Looping Nature: Recursivity, Epigenesis and Ideology

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Abstract:

The following paper attempts to articulate a distinctly materialist notion of emergence and the formation of patterns by way of re-visiting two texts that have been considered oddities, if not embarrassments, by the subsequent developments of their respective disciplines: Freud's *Project for a Scientific Psychology* and Engels's *Dialectic of Nature*. Both texts are strikingly similar in their speculative engagement with the natural sciences and in their potential to inform a renewed engagement with the question of the relation between technology and life. In the concept of "path-breaking" [*Bahnung*] Freud understands perceptions as inscribing themselves in the structure of the very perceiving apparatus through repetition of what one could call a "material trace" (Sybille Krämer). This notion of the "material trace" can be connected to the key thrust of Engels's "objective dialectics" in that it "concerns a model of structural emergence" (Hartmut Winkler). I want to propose that these texts can potentially enrich our understanding of how mental formations such as memory take shape and how subjectivity is constituted in material processes. That is, once Freud and Engels are read through recent philosophical thinking on technology (Bernard Stiegler, Catherine Malabou) and the concept of recursivity (Yuk Hui). This approach can also supply resources for a Marxist notion of ideology—namely by performing a turn from a critique that is primarily concerned with the question of how we can penetrate false appearances towards a materialist account of how ("false") appearances, something like "real abstractions" (Alfred Sohn-Rethel), can emerge out of the "flat plane" of matter.

Keywords: recursivity, materialism, epigenesis, ideology, dialectics, path-breaking, facilitation, structural emergence, pattern formation.

If we follow traces, argues the German media philosopher Sybille Krämer, then we find a way out—not only out of a sterile juxtaposition of signifiers and signifieds but out of a body-mind dualism on which such a bipolar model of representation is based. For Krämer, the concept of the trace is the Ariadne's thread "which leads us out of the 'pure' world of signs and connects us to the world's tangible, physical, and material side, which is the condition *sine qua non* of traces arising and being open to interpretation."[1] Traces, in this sense, serve both as a theoretical and literal "interface" since they mediate between meaning and non-meaning. Krämer's philosophical intervention and grounding of the sign in its materiality and practice becomes particularly important against the backdrop of a post-structuralist discourse, that according to Krämer, tends to "release signs from all connection with non-signifying elements" which in turn threatens to make all things disappear in a "euphoria of simulation."[2] The "so-called postmodern thought invokes signs bereft of references and a world seamlessly constituted by text."[3] The notion of the trace works as a corrective to such an aloof discursivity, because the trace is constitutively tied to materiality. However, it does so in a more interesting and substantial way than other, more vulgar sorts of materialism. Traces have a certain paradoxical nature: They appear in concrete form as they are *in and through* the material. Traces belong to the world of things while also standing for something that is not there. "The presence of the trace attests to the absence of that which generated it. In the visibility of the trace, that which created it is specifically withdrawn and invisible."[4]

Hartmuth Winklers adds another layer to Krämer's materialist media theory by pointing out that "traces are often not left once, but several times, meaning that they either continually overlap and thus become unrecognizable or, on the contrary, deepen by means of inscription."[5] The repetition of traces that relates to qualitative changes and to the emergence of patterns is illustrated by Winkler with the image of a flock of sheep in the snow who produce a visual motif—similar to those artworks appropriately dubbed "abstract expressionism".

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1   Sybille Krämer, "Was also ist eine Spur? Und worin besteht ihre epistemologische Rolle? Eine Bestandsaufnahme," *Spur: Spurenlesen als Orientierungstechnik und Wissenschaft,* ed. S. Krämer et al. (Frankfurt: Suhrkamp, 2007), 12. Translation by author.
2   Krämer, *Was also ist eine Spur?*, 12.
3   Krämer, *Was also ist eine Spur?*, 12.
4   Krämer, *Was also ist eine Spur?*, 12.
5   Hartmut Winkler, "Traces: Does Traffic Retroact on the Media Infrastructure?" *Traffic: Media as Infrastructures and Cultural Practices,* ed. M. Näser-Lather and C. Neubert (London: Brill, 2015), 96.

