried out by this volume.

Let us end with a few remarks about the limited scope of this volume. It does not make full justice to a number of philosophical trends, known for having provided valuable insights on technology over the past decades.

In particular, our coverage of the phenomenological tradition is relatively modest given the continuous importance of Heideggerian thought in French approaches to technology, whose concept of *Gestell* has raised a lot of comments and reinterpretations (Janicaud 1985; Henri 1987; Milet 2000). French phenomenologists such as Maurice Merleau-Ponty or even Jean-Paul Sartre did not directly contribute to the philosophy of technology.¹² Sartre's reflections on the mundane use of things in *l'Être et le néant* (1943) were largely inspired by the "tool analysis" of *Sein und Zeit*. Heidegger remains an inescapable reference, but he did not generate original views about technology in France as he did in the North-American and Dutch postphenomenological trends (Idhe 1979; Borgmann and Mitcham 1987).¹³ However, this volume features some innovative *uses* of phenomenology by Hoquet (in this volume), Stiegler (conversing with the German tradition as well as with Derrida), or Vial (who hybridizes phenomenology with Bachelardian "phenomenotechnics" and historical epistemology). In his *Ethics of Ordinary Technology* Michel Puech is also interested in the way "the grandiose structures of intentionality that were deployed in abstract compositions (Husserl) or gloomy destiny tales (Heidegger) have been redeployed by post-phenomenology within the fabric of daily life" (Puech 2016: 99, see also this volume) and some of the contributors to this book also practice a postphenomenology in their own way.¹⁴ We also care to emphasize that French phenomenologists who are concerned with technology take inspiration from the deconstruction movement, in particular Jacques Derrida and Jean-François Lyotard (see Sebbah in this volume).

Similarly, there is no chapter on the French Marxist tradition illustrated in the works of Georges Sorel (1908), Georges Friedmann (1946), Henri Lefebvre (1964), Serge Moscovici (1968), Cornelius Castoriadis (1978), or André Gorz (1988).¹⁵ However this tradition is not totally discarded since Petit and Guillaume argue in their chapter that the French Marxists interested in technology (Moscovici, Gorz in particular) ended up developing a political ecology. So Marxism appears in this concept as a legacy of the concept of *technical milieu*.

Finally we apologize for the "Franco-French" tone of this volume. Given the limited space allowed we could not include contributions by colleagues from Belgium, Switzerland, Quebec and other French-speaking countries. Their inspiring contributions, especially in the domain of the ethics of technology, would need another volume.

¹² Conversely, some of the French philosophers who contributed the most originally to reflections on technology during the Second War and post-war periods such as Etienne Souriau (1943, 1956), Pierre Ducassé (1958), Sebbah and Wilson (2014) or even Simondon (who was close to Merleau-Ponty and Mikel Dufrenne), were quite critical of phenomenology in their times.

¹³ For a more recent stance on Heidegger (and Marx) see Vioulac (2009, 2016).

¹⁴ One may mention the works conducted at COSTECH around the TAC thesis with a phenomenological (and enactive) approach to cognitive science (Steiner and Stewart 2009; Lenay 2013). Their researches on the technologically constituted conditions of perception are very close to the current Dutch school of postphenomenology. Unfortunately, they have too few interactions, although both take place in Universities of Technology (Compiègne, Twente, Eindhoven).

¹⁵ Neither do we deal with the controversy about the moral issues of "machinism" (*la querelle du machinisme*) sparked by writers such as Georges Duhamel and André Maurois in the 1930s, and which involved philosophers such as Pierre-Maxime Schuhl (1938) and Alexandre Koyré (1948). Historians Bertrand Gille and Jean-Pierre Vernant took also part in the debate, both attracting attention over the importance of machines and technological thought in the Middle Age or in Antique Greece.

