

■ Deleuze, Technology, and Thought

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Abstract

Although Gilles Deleuze never explicitly develops what might be considered a philosophy of technology, this article nonetheless attempts to outline the rudiments of a Deleuzian approach to technology by proposing a series of interrelated concepts: (1) *prosthesis* (technological artifacts are externalized organs); (2) *proto-technicity*, or originary technicity (but this technicity already exists in Nature, all the way down, and precedes any theory); (3) *exodarwinism* (the fact that evolutionary time has bifurcated, and technology evolves in a faster and accelerating time scale); (4) *de-specialization* or de-differentiation (what conditions the externalization of organs is their deterritorialization); (5) *motricity* (the link between the brain and the hand/mouth is primarily one of movement); (6) *inscription*, or graphism (the link between mouth and hand takes place through phonetic writing, when the hand reproduces speech in graphic inscriptions); (7) *maker's knowledge* (we know the organizations of matter found in nature through the organizations of matter that we ourselves have created); and finally, (8) *totipotency* (like a stem cell, the body is capable of being externalized in an almost unlimited number of forms and functions; it is itself an abstraction and the source of abstractions).

Keywords: Gilles Deleuze, technology, prosthesis, maker's knowledge, originary technicity

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Although Gilles Deleuze never explicitly develops what might be considered a philosophy of technology, he is strongly influenced by thinkers such as André Leroi-Gourhan, Raymond Ruyer, and Gilbert Simondon, all of whom provide profound analyses of the nature of technicity. Moreover, works such as *Capitalism and Schizophrenia* are grounded in a profound concept of machinism.¹ In what follows, I would like to offer some Deleuzian reflections on the nature of technology, and more specifically on the nature of the relationship between technology and thought. Deleuze famously defines philosophy as the creation of concepts, and I would propose, in a tentative manner, several concepts that, taken together, may help lay out the rudiments of a Deleuzian philosophy of technology: prosthesis, proto-technicity, exodarwinism, de-specialization, motricity, inscription, maker's knowledge, and totipotence.

I. Prosthesis

Speaking in general terms, technologies are “prosthetic,” so to speak—that is, they are extensions of the body. The German thinker Ernst Kapp, in his 1877 book *Elements of a Philosophy of Technology*, seems to have been the first to propound this idea of technical objects as organ projections.² I can pound a stake into the ground with my fist, but I do a much better job if I use a hammer, which mimics my forearm and fist. In place of the arm, technology substitutes an external artifact that resembles the arm: with a hammer in our hands, my flesh and bones become wood and iron, like an exoskeleton. Similarly, the wheel externalizes the quasi-spherical articulations of our hips, knees, and ankles; clothing externalizes the skin; a baby's bottle externalizes its mother's breast; a kitchen stove is an extension of the stomach; and so on. We have even managed to mimic the organs of other species: airplanes mimic the wings of birds; scuba equipment mimics the gills of fish, albeit with different means. Technology is an apparatus that has been extracted from the body, like a ship leaving port. This, it seems to me, is the basic point from which one has to start: technology is primarily corporeal, it is derived from the body. As such, technology marks a first threshold of life. As Marshall McLuhan puts it in the subtitle of *Understanding Media*, technologies are “the extensions of man.” Or, in Bernard Stiegler's words, “as a ‘process of externalization,’ technics is the pursuit of life by means other than life” (17).

¹ For an analysis of Deleuze and Guattari's concept of machinism, see Sauvagnargès 185-94.

² For Kapp, the necessity for technics derives from man's organ deficiencies, and he distinguishes between the principles of organic relief (*Organentlastung*), organic substitution or replacement (*Organersatzes*), and organic strengthening or improvement (*Organüberbeutung*). In France, Kapp's work in turn influenced the work of Alfred Espinas, notably his *Les origines de la technologie*.

Scientific instruments, for instance, constitute a vast sensorium spread out in a space that constitutes an externalized prosthetic body: telescopic eyes (like the Hubble telescope, or its successor, the Webb telescope) that magnify and record light on film; radio dishes as vast ears that listen to the heavenly noise; seismographs like vast fingers and nerve endings that sense the slightest tremor in the ground; or colliders that allow us to register the effects of particle collisions, as in the recent discovery of the Higgs boson. What is sometimes called the scientific revolution took place in part because of our ability to extend our senses in such technical artifacts.³

II. Proto-Technicity

But one must immediately modify this concept of prosthetics in two directions. On the one hand, the concept of prosthetics tends to presume the initial integrity of the body, which secondarily extends itself spatially. But in fact, the body itself must be comprehended in terms of its natural technicity. As Marx puts it, in a famous text, the greatness of Darwin was that he “directed attention to the history of *natural technology*, that is, the formation of the organs and plants of animals” (cited in Stiegler 26). In his book *Climbing Mount Improbable*, Richard Dawkins has an intriguing chapter, aptly titled “The Forty-Fold Path to Enlightenment,” that analyses the fact that eyes—which Dawkins calls “a remote sensing technology”—have evolved no fewer than forty times in the animal kingdom in accordance with nine distinct principles (138-39). From this viewpoint, not only eyes, but eggs, exoskeletons, feathers, hair, hooves, nails, teeth, the shells of turtles, and the scales of anteaters are all forms of what we might call proto-technicity, or “originary technicity.”⁴ This is what Deleuze and Guattari term “machinism.”

The idea of proto-technicity was perhaps developed most convincingly by the French philosopher Raymond Ruyer.⁵ Consider a unicellular animal such as an amoeba: it can digest food, even though it does not have digestive organs such as a stomach or intestines; it is able to react in intelligible ways to its environment, even though it has neither a nervous system nor any sensory organs; we could thus say that it thinks, even though it lacks a brain. In other words, though it has neither a brain, nor a nervous system, nor a stomach, an amoeba can think, can digest food, and can move about intelligibly in its environment. Ruyer’s conclusion is that *bodily*

³ On the role of instruments in science, see Galison.

⁴ The term “originary technicity” was initially coined by Jacques Derrida and developed by Bernard Stiegler. See Bradley.