Flock of sheep in the snow. In: Winkler, *Traces: Does Traffic Retroact on the Media Infrastructure?*, p. 94. Photo by Jürgen Gebhard © Picture Press, Hamburg.

For Winkler the concept of the trace at stake here is particularly interesting since it concerns the history of *memory theory:* From classical antiquity onwards, two metaphors—the wax tablet and the storeroom—have been used to theoretically grasp how memory functions.[6] According to Winkler both technics have served as illustrations of the various dimensions and complexities of what it means to retain and reactivate past experience: 1) the problem of perception as impression or retention, 2) the threat of forgetting, and 3) the idea of overlapping and overwriting[7].

It is Sigmund Freud's version of the wax table metaphor, the well-known "mystic writing pad," that frames all these conceptual difficulties of memory theory while at the same time allowing for the articulation of a specific solution.[8] Freud faced a puzzle *vis-à-vis* the mental apparatus—namely, how is it that the latter is always ready to absorb new information while nonetheless changing with every perception as it retains permanent traces? The seemingly easy but problematic answer that distributes the different mental operations to two different classes of neurons is supplemented by Freud with a significantly richer "theory of contact-barriers" developed in his earlier text *Project for a Scientific Psychology.*[9] In the latter, neurons are permanently altered by repeated excitation and, as a result, become more capable of conduction. Freud defines this process as "facilitation" or "path-breaking" [*Bahnung*]. For Winkler, who prefers the word "priming", this notion constitutes a major conceptual gain and theoretical contribution, as it establishes a mediating connection between single acts of perception and their underlying structure. Perceptions are understood to be inscribing themselves in the structure of the very perceiving apparatus precisely through *repetition of a trace.*

6   Harald Weinrich, "Typen der Gedächtnismetaphorik," *Archiv für Begriffsgeschichte* 9, (1964): 23–26.
7   Winkler, *Traces: Does Traffic Retroact on the Media Infrastructure?,* 98.
8   Sigmund Freud, "A Note upon the 'Mystic Writing-Pad," *Standard Edition.* Vol. 19 (London: Hogarth Press, 1925).
9   Sigmund Freud, "Project for a Scientific Psychology," *Standard Edition.* Vol. 1 (London: Hogarth Press, 1950).

Winkler relates this to another fundamental concept of psychoanalysis, namely *association*—that is, the ways in which "the various types of mental materials—be it ideas, images, concepts—relate to one another."[10] The "free association" in the analytic session reveals how these relations are both fixed and fluid in peculiar ways. In fact, the irony in the Freudian method of *free association* this that it is precisely not free. Rather it brings to the fore past facilitations as slips, ticks, and symptoms which supply the material that the analytic sessions "works through." It is the concept of trace, repetition, and priming that allows for a mediation between quantities (of external stimuli) and genesis (of the mental structure). In other words: traces are the key to understanding how "quantities transform into qualities."[11]

The latter quote stems from Friedrich Engels's infamous *Dialectic of Nature* and describes "a law-like connection between quantitive processes and the observable evolutionary leaps, the changes in the structure, the jump to new qualities."[12] For Winkler, it is in precisely in this sense that Engels develops a materialism that does not simply transform into a crude determinism since it includes an unpredictability and openness. For Winkler, the key thrust of Engels's "objective dialectics" is that it "*concerns a model of structural emergence*. The transformation from quantity into quality binds structure back to process, stable to liquid, and seemingly irreducible qualities to something gradable and quantitative."[13] Engels, who engages in a revision of natural philosophy and its metaphysical ideas by means of a Marxist critique, particularly through a dialectical materialism, highlights the shortcomings of notions such as abstract identity when it comes to adequately describing nature:

> Abstract identity ('a=a'; and negatively, 'a cannot be simultaneously equal and unequal to a') is likewise inapplicable in organic nature. The plant, the animal, every cell is at every moment of its life identical with itself and yet becoming distinct from itself, by absorption and excretion of substance, by respiration, by cell formation and death of cells, by the process of circulation taking place, in short, by sum of incessant molecular changes which make up life… [14]

For Engels the (objective) difference within identity liquefies seemingly stable and abstract entities and makes the "old formal identity standpoint" philosophically unsustainable.[15] However, what Winkler considers Engels's worthy theoretical contribution to be is that these identities do not melt into an absolutely contingent history, but become apparent as structures constitutively entangled in a process

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10   Winkler, *Traces: Does Traffic Retroact on the Media Infrastructure?,* 101.
11   Frederick Engels, "Dialectics of Nature," in *Collected Works.* Vol. 25, ed. K. Marx and F. Engels, (International Publishers, 1987), 356.
12   Winkler, *Traces: Does Traffic Retroact on the Media Infrastructure?,* 108.
13   Winkler, *Traces: Does Traffic Retroact on the Media Infrastructure?,* 111. Emphasis in the original.
14   Engels, *Dialectics of Nature,* 496.
15   Engels, *Dialectics of Nature,* 495.

of their creation and in the exchange with an environment in which they assert themselves. We are dealing here neither with a deterministic model nor with a contingent fluidity precisely insofar as the shift "from quantity to quality"—as the formation of *patterns* in the repetition of traces—comes to play an essential role.

An illustration of the Freudian facilitation/path-breaking/priming, if not a straightforward technical application of these concepts, can be found in contemporary artificial neural networks. Google's DeepDream, one could argue, extrapolates from Freud's mystic writing pad to such an extent that it might even introduce a qualitative shift in the concept of facilitation itself. The computer program created in 2014 by Google engineer Alexander Mordvintsev is based on a form of AI that links up a set of individual processing units (nodes) which are arranged in layers, working together in a network whose initial purpose is to classify images. Trained on a set of certain visual material, these classification networks—through a process of successive facilitations that create path-patterns between nodes emerging as the result of repeated application—are able to identify the content of new images with relative accuracy (e.g., if a given picture contains a car or not).
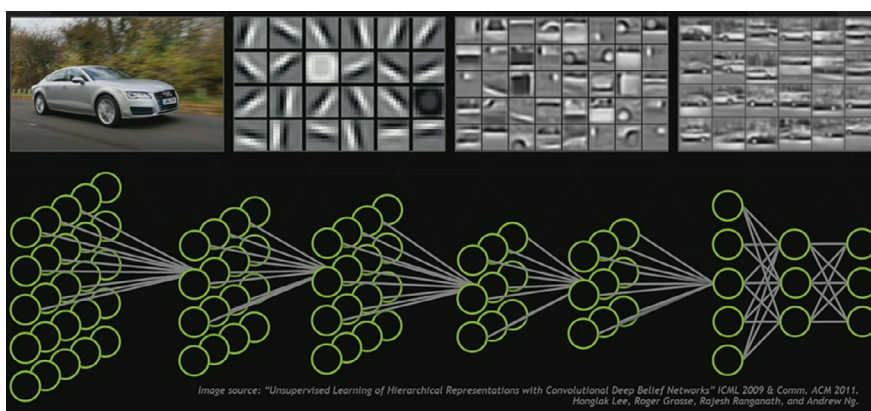
Model of how a deep neural network sees. Image source: "Unsupervised Learning of Hierarchical Representations with Convolutional Deep Belief Networks" ICML 2009 & Comm. ACM 2011.Honglak Lee, Roger Grosse, Rajesh Ranganath, and Andrew Ng.