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References

- Alsted, J. H. (1630). *Encyclopaedia*. Herborn: Corvini.
- Ames, W. (1629). *Technometria, Omnium & singularum Artium fines adaequatè circumscribens*. English edition: Ames, W. (1979). *Technometry* (L. W. Gibbs, Trans.). Philadelphia: University of Pennsylvania Press.
- Appadurai, A. (Ed.). (1986). *The social life of things: Commodities in cultural perspective*. New York: Cambridge University Press.
- Baertschi, B. (2005). *Enquête philosophique sur la dignité: Anthropologie et éthique des biotechnologies* (No. 43). Geneva: Labor et Fides.
- Baird, D. (2004). *Thing knowledge: A philosophy of scientific instruments*. Berkeley: University of California Press.
- Beckmann, J. (1777). *Anleitung zur Technologie, oder zur Kentniß der Handwerke, Fabriken und Manufacturen, vornehmlich derer, welche mit der Landwirtschaft, Polizey und Cameralwissenschaft in nächster Verbindung stehn*. Göttingen: Wittve Vandenkoek.
- Beckmann, J. (1806). *Entwurf der allgemeinen Technologie*. Göttingen: Johann Friedrich Röwer.
- Bergson, H. (1907). *L'évolution créatrice*. Paris: Alcan. English edition: Bergson, H. (1911). *Creative evolution* (A. Mitchell, Trans.). Lanham: University Press of America.
- Bergson, H. (1932). *Les deux sources de la morale et de la religion*. Paris: Presses Universitaires de France. English edition: Bergson, H. (1935). *The two sources of morality and religion* (R. A. Andrà, C. Brereton, & W. H. Carter, Trans.). New York: Henry Holt and Co., Inc.
- Bigelow, J. (1829). *Elements of technology, taken chiefly from a course of lectures delivered at Cambrigde on the Aplication of the sciences to the useful arts*. Boston: Hilliard, Gray, Little, and Wilkins.
- Bloch, M. (1936). Les techniques, l'histoire et la vie: Note sur un grand problème d'influences. *Annales d'histoire économique et sociale*, 8(42), 513–515.
- Blount, T. (1670). Technology. In *Glossographia: Or, a dictionary interpreting all such hard words as are now used in our refined English Tongue* (3rd ed.). London: Tho. Newcomb.
- Bonnot, T. (2002). *La vie des objets*. Paris: Éditions de la Maison des sciences de l'homme.
- Bonnot, T. (2014). *L'attachement aux choses*. Paris: CNRS éditions.
- Bontems, V. (2009). Simondon, les nanotechnologies et les hadrons. Actualité d'une philosophie des machines. *Revue de Synthèse*, 1, 37–66.
- Borgmann, A., & Mitcham, C. (1987). Works about Heidegger. *Philosophy Today*, 31(2), 167–191.
- Bourg, D. (1996). *L'homme-artifice. Le sens de la technique*. Paris: Gaillimard.
- Braunstein, J.-F. (2000). Canguilhem avant Canguilhem. *Revue d'histoire des sciences*, 53(1), 9–26.
- Brey, P. (2010). Philosophy of technology after the empirical turn. *Techné: Research in Philosophy and Technology*, 14(1), 36–48.