⁵ See Ruyer, *Éléments* 42-51, and *Neofinalism* 17-22.

organs are themselves technical artifacts. I do not necessarily need a hammer to pound a stake into the ground, but I can do a better job if I have one. Similarly, organisms do not need a stomach to digest, or a brain to think, or a nervous system to interact with the environment, but they digest and interact better if they have specialized organs fulfilling these functions.⁶ In short, if tools are externalized projections of our organs, we would equally have to say that our bodily organs—stomachs, lungs, kidneys, brains—are themselves technologies that have been created by the organism itself in the course of evolution. In Deleuze’s terminology, the egg is a body *without* organs, and organs are artifacts that are created by the egg in the course of embryogenesis. This is why, in a provocative turn of phrase, Ruyer sometimes calls the embryo our “primary consciousness,” since an embryo has a knowledge that is far vaster than the knowledge our brains have. An embryo easily and routinely creates numerous organs (brain, heart, stomach, lungs, kidneys) that the human brain is now trying to re-create artificially (artificial hearts, dialysis machines that replace the functioning of kidneys, artificial intelligence). But the embryo, our primary consciousness, creates these organs with a perfection that the brain, our secondary consciousness, can scarcely replicate.⁷

Nietzsche had already suggested that the most perfected form of knowledge we possess is knowledge that has been literally “incorporated”—it has been corporealized, it has become part of the body.⁸ This is the kind of knowledge a pianist has of a piece of music, or a basketball player has of his game: the knowledge is incorporated into their body as a motor habit (muscle memory). Students today are generally proficient typists, and typing obviously requires a knowledge of the layout of the computer keyboard. But if students are asked to identify the two letters to the left and right of the letter “c” on their keyboard, only a few are able to answer. The knowledge has been incorporated into their body and has largely disappeared from consciousness.

This is the kind of perfected primary knowledge that an embryo possesses, as opposed to the more limited secondary knowledge possessed by consciousness. Indeed, consciousness most usually intervenes when we *lack* knowledge—when

⁶ On the amoeba, see Ruyer, “Le paradoxe,” who in turn was drawing on Henri Bergson’s classic essay, “Life and Consciousness.”

⁷ “The embryo’s primary consciousness is no more vague than the [secondary] consciousness of the adult” (Ruyer, *Neofinalism* 71).

⁸ Nietzsche notes that the human species has hitherto survived by “incorporating” numerous erroneous presumptions (“that there are enduring things . . . that there are things, substances, and bodies . . . that our will is free”) and that it was only recently that these presumptions were denied and doubted in the name of truth—“the weakest form of knowledge.” In the present, “the thinker is now that being in whom the impulse for truth and those life preserving errors clash for their first fight.” The question for the future is “*To what extent can truth endure incorporation?* That is the question; that is the experiment” (110, 169-71).

we have to consciously look at the keyboard or double-check a musical score. The kind of incorporated knowledge we have when we play an instrument or play a sport is close to the kind of perfected corporeal knowledge of an embryo, in which the conscious self-awareness of the brain does not intervene at all.

Technicity and life interpenetrate each other. If technology is an externalization of the body, we must also say that bodily organs are themselves technologies. There is a technicity that reaches all the way down to the reproductive capacities of the smallest bacteria, and it is conceptually misleading to separate the two. Mutation and selection are two mechanisms of this natural technology. Indeed, as Michel Serres has remarked (*Rameaux* 154), the ancient ruins of long-vanished civilizations or even modern junkyards filled with the carcasses of rusting automobiles are not that different from the fossilized remains of the Cambrian period that are found in the Burgess Shales in the Canadian Rockies, about which Stephen Jay Gould wrote his superb book called *Wonderful Life*. They are all, Serres suggests, cemeteries of externalized techniques—fossil remains, ancient ruins, modern junkyards.

III. Exodarwinism

The concept of prosthetics must also be modified in a second direction. A cigarette lighter, for instance, can hardly be seen as an organ projection. Rather, what characterizes technical artifacts is that these externalized organs are detachable, removable; they become separated from the body, and as such, they have the advantage of *mobility*. A lion's fur, for instance, forces it to rather quickly halt a chase when it becomes overheated; but when fur is externalized in a coat, it can be put on and off at will, according to quickly changing conditions of hot and cold. An important consequence follows from this detachability. Having been detached from the body, technical objects enter into their own evolutionary history—a trajectory that Serres has called an "exodarwinism" (*Rameaux* 150). Evolution bifurcates: biological evolution produces organisms, with their own proto-technicity; but these organisms then produce technical artifacts that interconnect with each other in complex networks to produce a new body with its own moving tissue—a body for which Kevin Kelly has aptly coined the term *technium* (11).

The evolution of this new externalized body not only moves at a faster pace than normal evolution, but it is moving at an increasingly accelerated pace. Indeed, it is this other evolutionary time people are referring to when they talk about the fast pace of modern life.⁹ One would be tempted to say that each of us now

⁹ See Gleick.

lives in two bodies and participates in two evolutionary temporalities: our organic body, which is sculpted by an extremely slow-moving evolutionary process; and the second technological body (the *technium*) that we have created around ourselves, which is formed, more rapidly, by exodarwinism. And of course, this second body begins to react back upon the first, producing all the complexities of what we call the new bio-technologies, and the theme of the cyborg.¹⁰

IV. De-specialization

But this raises a delicate question: other species create and use technology—spiders weave webs, beavers build dams, birds make nests—but without entering into this “exodarwinian” time. Their techniques seem largely tied to their genetic makeup. What is it that has allowed the artifacts produced by the human species to become detached from its organic body, such that its extended body is now spread over the entire planet? Deleuze’s answer: deterritorialization. In evolutionary theory, the bodies of living beings are transformed through two processes, mutation and selection, which allow an organism to specialize in such a way that it can better exploit the resources of its particular ecological niche. But the human species, somewhat paradoxically, has been partly disengaged from this schema: whereas other species tend to be genetic automatons, largely following their genetic programming, humans have been, as it were, de-programmed or de-specialized, de-specified. How did this happen?