What sets DeepDream apart is that it reverses the direction of this process: A trained neural network is used to find and enhance the already-present characteristics in a certain image. DeepDream effectively performs what could be described as a sort of algorithmic "pareidolia"—the tendency of perception to impose a meaningful interpretation on a nebulous stimulus (e.g., seeing faces in clouds). Instead of training the network to recognize images, the image is "trained" to enhance certain already-existing features. An initial picture becomes, for example, "more cat-like," as the program uses the enhanced image again as an input to the procedure, thereby employing recursive feedback loops to create imagery akin to a LSD-induced hallucination. The striking similarity between these two phenomena in fact

suggests a functional resemblance between artificial neural networks and particular layers of the visual cortex.[16]
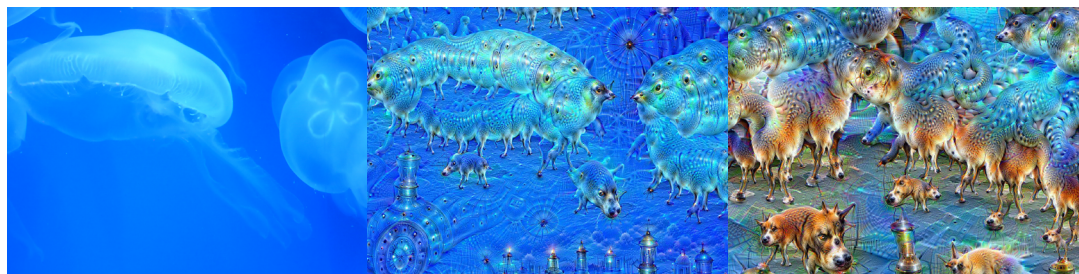
The original image (left) after applying 10 (middle) and 50 (right) iterations of *Google DeepDream*.
The network having been trained to perceive dogs. Image source: Wikimedia Commons.

Here Yuk Hui's recent book *Recursivity and Contingency* affords us the philosophical notions that allow us to better grasp the materialist account of media, memory, and ultimately subjectivity at stake in the present inquiry.[17] Even though Freud and Engels remain unmentioned in Hui's historical and systematic attempt to understand recursivity beyond cybernetics and to appreciate its full philosophical significance, the resonance cannot be missed against the backdrop of what has been described above.

In standard technical terms, recursivity can be described as a function that is applied within its own definition. Hui defines recursivity as follows: "recursivity is a general term for looping. This is not mere repetition, but rather more like a spiral, where every loop is different as the process moves generally towards an end, whether a closed one or an open one"[18].
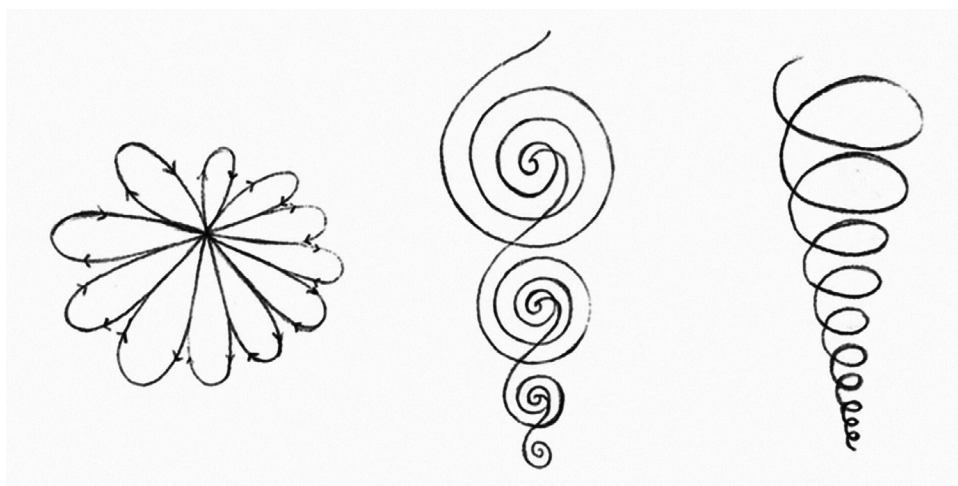
Sketches of forms of recursion as featured in Yuk Hui: *Recursivity and Contingency* (2019), p.10. In the center is Heidegger's diagram on Schelling.