- Canguilhem, G. (1952). Machine et organisme. In *La connaissance de la vie* (pp. 101–127). Paris: Hachette. English edition: Canguilhem G. (2008). Machine and organism. In *Knowledge of life* (pp. 75–97, S. Geroulanos & D. Ginsburg, Trans.). New York: Fordham University Press.
- Canguilhem, G. (2011). *Œuvres complètes, tome I: Ecrits philosophiques et politiques, 1926–1939*. Paris: Vrin.
- Castoriadis, C. (1978). Technique. In *Les carrefours du labyrinthe* (pp. 289–224). Paris: Seuil.
- Dagognet, F. (1985). *Rematéraliser: matières et atéralismes*. Paris: Vrin.
- Dagognet, F. (1989). *Éloge de l'objet. Pour une philosophie de la marchandise*. Paris: Vrin.
- Dagognet, F. (1993). *Le musée sans fin*. Seyssel: Champ Vallon.
- Daston, L. (Ed.). (2000). *Biographies of scientific objects*. Chicago: University of Chicago Press.
- Daston, L. (Ed.). (2004). *Things that talk: Object lessons from art and science*. New York: Zone Books.
- Daumas, M. (Ed.). (1962). *Histoire générale des techniques. Tome I: Les origines de la civilisation technique*. Paris: Presses Universitaires de France.
- Daumas, M. (Ed.). (1965). *Histoire générale des techniques. Tome II: Les premières étapes du machinisme*. Paris: Presses Universitaires de France.
- Daumas, M. (Ed.). (1971). *Histoire générale des techniques. Tome III: L'expansion du machinisme*. Paris: Presses Universitaires de France.
- Deforge, Y. (1985). *Technologie et génétique de l'objet industriel*. Paris: Maloine.
- Dessauer, F. (1927). *Philosophie der Technik: Das Problem der Realisierung*. Bonn: F. Cohen.
- Diesel, E. (1939). *Das Phänomen der Technik, Zeugnisse, Deutung und Wirklichkeit*. Berlin: VDI-Verlag.
- Ducassé, P. (1958). *Les techniques et le philosophe*. Paris: Presses Universitaires de France.
- Espinas, A. (1897). *Les origines de la technologie*. Paris: Alcan.
- Feenberg, A. (2000). From essentialism to constructivism: Philosophy of technology at the crossroads. In E. Higgs, A. Light, & D. Strong (Eds.), *Technology and the good life?* (pp. 294–315). Chicago: University of Chicago Press.
- Feenberg, A. (2003). Modernity theory and technology studies: Reflections on bridging the gap. In T. J. Misa, P. Brey, & A. Feenberg (Eds.), *Modernity and technology* (pp. 73–104). Cambridge, MA: MIT Press.
- Friedel, R. (1994). The history of the zipper? *American Heritage of Invention & Technology*, 10(1), 8–16.
- Gemelli, G. (1987). Communauté intellectuelle et stratégies institutionnelles; Henri Berr et la fondation du Centre International de synthèse. *Revue de Synthèse*, 108(2), 225–259.
- Gille, B. (1978). *Histoire des techniques*. Paris: Gallimard.
- Gille, B. (1979). La notion de “système technique” (essai d'épistémologie technique). *Culture technique*, 1, Neuilly-sur-Seine: Centre de recherche sur la culture technique.
- Gorz, A. (1988). *Métamorphoses du travail, quête du sens*. Paris: Galilée.
- Guchet, X. (2005). *Les Sens de l'évolution technique*. Paris: Léo Scheer.
- Guillerme, J., & Sebestik, J. (1966). Les commencements de la technologie. *Thalès*, 12, 1–72. Reprinted in: Guillerme J., & Sebestik J. (2007). Les commencements de la technologie. *Documents pour l'histoire des techniques*, 14(2), 49–122.
- Hård, M. (1998). German regulation: The integration of modern technology into national culture. In M. Hård & A. Jamison (Eds.), *The intellectual appropriation of technology, 1900–1939* (pp. 33–67). Cambridge, MA: MIT Press.

- Harman, G. (2011). *The quadruple object*. Alresford: Zero Books.
- Haudricourt, A.-G. (1987). *La technologie, science humaine. Recherche d'histoire et d'ethnologie des techniques*. Paris: Editions de la Maison des sciences de l'homme.
- Henri, M. (1987). *La barbarie*. Paris: Grasset.
- Hottois, G. (1982). Ethique et technique. *Bulletin de la Société Française de Philosophie Paris*, 76(3), 77–114.
- Hottois, G. (2004). *Qu'est-ce que la bioéthique?* Paris: Vrin.
- Husserl, E. (1900–1901). *Logische Untersuchungen*. Halle: Niemeyer. 2nd English edition: Husserl, E. (2001). *Logical investigations* (D. Moran, Trans.). London: Routledge.
- Ihde, D. (1979). *Technics and praxis*. Dordrecht: Springer.
- Idhe, D. (1993). *Philosophy of technology: An introduction*. New York: Parangon.
- Ihde, D. (1995). *Postphenomenology: Essays in the postmodern context*. Northwestern: Northwestern University Press.
- Ihde, D. (2008). Introduction: Postphenomenological research. *Human Studies*, 31(1), 1–9.
- Ihde, D. (2009). *Postphenomenology and technoscience: The Peking University lectures*. Albany: State University of New York Press.
- Ingold, T. (2013). *Making: Anthropology, archeology, art and architecture*. London: Routledge.
- Janicaud, D. (1985). *La puissance du rationnel*. Paris: Gallimard. English edition: Janicaud, D. (1994). *Powers of the rational science, technology, and the future of thought* (P. Birmingham & E. Birmingham, Trans.). Bloomington: Indiana University Press.
- Julien, M.-P., & Rosselin, C. (Eds.). (2009). *Le sujet contre les objets...tout contre*. Paris: Editions du CTHS.
- Kapp, E. (1877). *Grundlinien einer Philosophie der Technik. Zur Entstehungsgeschichte des Kultur as neuen Gesichtspunkten*. Brunswick: Westermann.
- Kermisch, C. (2011). *Le concept du risque: De l'épistémologie à l'éthique*. Paris: Lavoisier.
- Kopytoff, I. (1986). The cultural biography of things: Commoditization as process. In A. Appadurai (Ed.), *The social life of things: Commodities in cultural perspective* (pp. 70–73). New York: Cambridge University Press.
- Koyré, A. (1948). Les philosophes et la machine. *Critique*, 4(23), 324–333. Republished in Koyré, A. (1961). *Etudes d'histoire de la pensée philosophique* (pp. 610–630). Paris: Armand Colin.
- Kroes, P., & Meijers, A. (2006). The dual nature of technical artefacts. *Studies in History and Philosophy of Science Part A*, 37(1), 1–4.
- Krünitz, J. G. (Ed.). (1773–1858). *Oekonomisch-technologische Enzyklopädie oder allgemeines System der Staats- Stadt- Haus- und Landwirthschaft* (Vol. 242). Göttingen and Frankfurt: Joachim Pauli.
- Lafitte, J. (1932). *Réflexions sur la science des machines*. Paris: Bloud & Gay.
- Lalande, A. (1902–1947). Technologie. In *Vocabulaire technique et critique de la philosophie* (17th ed., 1991, pp. 1106–1107). Paris: Presses Universitaires de France.
- Lamard, P., & Lequin, Y.-C. (2005). *La technologie entre à l'université. Compiègne, Sevenans, Belfort-Montbéliard...* Belfort: Editions de l'Université de technologie de Belfort-Montbéliard.
- Latour, B. (1992). *Aramis ou l'amour des techniques*. Paris: La Découverte. English edition: Latour, B. (1996). *Aramis, or, the love of technology* (C. Porter, Trans.). Cambridge: Harvard University Press.
- Latour, B. (1994). On technical mediation. *Common knowledge*, 3(2), 29–64.