If we follow the theses of André Leroi-Gourhan in *Gesture and Speech*, the answer to this question must be found in the body, and in the upright position that the body assumed in the (first) evolutionary process. As humans assumed the upright position, their front paws gradually lost their faculty of locomotion, but in the process evolution invented the hand, which became what Aristotle calls “a tool of tools,” a kind of generalized tool.¹¹ At the same time, the mouth largely lost its capacity for prehension, which was taken over by the hand, but in the process it gained the capacity for speech. In other words, the hand and the mouth went through a process of “de-territorialization”: in the upright position, they are literally removed from the earth or the ground (the *terre*, in French).¹² Put differently, far

¹⁰ Serres’s *L’Hominescence* is a profound analysis of the *technium* and the process of exodarwinism.

¹¹ “The soul is analogous to the hand; for as the hand is a tool of tools, so the mind is the form of forms and sense the form of sensible things” (Aristotle 432a).

¹² One might note that Deleuze and Guattari adapt Leroi-Gourhan’s hand-mouth distinction in various manners throughout their works: form of expression (the mouth, or speech) and form of content (the hand, or technology); collective assemblages of enunciation and machinic assemblages of desire; code and territory; discursive knowledge and non-discursive knowledge.

from being animals that are well adapted to their environment, humans are “champions of inadaptation” (Serres, *Incandescent* 41). Because we are not adapted to any particular environment, we can adapt to almost any environment. And the fact is that evolution takes place only through inadaptation, since species that are already perfectly adapted to their environment, such as jellyfish, have hardly changed since the Cambrian period, and have no reason to change (Serres, *Hominescence* 43).

Put differently, we might say that, through deterritorialization, the human body has become a generality, not unlike the algebraic variable x , which can take on any and all values because it has no value in itself. Or, to use an image suggested by Michel Serres: it is like a stem cell, capable of giving rise to any cell type or a complete embryo (*Incandescent* 41-8). Embryologists have coined a term to describe this state of a stem cell: “totipotence” [toe-‘ti-po-tence], which can be contrasted with the term “omnipotence” often used to describe God. Stem cells are not omnipotent, they are not all-powerful; but they are totipotent, they have the power of taking on an almost indefinite number of forms and functions. Thus, whereas other species fill their niche to perfection, humans have been able to leave their local niche and to open themselves onto a global space. We have been able to do this because of the de-specialization or de-differentiation of our own organs, which has allowed us to create extended organs in the externalized body of the *technium*.

V. Motricity

This brings us to a fifth concept: motricity. It is one thing to say the human body has been deterritorialized and despecialized, and that this is a condition of our technicity. But what about the brain? Do we also not have to say that the fabrication of technical artifacts is a sign of superior human intelligence? At bottom, is it not true that we humans are able to build airplanes and computers because, to put it bluntly, we are the smartest creatures on the planet? Whatever the deterritorialized status of our bodies, is it not the brain that really counts? The answer to all these questions is: no. Leroi-Gourhan, for instance, strongly critiques brain-centered versions of evolution, like that of Teilhard de Chardin, who interpreted evolution as a movement toward an expanded consciousness. The determining factor of human evolution, he argues, was not intelligence, but locomotion (*Gesture and Speech* 26). In other words, what has driven human evolution was not the brain, but a more modest body part, the foot, since it was modifications in the foot that allowed humans to assume the upright position. It is true that the upright position also allowed for the expansion of the skull, which gave humans bigger brains, since a vertical spine can support a heavier cranium than a horizontal spine. But this was an effect of the evolutionary process and not its cause.

But why then would a bigger brain matter? If animals, compared to plants, have more developed nervous systems, it is because animals have to move about in their environment in order to feed and survive, whereas plants can remain largely immobile, since chlorophyll allows them to “feed” directly from the sun. In animals, the nervous system is thus the interface between the organism and its environment, or more exactly, between the organism’s sensory organs (which provide input from the environment) and its locomotor apparatuses (which allow it to act).¹³ A larger brain thus allows for a greater and more accurate motricity.¹⁴

Motricity is important for thinking about technicity, in turn, for several reasons. First, in the movement toward the upright position, the brain became bigger at exactly the same time that the hand and face became deterritorialized. As Leroi-Gourhan insists, the triple “liberation” of the brain, the hand, and the mouth was *one and the same phenomenon*. A considerable amount of brain activity is oriented toward coordinating the muscles in the hand and the face, which lie at the origin of both technicity (produced by the movement of the hand) and speech (produced by the movement of the mouth). This is why Leroi-Gourhan himself, in his early two-volume masterpiece *Evolution and Techniques*, analyzes technical artifacts, not as externalized organs (as Ernst Kapp does), but rather as an externalization of our sensory-motor movements, such as prehension (grasping, turning, sawing) and percussion (striking, pounding).¹⁵ This is also why Deleuze (and others) can speak about a movement that is proper to thought, since thinking takes place through both language and technicity, as we shall see.¹⁶

Second, if tools are externalized organs, it follows that our brains have also been externalized and become part of the *technium*. The great anthropologist Jack Goody writes extensively about what he calls the “technologies of the intellect,” that is, technologies that have externalized our intellects.¹⁷ The most important example of a technology of the intellect is writing, which is a highly complex technology that requires a surface to write on (stone, vellum, parchment, paper) and an instrument to do the writing (chisel, pen, pencil). In other words, writing, like speech, is a complicated motor skill, though speech and writing are very different from each other. Speech is a motor technique of the mouth, which children

¹³ On these points, see Bergson 133-39.

¹⁴ Oliver Sacks notes that anatomists can tell that a person is a pianist by examining their MRI brain scans, because the motor sequences required to play the piano are complex, and the pathways can be seen in their brain imaging (94).

¹⁵ See *Vol. 1: L'Homme et la matière* and *Vol. 2: Milieu et technique*.

¹⁶ In the lecture “Movement-Image,” Deleuze remarks: “There is a speed proper to thought, there is a movement proper to thought, there is a duration proper to thought” (my translation).

¹⁷ See, among others, Goody, *Domestication; Interface; Logic; and Power*.

learn fairly quickly; phonetic writing is a technique for transferring speech into spatialized drawings using the hand and requires years of training.¹⁸ Writing brought about a profound transformation in the hand-mouth relation, which would be modified again with the advent of computers.