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16   Adrienne LaFrance, "When Robots Hallucinate. What do Google's trippy neural network-generated images tell us about the human mind?" *The Atlantic*, September 3, 2015. https://www.theatlantic.com/technology/archive/2015/09/robots-hallucinate-dream/403498/
17   Yuk Hui, *Recursivity and Contingency* (London: Rowman & Littlefield International, 2019).
18   Yuk Hui, "Cybernetics for the Twenty-First Century: An Interview with Philosopher Yuk Hui." Interview by Geert Lovink, *e-flux journal*, no. 109 (September 2019). https://www.e-flux.com/jour-

For Hui, it is essential to distinguish recursivity from mechanical repetition:

> Recursivity is not mere mechanical repetition; it is characterized by the looping movement of returning to itself in order to determine itself, while every movement is open to contingency, which in turn determines its singularity. We can imagine a spiral form, in its every circular movement, which determines its becoming partially from the past circular movements, which still extend their effects as ideas and impressions. This image corresponds to the *soul*. What is called the soul is the capacity of coming back to itself in order to know itself and determine itself. Every time it departs from itself, it actualizes its own reflection in traces, which we call *memory*. It is this extra in the form of difference that witnesses the movement of time, while at the same time modifying the being that is itself time, so that it consequently constitutes the dynamic of the whole. Every difference is a differing, deferring in time and a being different in space, a new *creation*. Every reflective movement leaves a trace like a road mark; every trace presents a questioning, to which the answer can be addressed only by the movement in its totality[19].

A mechanical mode of operation relies on linear causation, and an unforeseen event may lead to the collapse of such a system (e.g., a malfunction of one part causes a breakdown of the whole mechanic apparatus). In a recursive process, however, contingency is necessary since it enriches the system and allows for development. Incidentally, this is the case for both living organisms and today's machine learning. Here Hui's vocabulary shows its closest proximity to Freud's and Engels's theoretical endeavour, which can be put in the context of the dialectal materialism of the trace mobilized by Krämer that pits itself against a vulgar body-mind dualism:

> Recursion is both *structural* and *operational*, through which the opposition between being and becoming is sublated. Sublation preserves the oppositional theses (thesis and antithesis), and it also elevates them to comprise a third (synthesis). Being is preserved as a dynamic structure whose operation is open to the incoming of contingency: namely, becoming. […] The opposition between the body and the mind, as well as the concepts of evolution and development in biology, also involve a failure to understand structure and operation, since they all attempt to substantialize[20].

Freud had felt the need to take recourse to a technical and mechanical apparatus of the mystic writing pad to give an account of memory, whereby the psyche itself is understood as an apparatus. However, the concept of facilitation or path-breaking complicates the picture and remains in an unresolvable

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nal/102/282271/cybernetics-for-the-twenty-first-century-an-interview-with-philosopher-yuk-hui

19   Hui, *Recursivity and Contingency*, 4 Emphasis in original.
20   Hui, *Recursivity and Contingency*, 4–5.

tension with the linear mechanistic mode of operation implied in the analogy—at his time, Freud simply had only a linear mechanical understanding of technology at his disposal. The revolutionary import of the concept of facilitation, one could argue, is coextensive with its allusion to an, albeit not fully articulated, notion of recursivity. Much like in Engels's structural emergence, the old danger of materialism is thereby held at bay: the familiar threat of determinism that haunts materialism from the very origin of its conception, at the very latest since La Mettrie's *L'Homme Machine* (1747).

The memory of the apparatus—memory *as* apparatus—the apparatus *as* memory: These are the constellations that speak to the intricate twist and intertwining between structure and operation—between being, doing, and becoming. The *longue durée* of the entanglement of man and technology is the object of Hui's former teacher Bernard Stiegler, who speaks of the dual invention of man and tool on an anthropological timescale. In *Technics and Time I* (1994), Stiegler argues that the genesis of technics is not only co-constitutive with the genesis of what is called "human"—but with temporality as such. Man and technics are indissociable insofar as hominization is the phenomenon of the technicization of the living. Despite the structural forgetting of technics at play in this long history starting with the earliest humans and their ancestors, man is nothing other than a diffraction through technical life. Though one immediately needs to add that for Stiegler the human is technical but not equal to technics. The variation of the notion of the human itself stands in a differential—and hence non-deterministic—relation to technics).