- Latour, B. (2001). A sociology without objects? Remarks to inter-objectivity. *Berliner Journal für Soziologie*, 11(2), 237–252.
- Latour, B. (2002). Morality and technology: The end of the means. *Theory, Culture & Society*, 19(5–6), 247–260.
- Latour, B. (2010). *Cogitamus: six lettres sur les humanités scientifiques*. Paris: La Découverte.
- Law, J., Bijker, W. E., Hughes, T. P., & Pinch, T. (1987). *The social construction of technological systems*. Cambridge, MA: MIT Press.
- Leca-Tsiomis, M. (1999). *Écrire l'Encyclopédie. Diderot: de l'usage des dictionnaires à la grammaire philosophique*. Oxford: Voltaire Foundation.
- Lefebvre, F. (1964). *Vers le cybernanthrope, contre les technocrates*. Paris: Denoël-Gonthier.
- Lenay, C. (2013). Minimalist approach for a dialogue between phenomenology, science and technology. *PhiTeCo Lectures (Philosophy, Technology, Cognition): From Perceptual interaction to extended cognition*. https://webtv.utc.fr/watch_video.php?v=17WUR21R2O8O . Accessed 31 July 2016.
- Lenay, C., Havelange, V., & Stewart, J. (2002). Les représentations: mémoire externe et objets techniques. *Intellectica*, 35(2), 115–129.
- Lenormand, L.-S. (1819). Considérations sur les avantages que présente la Technologie, et sur les moyens propres à faciliter l'étude de cette science. *Revue encyclopédique*, 1, 227–244.
- Lenormand, L.-S. (Ed.). (1822–1835). *Dictionnaire technologique, ou Nouveau dictionnaire universel des arts et métiers, et de l'économie industrielle et commerciale*(Vol. 22). Paris: Thomine et Fortic.
- Leroi-Gourhan, A. (1943). *Evolution et techniques. I, L'Homme et la matière*. Paris: Albin Michel.
- Leroi-Gourhan, A. (1945). *Evolution et techniques. II, Milieu et techniques*. Paris: Albin Michel.
- Leroi-Gourhan, A. (1949). Note sur les rapports de la technologie et de la sociologie. *L'année sociologique*, 2, 766–772.
- Leroi-Gourhan, A. (1964). *Le geste et la parole. Tome I: Technique et langage*. Paris: Albin Michel.
- Leroi-Gourhan, A. (1965). *Le geste et la parole. Tome II: La mémoire et les rythmes*. Paris: Albin Michel. English edition: Leroi-Gourhan, A. (1994). *Gesture and speech*(Vols. I & II, A. B. Berger, Trans.). Cambridge, MA: MIT Press.
- Marx, L. (2010). Technology: The emergence of a hazardous concept. *Technology and Culture*, 51(3), 561–577.
- Mauss, M. (1927–1928). Technologie. In M. Mauss (Ed.), *Instructions d'ethnographie descriptive* (pp. 27–76). Lectures at the Institut d'ethnologie of the Université de Paris. Reprinted in N. Schlanger (Ed.). (2012). *Marcel Mauss. Techniques, technologie et civilisation* (pp. 295–326). Paris: Presses Universitaires de France.
- Mauss, M. (1948). Les techniques et la technologie. *Journal de Psychologie Normale et Pathologique*, 41, 71–78.
- Mertens, J. (2010). The mere handicrafts: Ure's dictionary (1839–1853) compared with the Dictionnaire technologique (1822–1835). *Documents pour l'histoire des techniques*, 19, 277–285.
- Mertens, J. (2011). The decline of general technology: Léon Lalanne and the ascendancy of applied mechanics. *Documents pour l'histoire des techniques*, 20, 107–117.
- Milet, J. P. (2000). *L'absolu technique: Heidegger et la question de la technique*. Paris: Kimé.
- Miller, D. (1998). *Material cultures. Why some things matter*. Chicago: The University of Chicago Press.
- Montjaret, A. (Ed.). (2014). Le retournement des choses. *Socio-Anthropologie*, 30(2).