Indeed, as a technology of the intellect, one might consider the computer from the viewpoint of three faculties of the mind that classical philosophers often identified: memory, imagination, and reason. The memory in a computer is a million times more powerful than one's own memory and can be accessed anytime ("Let's google it"). Its imagination is equally enormous, nourished by millions of icons and images. (Compare this to the fact that the only images a typical medieval peasant in Europe might have seen during their life were probably the stained glass windows and paintings at their local parish church or cathedral.) Computers even have a faculty of reason, since their programs can solve numerous problems that we could never have solved on our own. (For many mathematicians, having a computer is much more important than having a formal axiomatic). It is as if our heads—our brains and our minds—have been externalized in front of us in an objectified cognitive box, which we can now tuck away and carry around with us in our backpacks, just as our forearm and fist are objectified in a hammer.

VI. Inscription

The idea that writing constitutes a technology of the intellect implies a sixth concept, *graphism*, or what amounts to the same thing, *inscription*, to use Deleuze and Guattari's vocabulary in *Anti-Oedipus*.¹⁹ Inscription is a broad category that includes not only writing and symbolization, but also drawing and art, as well as markings inscribed on the body (tattoos, piercings, circumcisions). We often forget that learning how to write is learning how to draw, albeit in a particular manner. We also forget that writing is itself a technology whose effects have arguably been more far-reaching than almost any other technology. Bergson notes that the immediate advantages humans may derive from a new technical artifact "is a slight matter compared with the *new ideas* and *new feelings* that the invention may give rise to in every direction," and this is certainly true of writing (Bergson 201). Above all, writing is an externalization of memory. In so-called oral cultures,

¹⁸ The classic analysis of the shift from oral to literate traditions is Walter Ong's *Orality and Literacy*. Eric Havelock's *Preface to Plato* assesses the impact phonetic writing had on Greek philosophy, and notably Plato's work.

¹⁹ "Society is not first of all a milieu for exchange where the essential would be to circulate or to cause to circulate, but rather a socius of *inscription* where the essential thing is to mark and to be marked" (142).

poems like the *Iliad* and the *Odyssey* had to be formulaically memorized, and any knowledge that existed had to be retained in the mind. Hence the respect shown to elders, who were literally living libraries, living repositories of knowledge, knowledge that could simply disappear when the person died.²⁰ But once knowledge was written down and externalized, it could be stored in books and libraries, or even in computer chips, and was available for consultation anytime. The move from “pre-history” to “history” is marked by the advent of writing. (This is why the burning of the library in Alexandria was one of the great catastrophes of the ancient world—it destroyed a considerable portion of the collective memory of the human species.) Philosophy itself was made possible by writing, as evidenced by the confrontation between Plato, who championed writing, and Socrates, who refused writing and praised living speech, and in this sense still belonged to the old Homeric culture. Writing also produced entirely new forms of religion—what we call “religions of the Book” (Judaism, Christianity, Islam), oriented around the interpretation of texts, and thus utterly focused on the technology of writing. They are *technological religions*. (Oral religions, by contrast, tended to be oriented around the voice.)²¹

VII. Maker’s Knowledge

The idea that our intellects have been externalized as much as our bodies takes us to a seventh concept, *maker’s knowledge*, which deals with the nature of the relationship between technology and thought. Maker’s knowledge is a somewhat minor and subterranean tradition, and a short detour through the history of philosophy will help clarify its importance in thinking about technicity.

The Greeks famously distinguished between *epistēmē* (knowledge) and *technē* (know-how or craftsmanship), and it is well known that Plato elevates *epistēmē* over *technē*. In some famous passages in the *Republic* and elsewhere, Plato claims that the user of a flute, for instance, knows the flute better than the maker of the flute, and the person who knows the Idea of the flute has a better knowledge than either the user or the maker.²² Some see in Plato’s texts a kind of elitism: a slave who fabricated things could not be allowed to be the possessor of a science superior to

²⁰ On the techniques of orality in Homeric verse, see Lord, and Parry. On techniques of memorization, see Yates.

²¹ On the primacy of the voice in oral traditions—and particularly the relation between the human voice and animal voices—see Abram 137-53.

²² See Plato, *Republic* 597b, 601c; *Cratylus* 601c-d.

that of the master who used them.²³ For Plato, the highest knowledge is given to those who contemplate the intelligible form of Ideas, and not those who actively fabricate things. Epistemology (the contemplative knowledge of the user or the beholder) wins out over technology (the active knowledge of the maker).

In emphasizing language over technicity, Plato sets the tone for much subsequent philosophy. In contemporary analytic philosophy, there is a similar appeal to what is called “propositional knowledge,” the presupposition that knowledge is primarily expressed in propositions.²⁴ In the continental tradition, Foucault emphasizes what he calls “discursive formations,” as if thought was shaped primarily by discourse; Lacan similarly stresses the role of what he calls the “symbolic.” In all these cases, in differing ways, there remains an implicit deprecation of knowledge that comes through making—in other words, technology—a denigration of knowing-how in favor of knowing-that, to use a terminology formulated by Gilbert Ryle (25-61).

It is not until the sixteenth century that the status of “maker’s knowledge” starts to be reconsidered and rejuvenated within philosophical discourse, notably in works such as Hobbes’s *Leviathan* and Vico’s *The New Science*.²⁵ In the intervening period, to be sure, the knowledge of “makers”—metallurgists, brewers, sailors, potters, brewers, and so on—never disappeared and indeed proliferated.²⁶ But the Renaissance engendered a philosophical restoration of the rights of maker’s knowledge, and it is Vico who provides the most succinct summary of the tradition in a famous phrase: “*verum et factum convertuntur*,” “the true and the made are interchangeable.”²⁷ In other words, *we truly understand only what we can make*. Maker’s knowledge is a kind of knowledge *per causas*: makers have superior knowledge of the products of their creation because they cause them to come into being. We can say we truly understand flight, for instance, because we have learned how to make planes. Knowing is a kind of making, and there is a reciprocal relation between cognition and construction.

For both Hobbes and Vico, curiously, the two paradigms of maker’s knowledge are mathematics and the state, since both are made by humans and thus are de-

²³ See, for instance, Farrington 106, 114.