An "archaic technical evolution" can be traced alongside the archaic evolution of the human, an evolution that is no longer exclusively genetically programmed. A decisive differentiation in the development of life emerges: "the pursuit of the evolution of the living by other means than life."[21] Unlike a sci-fi imaginary fantasizing about the arrival of an "artificial intelligence" in the future, Stiegler's conception elaborates the past of human consciousness as always already artificial by way of "the technological rooting of *all relation to time*."[22]

A conception of time implies memory. And to have memory, one needs technics, so Stiegler argues. But for Stiegler, this does not mean that before a human conception of time there was no memory. In fact, there were already two systems in existence to preserve what has come to pass—that is: (1) genetic memory materialized in the DNA and (2) memory of the individual organisms, stored in the nervous system. Even though both forms of memory exist in all superior vertebrates, they do not communicate with each other and are completely autonomous. When the individual dies, all its accumulated memory is lost. After technics appears, the situation changes. Even in the most archaic stone tool, a transmission is made possible: the recording of the gestures that created the tool *in and as* the very tool itself. Traces

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21   Bernard Stiegler, *Technics and Time I* (Standford: Stanford University Press, 1994), 135.
22   Stiegler, *Technics and Time I,* 135.

of individual experience are preserved for life and become trans-individual traces, transmitted to the next generation. We find here the source code of what we call "culture"—the conservation of the past of a social group through material records. In essence, for Stiegler, technics is a memory-support, or even more radically: the inauguration of memory *as* memory—of transcendentality proper. Technics is the condition for establishing a relation to the past (and future).
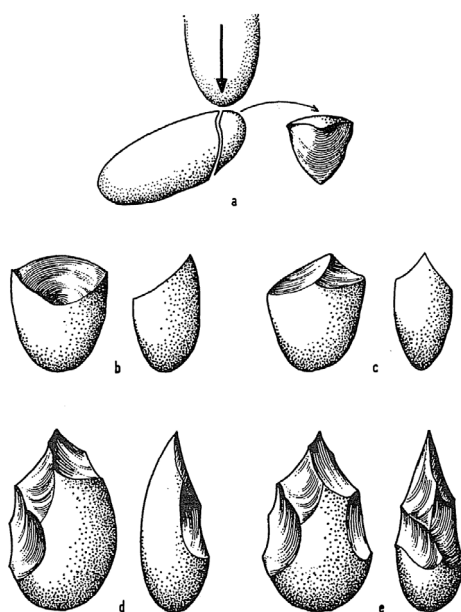
46. Industry in the first stage. The operating sequence is confined to a single action (a) used to produce a tool that develops from the chopper (b) to the rudimentary biface (e) through the addition of points of impact and the fashioning of a tip (c, d).

André Leroi-Gourhan, *Gesture and Speech* (1993), p. 93.

A central term for Stiegler's argument is what he calls the "mirror proto-stage." The "mirror" here denotes a particular relation between the cortex and the tool—a relation in which "one, looking at itself in the other, is both deformed and formed in the process"[23]—a *recursive* structure. The image of the mirror Stiegler employs not only illustrates the reciprocal entanglement of technics and the human, but also serves to explicate a need to grasp a fundamental paradox or aporia at the bottom of the human-technological constellation. In structuralist terms we could articulate this paradox as a situation in which a *relation* has the primacy over the *relata,* where a relation has precedence over the things that are related. In Stiegler's "mirror proto-stage," this paradox is concretely elaborated in two registers: space and time, as the dynamics of "externalisation" and "anticipation". (1) An exteriorization without

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23   Stiegler, *Technics and Time I,* 158.