- Morère, J.-É. (1966). Les Vicissitudes du sens de “Technologie” au début du XIXe siècle. *Thales*, 12, 73–84.
- Moscovici, S. (1968). *Essai sur l'histoire humaine de la nature*. Paris: Flammarion.
- Parizeau, M. H. (2010). *Biotechnologie, nanotechnologie, écologie: entre science et idéologie*. Versailles: Quæ.
- Parrochia, D. (2009). French philosophy of technology. In A. Brenner & J. Gayon (Eds.), *French studies in the philosophy of science* (pp. 51–70). Dordrecht: Springer.
- Parrochia, D. (Ed.). (2011). *François Dagognet: un nouvel encyclopédiste ?* Seyssel: Champ Vallon.
- Phillips, E. (1706). Technology. In *The new world of words* (6th ed.). Universal english dictionary containing an account of the original or proper sense, and various significations of all hard words. London.
- Pinch, T. J., & Bijker, W. E. (1984). The social construction of facts and artefacts: Or how the sociology of science and the sociology of technology might benefit each other. *Social Studies of Science*, 14(3), 399–441.
- Pinsart, M. G. (2003). *Genre et bioéthique*. Paris: Vrin.
- Poirot-Delpech, S. (1988). L'Encyclopédie Française. *Vulgariser les sciences (1919–1939). Acteurs, projets, enjeux. Cahiers d'histoire et de philosophie des sciences*, 24, 7–14.
- Puech, M. (2016). *The ethics of ordinary technology*. New York: Routledge.
- Reuleaux, F. (1884). *Kultur und Technik*. Vienna: A Kreiss.
- Rheinberger, J. (2005). Gaston Bachelard and the notion of ‘phenomenotechnique’. *Perspectives on Science*, 13(3), 313–328.
- Schatzberg, E. (2006). Technik comes to America: Changing meanings of technology before 1930. *Technology and Culture*, 47(3), 486–512.
- Schlanger, N. (2012). Une technologie engagée. Marcel Mauss et l'étude des techniques dans les sciences sociales. In N. Schlanger (Ed.), *Marcel Mauss. Techniques, technologie et civilisation* (pp. 17–134). Paris: Presses Universitaires de France.
- Schröter, M. (1934). Philosophie der Technik. In A. Baeumler und M. Schröter (Eds.), *Handbuch der Philosophie* (chap. 43). Oldenbourg, München und Berlin: Druck und Verlag von R. Oldenbourg.
- Schröter, M. (1935). *Deutscher Geist in der Technik*. Köln: Schaffstein.
- Schuhl, P. M. (1938). *Machinisme et philosophie*. Paris: PUF. Revised second ed. 1946.
- Sebbah, F. D., & Wilson, D. (2014). The philosopher and (his) technics: From the work of Pierre Ducassé. *Diacritics*, 42(1), 6–21.
- Sebestik, J. (2007). Les commencements de la technologie. Postface/préface. *Documents pour l'histoire des techniques*, 14(2), 123–133.
- Selinger, E. (Ed.). (2006). *Postphenomenology: A critical companion to Ihde*. Albany: State University of New York Press.
- Sigaut, F. (1985). More (and enough) on technology! *History and Technology*, 2(2), 115–132.
- Simondon, G. (1958). *Du Mode d'existence des objets techniques*. Paris: Aubier. English edition: Simondon, G. (2016). *On the mode of existence of technical objects* (C. Malaspina, Trans.). Minneapolis: Univocal Publishing.
- Sorel, G. (1908). *Les Illusions du progrès*. Paris: Marcel Rivière.
- Souriau, E. (1943). *Les différents modes d'existence*. Paris: Presses Universitaires de France.
- Souriau, E. (1956). Du mode d'existence de l'œuvre à faire. *Bulletin de la Société française de philosophie*, 50(1), 4–24.