²⁴ An extreme version of such intellectualism is Stanley and Williamson’s “Knowing How,” which argues that all knowing-how is reducible to knowing-that. For a rejoinder, see Noë, “Against Intellectualism,” which concludes that “neither linguistic analysis nor cultivated intuitions are the key to understanding the nature of mind” (290).

²⁵ For overviews of the maker’s knowledge tradition, see Perez-Ramos, and Hintikka.

²⁶ See Conner’s *A People’s History of Science*, which traces the history and role of maker’s knowledge in science.

²⁷ “For the Latins, *verum* (the true) and *factum* (what is made) are interchangeable, or to use the customary language of the Schools, they are convertible” (Vico, *On the Most Ancient Wisdom* 45). For analysis, see Berlin, especially 30-41.

monstrable.²⁸ Vico's "new science" is the science of society and its history: we can understand society because we have made it ourselves, whereas we cannot truly understand Nature because it is made by God.²⁹ Hobbes, in the opening of *Leviathan*, presents the state as "an artificial man," a kind of "automata" fabricated by humans, and thus knowable by them (7). We cannot have a maker's knowledge of natural objects, since we do not make them; we find them ready-made, a brute fact that is simply given. Though Kant never uses the term, his transcendental project can be seen as a continuation of the maker's knowledge tradition.³⁰

Maker's knowledge has an obvious connection to what might be called *actor's knowledge*, since making is an action. In *Critique of Judgment*, Kant has already defined desire as "a faculty which by means of its representations is the *cause* of the actuality of the objects of those representations" (qtd. in Deleuze and Guattari, *Anti-Oedipus* 25). More generally, this is the basis of Kant's distinction between theoretical reason and practical reason: "Practical reason is concerned not with objects in order to *know* them, but with its own capacity to *make them real*—which does require knowledge of them," but a particular kind of knowledge that is neither theoretical nor conceptual but causal (*Practical Reason* 93; emphasis added). For Aquinas, similarly, practical knowledge is "the *cause* of what it understands," whereas "speculative" knowledge "is *derived* from the objects known."³¹ Elizabeth Anscombe's *Intention* is the *locus classicus* in considering intentional action as a form of maker's knowledge (87). Though they too never use the phrase, to my knowledge, Deleuze and Guattari's work can be similarly placed in the maker's knowledge tradition—a tradition that, in Deleuze's language, poses the question of *genesis*. *Anti-Oedipus*, in a Vico-esque manner, is an attempt to rewrite Kant's *Critique of Practical Reason* (desire is productive) by replacing the transcendent Ideas that constitutes Kant's postulates (World, God, Self) with purely immanent syntheses (connection, disjunction, and conjunction) that serve as principles for

²⁸ Thomas Hobbes writes in *Epistle Dedicatory to Lord Pierrepont*: "The science of every subject is derived from a precognition of the causes, generation, and construction of the same; and consequently, where the causes are known, there is place for demonstration, but not where the causes are to seek for. Geometry therefore is demonstrable, for the lines and figures from which we reason are drawn and described by ourselves; and civil philosophy is demonstrable, because we make the commonwealth ourselves. But because of natural bodies we know not the construction, but seek it from the effects, there lies no demonstration of what the causes be we seek for, but only of what they may be" (cited in Hintikka 82).

²⁹ Berlin notes that Vico's distinction would reappear in nineteenth-century Germany in the difference between the *Naturwissenschaften* (natural sciences) and the *Geisteswissenschaften* (human sciences), each with their characteristic way of knowing: *Erklären* (explanation) and *Verstehen* (interpretation) (31).

³⁰ Kant observes that "we can know *a priori* of things only what we ourselves put into them." Moreover, "reason has insight only into that which it produces after a plan of its own" (*Pure Reason* Bxviii, Bxiii).

³¹ Thomas Aquinas, *Summa Theologica*, Ia IIae, Q3, art. 5, obj. 1.

the production of social formations (75).³² Even in the theoretical domain, they define philosophy as the activity of fabricating concepts,³³ and insist that the proper question to be posed about a concept is not “What does it mean?” but rather “How does it work?” (*Anti-Oedipus* 109).

This all-too-brief detour through the history of philosophy should nonetheless make clear the importance of the maker’s knowledge tradition in analyzing the nature of technology. Vico’s claim—that we can have a maker’s knowledge of history and society but not nature—can sound strange to modern ears, since we now seem to have a better understanding of nature than society, given the advances in the natural sciences, and the workings of politics and the economy can still seem something of a mystery. But this is the point at which technology intervenes. As Barry Cooper has written in *Action into Nature*, “modern technology can do in the realm of nature what Vico thought could be done only in the realm of history” (cited in Mitcham 245). To be sure, Vico thinks nature is susceptible to a mathematical treatment because mathematics is constructed by us and thus demonstrable. Similarly, an experiment, though not necessarily a creation, can provide us with knowledge because it allows us to artificially reassemble, recreate, and record the processes of nature. In remaking nature, we come to know the workings of nature. Nonetheless, despite the justified emphasis on mathematics and experimentation in characterizations of science, the role of what we might call “technical schemata” in our knowledge of nature is often overlooked.

The fact is that we tend to *think* nature, to *know* nature, through our technologies. Consider the following. It is often said that, in the modern world, there have been three ages of machines: mechanical machines, like levers, pulleys, watches, and automata; energetic or thermodynamic machines, like the steam engines and electrical motors that powered what Toynbee was the first to call “the industrial revolution”; and finally, informational machines like computers and smartphones, which define the information age we are in the midst of. Each of these machines has been used as a model to interpret nature as a whole, or objects within nature. In the seventeenth century, the idea of mechanism arose from an analogy with the watch: the world is like a watch, with internal mechanisms that explain its functioning; animals, according to Descartes and LeMettrie, are themselves nothing but pieces of machinery; and just as a watch needs a watchmaker, the deists argue, so the world needs a creator. The same happened in the nineteenth

³² Of course, whereas Anscombe focuses on conscious intention, Deleuze and Guattari insist that intentionality is grounded (or rather, ungrounded) in unconscious desire.