a preceding interiority: "the interior is constituted in exteriorization."[24] (2) The anticipation at *work* before the making of the tool, is only possible after—*through* the tool.
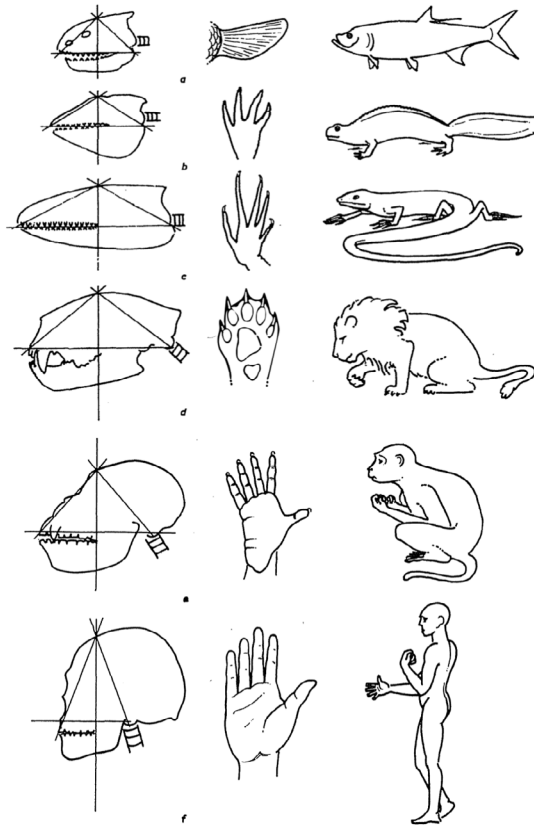
André Leroi-Gourhan, *Gesture and Speech* (1993), p. 38/39.

Stiegler coins the term *Epiphylogenesis* to describe the specificity of this third kind of memory formation. Technological memory of man is epi-phylo-genetic in the sense that it is the conservation, accumulation, and sedimentation of successive individual epigenesis (*epi*) and at the same time recapitulating, dynamic, and morphogenetic (phylogenetic).[25] The preservation of previous epigenetic experience in technical objects is what defines the human. Man is defined by *a past that he himself, as individual, has not lived.* As a quasi-Lamarckian theory of "artificial selection," e*piphylogenesis* describes how successive epigenetic experiences are stored, accumulated, and transmitted from generation to generation—however, *not* in

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24   Stiegler, *Technics and Time I,* 141.
Stiegler follows as well as critiques here the argument of the paleoanthropologist André Leroi-Gourhan: The liberation of the hand during erect locomotion frees the face from its grasping function by establishing an *originary distance*. The free hand will necessarily call for tools as moveable organs and subsequently for a language of the face. Mental interiority springs out of this differentiation of man as an originary psycho-physical complex in which the tools as "pros-thesis is what is placed in front, that is, what is outside, outside what it is placed in front of. However, if what is outside constitutes the very being of what it lies outside of, then this being is outside itself. The being of human is to be outside itself" Stiegler, *Technics and Time I,* 193.
25   See Stiegler, *Technics and Time I,* 177.

the genes or in the individual nervous system (therefore precisely only *quasi*-Lamarckian), but in the form of technical objects.

Stiegler phrases this in explicit materialist terms, as "the appearance of a new relation between the organism and its environment which is also a new state of matter."[26] Here, the *individual* (organic, organized matter) is mediated with the *environment* (matter in general, organic, or inorganic) through the *tool*—that is, *organized but inorganic matter* as *organon*. The ambiguity of the "who" and the "what" implicit in this relation (Who or what invents? Who or what is invented?)—that is, binding the two while keeping them apart—is *différance*. One is inclined to read Stiegler here as attempting to do something similar to what Friedrich Engels tried to do in his *Dialectics of Nature*. Much like Engels, who attempted to apply Marx's dialectical materialism to nature, Stiegler could be read as attempting to perform an analogous gesture regarding Derrida's deconstruction, producing something like a différantial materialism—*Différance of Nature*. *Différance* denoting not an origin or foundational principle, but to an always already operative, albeit impossible to grasp, (spatial) differing and (temporal) deferral: "There will have been nothing at the origin but the fault, a fault that is nothing but the de-fault of origin or the origin as de-fault." [27]

The passage of life in general into humanization consists precisely of the conservation and accumulation of events that have come to pass. In non-artificial, non-technical, non-articulated life, the memories of an individual are lost with the passing away of the individual who was their support. In another turn of "différantiation" already at work in *phusis* as genetic memory (DNA) and epigenetic memory (the memory of the central nervous system), technological memory (technics & language via exteriorization and temporalization) comes about as the *inorganic organization of memory*.