- Spengler, O. (1931). *Der Mensch und die Technik. Beitrag zu einer Philosophie des Lebens*. Munich: Beck Verlag. English edition: Spengler, O. (1932). *Man and technics. A contribution to a philosophy of life* (C. F. Atkinson, Trans.). New York: Alfred A. Knopf, Inc.
- Stalnaker, J. (2010). *The unfinished Enlightenment. Description in the age of encyclopedia*. Ithaca: Cornell University Press.
- Steiner, P. (2010). Philosophie, technologie et cognition: état des lieux et perspectives. *Intellectica*, 53(54), 7–40.
- Steiner, P., & Stewart, J. (2009). From autonomy to heteronomy (and back): The enaction of social life. *Phenomenology and the Cognitive Sciences*, 8(4), 527–550.
- Stiegler, B. (1994). *La technique et le temps, 1. La faute d'Épiméthée*. Paris: Galilée. English edition: Stiegler, B. (1998). *Technics and time, 1. The fault of epimetheus* (G. Collins & R. Beardsworth, Trans.). Cambridge, MA: Stanford University Press.
- Tinland, F. (1997a). *La différence anthropologique : essai sur les rapports de la nature et de l'artifice*. Paris: Aubier Montaigne.
- Tinland, F. (1997b). *L'homme aléatoire*. Paris: Presses Universitaires de France.
- Verbeek, P.-P. (2006). The morality of things: A postphenomenological inquiry. In E. Selinger (Ed.), *Postphenomenology: A critical companion to Ihde* (pp. 117–128). Albany: State University of New York Press.
- Verbeek, P.-P. (2008a). Obstetric ultrasound and the technological mediation of morality: A postphenomenological analysis. *Human Studies*, 31(1), 11–26.
- Verbeek, P.-P. (2008b). Design ethics and the morality of technological artefacts. In P. E. Vermaas, P. Kroes, A. Light, & S. A. Moore (Eds.), *Philosophy and design. From engineering to architecture* (pp. 91–100). Dordrecht: Springer.
- Vioulac, J. (2009). *L'époque de la technique. Marx, Heidegger et l'accomplissement de la métaphysique*. Paris: Presses Universitaires de France.
- Vioulac, J. (2016). *Apocalypse de la vérité. Méditations heideggeriennes*. Paris: Ad Solem.
- Winner, L. (1986). Do artifacts have politics? In L. Winner (Ed.), *The whale and the reactor. A search for limits in an age of high technology* (pp. 19–39). Chicago: The Chicago University Press.
- Wolff, C. F. (1735). *Philosophia rationalis sive Logica*. Frankfurt: Officina libraria Rengeriana.
- Woolgar, S., & Cooper, G. (1999). Do artefacts have ambivalence? Moses' bridges, Winner's bridges and other urban legends in S&TS. *Social Studies of Science*, 29(03), 433–449.
- Zschimmer, E. (1914). *Philosophie der Technik: vom Sinn der Technik und Kritik des Unsinnns über die Technik*. Jena: Mittler.
- Zschimmer, E. (1920). *Technik und Idealismus*. Jena: Jenaer Volksbuch.
- Zschimmer, E. (1937). *Deutsche Philosophen der Technik*. Stuttgart: Enke.