³³ Deleuze and Guattari cite Nietzsche: Philosophers “must no longer accept concepts as a gift, nor merely purify and polish them, but must first make and create them, present them and make them convincing” (*What is Philosophy?* 2).

century, when the world was interpreted in energetic terms: because of entropy, the world was going to end “not with a bang but a whimper.”³⁴ Today, many people appeal to the computer as a model for the mind: the brain is the hardware, and the mind is the software, running different programs in different modules.

Even before the age of machines, in the Latin Middle Ages, it was not the computer or the watch, but rather the book that functioned as an analogy for Nature. Nature was a book in which one could read “the stenography of God’s omniscient hand,”³⁵ and for Galileo, that language of Nature turned out to be mathematics. In antiquity, Heraclitus similarly appealed to the bow and the lyre as models of a universe that harnessed two forms of energy, potential and kinetic, tension and release (“we pull on the string, and either an arrow or a tone is released”) (Rothenberg 3, 111). Other ancient thinkers appealed to the potter’s wheel, the lathe, and the spindle to conjure the concept of a spinning, perfect, harmonious universe: an eternal circle (Rothenberg 112-14).

For a long time, these supposed analogies seemed to me to follow an impossibly inverted logic. We invent a technology—books, watches, computers—and then we project it onto Nature and say, “Nature itself is like one of our machines!” Nature is like a book, the universe is like a watch, the mind is like a computer. But Nature is not a watch, any more than the mind is a computer. The entire thought process seemed anthropomorphic, analogy run amok, not unlike theology: just as we create gods in the image of humans, so we create Nature in the image of our technologies. One might even go a step further: just as the Enlightenment exposed the notion of God as a human product, modeled on human attributes, perhaps we need a second Enlightenment that would expose our notion of Nature (sometimes at least) as an equally human product, modeled on human technologies. Or so I thought, for a while, with a Richard Dawkins-like sense of righteousness.

But this initial response becomes less tenable when one considers two impressive counter-examples, namely, Darwin and Einstein. The first chapter of Darwin’s 1859 *Origin of Species* is entitled “Variation under Domestication,” and in it Darwin analyzes the ways in which agriculturalists and stockbreeders had long been breeding animals and grafting plants in order to select and encourage certain traits. Darwin presents his own theory as a projection of this *artificial* selection of traits undertaken by breeders into nature itself: a *natural* selection.³⁶

³⁴ “The Hollow Men” (Eliot 82).

³⁵ This famous phrase is from Robert Boyle’s *The Usefulness of Natural Philosophy*, referring to the practice of shorthand, then much in vogue. For Boyle, “living things were ‘texts’ whose interpretation called for ‘penetrating indagations’ directed toward the discovery of their ‘unobvious properties’” (Harrison 78).

³⁶ In his Introduction, Charles Darwin writes: “It is of the highest importance to gain a clear insight into the means of modification and co-adaptation. At the commencement of my observations, it seemed

Like many others, Darwin uses a human technology to interpret nature. Similarly, Einstein's 1905 paper on special relativity begins with a reflection on the relation between two pieces of technology, a moving train and a ticking clock: "If I say: 'That train arrives here at 7 o'clock,' I mean something like this: 'The pointing of the small hand of my watch to 7 and the arrival of the train are simultaneous events.'"³⁷ Although Einstein was not imposing a technical model on Nature, the theory of relativity would have been impossible to even think in a world without clocks.³⁸ Two of the most important developments in the sciences—evolution and relativity—were dependent for their formulation on previously developed technologies.

How then are we to understand the maker's knowledge that is contained in these technical artifacts? We usually tend to think of a piece of technology as an application of a theory—as when an architect designs a house and the contractors build it—but in the broadest sense it is the reverse that is true: from an evolutionary viewpoint, as we have seen, it is technology that long precedes theory. Moreover, we often presume that the creation of a technical artifact requires a mental image in the mind of its maker, a model or representation of the object to be produced, an Idea. Such is the *hylomorphic schema* that Gilbert Simondon famously critiques (39-51). Gary Tomlinson has recently shown, in analyzing the prehistoric tool known as the "biface," that the tool itself was the means of transmitting the operational sequences of its own production, without a self-conscious intentionality behind it.³⁹ Bertrand Gille has proposed the term "technemes" to indicate the knowledge that is thereby transmitted from master to apprentice (1144). But we can now see why we would comprehend nature through our technologies. It is not that we comprehend nature through an analogy between natural objects and technical artifacts, or even that technologies provide us with metaphors for understanding nature. Analogy and metaphor are still primarily linguistic operations. Rather, natural objects are organizations of matter, and tools and machines are the ways in which *we* have learned to organize matter. Since we have a maker's knowledge of our own machines, we use that knowledge—what we might call the "technical schemata" of those machines—to comprehend the organizations of matter that we find in nature. In other words, it is our maker's knowledge of technical artifacts that gives us a knowledge of the artifacts of nature itself. Put succinctly, technologies are

to me probable that a careful study of *domesticated animals* and of *cultivated plants* would offer the best chance of making out this obscure problem" (13).

³⁷ Einstein, "On the Electrodynamics of Moving Bodies." Originally published in 1905 in German as "Zur Elektrodynamik bewegter Körper" in *Annalen der Physik*.

³⁸ See Galison 221-93, and Canales.

³⁹ See Tomlinson, particularly the remarkable third chapter, "1,000,000 Years Ago: Acheulean Performances" (51-88).

forms of knowledge: we know not only through what we can say (propositional knowledge), but also through what we can make, what we can do.

VIII. Totipotence

I would like to conclude, very speculatively, by returning to a concept we have already mentioned, namely, *totipotence*. Following Serres, we have used the term as a way of describing the de-specialization of human organs such as the hands, which, like stem cells, are capable of taking on an indefinite number of functions. In *Difference and Repetition*, Deleuze speaks of white light, which contains virtually all colors, or white noise, which contains virtually all sounds. In a similar vein, one might speak of the body without organs (the egg) as a white stem cell that contains virtually in itself all the organs and functions it is capable of externalizing. But this brings us to a final speculative question: if technologies are externalizations of the body, is the human body also capable of externalizing its totipotence? In other words, is abstraction itself born from our own bodies?

The initial answer would seem to be: yes. Why did we once put fences around pastures and meadows except to create artificial empty white spaces in which we could raise our domesticated animals and plants? The diversity of cultures on the planet presupposes this very gesture (the term “culture” is derived from “cultivation”). The same is true in economics, for what is a coin, a piece of money, except a white promise: we can exchange it for a night on the town, a meal with friends, a book to curl up with. If money is equivalent to everything, it is because, in and of itself, it is worth nothing; it is a pure abstraction. Do there exist cognitive white objects? A famous fragment of Anaximander identified the origin of geometry as what he called *apeiron*, an indefinite with no limits, in other words, a purely formal and white space that rather quickly received the name of the Earth or Geo, which geometry measured and mastered. In algebra, as we have already noted, the variable x can take on all values because it has none in and of itself.

Indeed, one could say that metaphysics is itself the domain of dedifferentiated concepts. For instance, the concept of matter is a *hyle* without specification; but when we confront matter in the form of wood, stone or metal, crystal, molecule, atom, particle, or quark, then the generic concept of matter becomes useless. The white concept of space has a translucent content, innocent of all the things of the world; but when it becomes Euclidean space, or projective space, or a topological space that multiplies its dimensions, then we no longer say anything about space in general and it disappears from our preoccupations. Similarly, desire and love are white concepts, since we always desire a particular thing and fall in love with a

particular person. This is how metaphysics used to work: it was dedifferentiated. It spoke of the individual before we had either Peter, Paul, or Mary; it spoke of consciousness before it became the “consciousness of something” (Serres, *Incandescent* 64-71).

But if this class of white concepts is made possible by the totipotency of our own bodies, then we would have to take the further step and follow Deleuze in affirming that “the abstract is lived experience. I would almost say that once you have reached lived experience, you reach the most fully living core of the abstract. . . . You can live nothing but the abstract and nobody has lived anything else but the abstract.”⁴⁰

We have presented eight concepts as a preliminary manner of approaching Deleuze’s philosophy of technology: (1) *prosthesis* (technological artifacts are externalized organs); (2) *proto-technicity*, or originary technicity (but this technicity already exists in Nature, all the way down, and precedes any theory); (3) *exodarwinism* (the fact that evolutionary time has bifurcated, and technology evolves in a faster and accelerating time scale); (4) *de-specialization* or de-differentiation (what conditions the externalization of organs is their deterritorialization); (5) *motricity* (the link between the brain and the hand/mouth is primarily one of movement); (6) *inscription*, or graphism (the link between mouth and hand takes place through phonetic writing, when the hand reproduces speech in graphic inscriptions); (7) *maker’s knowledge* (we know the organizations of matter found in nature through the organizations of matter that we ourselves have created); and, finally, (8) *totipotency* (like a stem cell, the body is capable of being externalized in an almost unlimited number of forms and functions; it is itself an abstraction and the source of abstractions). Far from being complete or systematic, these concepts are components of an assemblage that inevitably remains open and dynamic.

Works Cited

- Abram, David. *The Spell of the Sensuous: Perception and Language in a More-Than Human World*. Vintage, 1996.
- Anscombe, Elizabeth. *Intention*. 1957. 2nd ed., Harvard UP, 2000.
- Aquinas, Thomas. *Summa Theologica*. Translated by Fathers of the English Dominican Province, Benziger Brothers, 1911-1925.
- Aristotle. *On the Soul*. Translated by Walter Stanley Hett, Harvard UP, 1936.
- Bergson, Henri. *Creative Evolution*. 1907. Translated by Arthur Mitchell, Dover, 1998.

⁴⁰ See English transcripts of Deleuze’s Cours Vincennes lectures, “Kant” and “Synthesis.”

- Berlin, Isaiah. "Vico and Herder." *Three Critics of the Enlightenment: Vico, Hamann, Herder*, edited by Henry Hardy, Princeton UP, 2000, pp. 1-242.
- Bradley, Arthur. *Originary Technicity: The Theory of Technology from Marx to Derrida*. Palgrave, 2011.
- Canales, Jimena. "The Media of Relativity: Einstein and Telecommunications Technology." *Technology and Culture*, vol. 56, no. 3, July 2015, pp. 610-45.
- Conner, Clifford D. *A People's History of Science: Miners, Midwives, and "Low Mechanics."* Nation Books, 2005.
- Darwin, Charles. *On the Origin of Species*. 1859. Penguin, 2009.
- Dawkins, Richard. *Climbing Mount Improbable*. W. W. Norton, 1996.
- Deleuze, Gilles. *Difference and Repetition*. Translated by Paul Patton, Columbia UP, 1995.
- _____. "Kant." Cours Vincennes lecture, 21 Mar. 1978, English transcript by Melissa McMahon, www.webdeleuze.com/textes/67.
- _____. "The Movement-Image: Bergsonian Lessons on Cinema." *The Deleuze Seminars*, lecture 1, 10 Nov. 1981. Purdue University Research Repository, doi:10.4231/R7G73BVW.
- _____. "Synthesis and Time." Cours Vincennes lecture, 14 Mar. 1978, English transcript by Melissa McMahon, www.webdeleuze.com/textes/66.
- Deleuze, Gilles, and Félix Guattari. *Anti-Oedipus: Capitalism and Schizophrenia*. Translated by Robert Hurley et al., Viking Penguin, 1977.
- _____. *What is Philosophy?* Translated by Hugh Tomlinson and Graham Burchell, Columbia UP, 1994.
- Einstein, Albert. "On the Electrodynamics of Moving Bodies." *The Principle of Relativity*, translated by W. Perrett and G. B. Jeffery, Methuen, 1923. Fourmilab, www.fourmilab.ch/etexts/einstein/specrel/www.
- Eliot, T. S. *Collected Poems, 1909-1962*. Harcourt Brace Jovanovich, 1991.
- Farrington, Benjamin. *Science in Antiquity*. Oxford UP, 1969.
- Galison, Peter. *Einstein's Clocks, Poincaré's Maps: Empires of Time*. Norton, 2003.
- Gille, Bertrand, et al. *The History of Techniques: Techniques and Sciences*. Translated by J. Brainch et al., vol. 2, Gordon and Breach, 1986.
- Gleick, James. *Faster: The Acceleration of Just About Everything*. Vintage, 2000.
- Goody, Jack. *The Domestication of the Savage Mind*. Cambridge UP, 1977.
- _____. *The Interface between the Written and the Oral*. Cambridge UP, 1987.
- _____. *The Logic of Writing and the Organization of Society*. Cambridge UP, 1986.
- _____. *The Power of the Written Tradition*. Smithsonian Institution Press, 2000.
- Harrison, Peter. *The Territories of Science and Religion*. U of Chicago P, 2015.
- Havelock, Eric. *Preface to Plato*. Harvard UP, 1963.
- Hintikka, Jaakko. "Practical vs. Theoretical Reason: An Ambiguous Legacy." *Knowledge and the Known: Historical Perspectives in Epistemology*, Reidel, 1974, pp. 80-97.
- Hobbes, Thomas. *Leviathan*. 1651. Edited by J. C. A. Gaskin, Oxford UP, 1998.
- Kant, Immanuel. *Critique of Judgment*. Translated by James Creed Meredith, Oxford UP, 1952.
- _____. *Critique of Practical Reason*. Translated by Lewis White Beck, Macmillan, 1993.
- _____. *Critique of Pure Reason*. Translated by Norman Kemp-Smith, Macmillan, 1929.
- Kapp, Ernst. *Elements of a Philosophy of Technology: On the Evolutionary History of Culture*. Edited by Jeffrey West Kirkwood and Leif Weatherby, translated by Lauren K. Wolfe, U of Minnesota P, 2018.

- Kelly, Kevin. *What Technology Wants*. Penguin, 2010.
- Leroi-Gourhan, André. *Evolution et techniques, vol. 1: L'Homme et la matière*. 1943. Albin Michel, 1971.
- _____. *Evolution et techniques, vol. 2: Milieu et technique*. 1945. Albin Michel, 1973.
- _____. *Gesture and Speech*. 1967. Translated by Anna Bostock Berger, MIT P, 1993.
- Lord, Albert B. *The Singer of Tales*. Harvard UP, 1960.
- McLuhan, Marshall. *Understanding Media: The Extensions of Man*. 1964. Edited by W. Terrence Gordon, critical ed., Gingko Press, 2003.
- Mitcham, Carl. *Thinking through Technology: The Path between Engineering and Technology*. U of Chicago P, 1994.
- Nietzsche, Friedrich. *The Gay Science*. Translated by Walter Kaufman, Vintage, 1974.
- Noë, Alva. "Against Intellectualism." *Analysis*, vol. 65, no. 4, Oct. 2005, pp. 278-90.
- Ong, Walter. *Orality and Literacy*. Methuen, 1982.
- Parry, Milman. *The Making of Homeric Verse: The Collected Papers of Milman Parry*. Oxford UP, 1987.
- Perez-Ramos, Antonio. *Francis Bacon's Idea of Science and the Maker's Knowledge Tradition*. Clarendon Press, 1988.
- Plato. *Cratylus*. Translated by Harold North Fowler, Harvard UP, 1926.
- _____. *Republic*. Translated by G. M. A. Grube, revised by C. D. C. Reeve, Hackett Publishing, 1992.
- Rothenberg, David. *Hand's End: Technology and the Limits of Nature*. U of California P, 1993.
- Ruyer, Raymond. *Éléments de Psycho-biologie*. PUF, 1946.
- _____. *Neofinalism*. 1952. Translated by Alyosha Edlebi, U of Minnesota P, 2016.
- _____. "Le paradoxe de l'amibe et la psychologie." *Journal de psychologie normale et pathologique*, July-Dec. 1938, 472-92.
- Ryle, Gilbert. *The Concept of Mind*. U of Chicago P, 1949.
- Sacks, Oliver. *Musophilia: Tales of Music and the Brain*. Knopf, 2007.
- Sauvagnarges, Anne. *Artmachines: Deleuze, Guattari, Simondon*. Translated by Suzanne Verderber and Eugene W. Holland, Edinburgh UP, 2016.
- Serres, Michel. *L'Hominescence*. Le Pommier, 2001.
- _____. *The Incandescent*. Translated by Randolph Burks, Bloomsbury, 2018.
- _____. *Rameaux*. Le Pommier, 2007.
- Simondon, Gilbert. *L'Individuation à la lumière des notions de forme et d'information*. 1958. Jérôme Millon, 2003.
- Stanley, Jason, and Timothy Williamson. "Knowing How." *The Journal of Philosophy*, vol. 98, no. 8, Aug. 2001, pp. 411-44.
- Stiegler, Bernard. *Technics and Time, 1: The Fault of Epimetheus*. Translated by Richard Beardsworth and George Collins, Stanford UP, 1998.
- Tomlinson, Gary. *A Million Years of Music: The Emergence of Human Modernity*. Zone Books, 2015.
- Vico, Giambattista. *On the Most Ancient Wisdom of the Italians: Unearthed from the Origins of the Latin Language*. Translated by L. M. Palmer, Cornell UP, 1988.
- Yates, Francis A. *The Art of Memory*. U of Chicago P, 1966.

德勒茲、科技與思考

摘要

就算吉爾·德勒茲並未直接發展所謂的「科技的哲學」，本篇論文仍提出一系列相關聯的概念，列出幾個德勒茲式的基本科技原則。（一）義肢（科技加工物為外部化的器官），（二）原科技性或原初科技性（但此種科技性早已存在於大自然之中，一直傳遞下來，且先於任何理論），（三）外部達爾文主義（事實上，演化的時間早已分化，而科技的演化更快，且不斷加速中），（四）去專門化或去差異化（決定器官外部化的是它們本身的解畛域），（五）動能性（大腦和手/口的連結基本上是動作的一種），（六）印記或圖像主義（當手透過圖像複製口說，口和手的連結就是透過語音書寫建立的），（七）創造者的知識（我們透過自己創造出的物質組織、來了解在自然中發現的物質組織），（八）全能性（就像幹細胞，身體能幾乎無限制地被外部化為種種形式與功用；身體本身是抽象化的，也是抽象化的來源）。

關鍵字：吉爾·德勒茲、科技、義肢、創造者的知識、原初科技性