Whereas Stiegler is concerned with an anthropological question and its human-technological loops, Hui elaborates the theoretical and epistemological breaks instantiated by the development of a notion of recursivity. Against this backdrop one might ask about the role of contemporary technological development in machine learning and artificial intelligence already referred to in the example of Google's DeepDream algorithm.

Catherine Malabou, in a recent conversation with Hui, highlights the current epigenetic turn in neurology, by which the brain, far from being a rigid structure, is being understood in its profound malleability as it undergoes continuous changes and rewiring.[28] These new insights into the brain's neuro-plasticity not only provoke a change in the definition of the brain and intelligence, but, more

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26   Stiegler, *Technics and Time I,* 177.
27   Stiegler, *Technics and Time I,* 188.
28   Catherine Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips," Research Network for Philosophy and Technology, October 14, 2021, video, https://www.youtube.com/watch?v=8J235FFSO2A

importantly, also resonate with the most recent achievements and developments in cybernetics and AI and their effects down to the very material components of computer hardware.

Malabou discusses how an older gene-deterministic paradigm has been weakened at least since the first virtually full decoding of a human genome in 2001, which revealed that only a fraction of the total set of genes are actually actively coding—separated by vast chunks of "gene deserts" or "junk" lying inactive. This in turn gave further importance to the field of epigenetics, the study of gene expressions by way of mechanisms of gene activation or silencing. When it comes to neurology, the brain revealed itself to be more than just the reflection of our genes. Simply put, there are "too many synapses and not enough genes."[29] Since epigenetic changes in gene expression do not involve changes in the underlying gene sequence and vary depending on non-predictable external and internal influences, "the DNA seems analogous to a book or musical score while the epigenetic mechanism works like a selective reading or interpretation."[30] In fact, the brain's epigenetic nature illustrated by these humanistic metaphors was taken as an argument to prove its irreducibility to technology/cybernetic/robotic processes. For Malabou the discovery of epigenetic cerebral plasticity spoke to "the intermingling of the biological and the symbolic,"[31] which came to be understood as radically different from technological functioning—supporting the idea that the brain has a "self" unlike the machine.

However, recent developments in AI and cybernetics woke Malabou up from her self-described "dogmatic slumber."[32] A new generation of chips "mimic the human brain" by simulating its neuron-synaptic dynamics by employing the processes of facilitation and path-breaking described above. First developed in 2011 in IBM's *syNAPS project* (short for: "systems of neuro-morphic adaptive plastic scalable electronics"), these systems are able to change their programming as they adapt and rewire their synapses based on their inputs. As such they distinguish themselves from previous computer chips which execute instructions in linear sequences. In the new neuro-morphic systems, "different cores function autonomously, in a non-synchronized way. Those who are not solicited remain inactive." The "electronic-synaptic components are capable of varying connection-strength between two neurons, very much analogous to the brain […] as the system develops its own specific 'experience.'"[33] The chips continuously learn due to their synaptic plasticity, resulting in smarter, more-energy efficient systems. The deep learning at work here, argues Malabou, is "more akin to epigenetic than genetic development": a qualitative shift rather than quantitative shift (as CPUs are not just getting ever faster). We are entering an "uncanny valley of intelligence,"[34] where not just the physical appearance of robots

29   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."
30   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."
31   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."
32   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."
33   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."
34   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."

is similar to that of humans, but the cerebral resemblance between the human brain and synaptic computer is a cause of unrest.
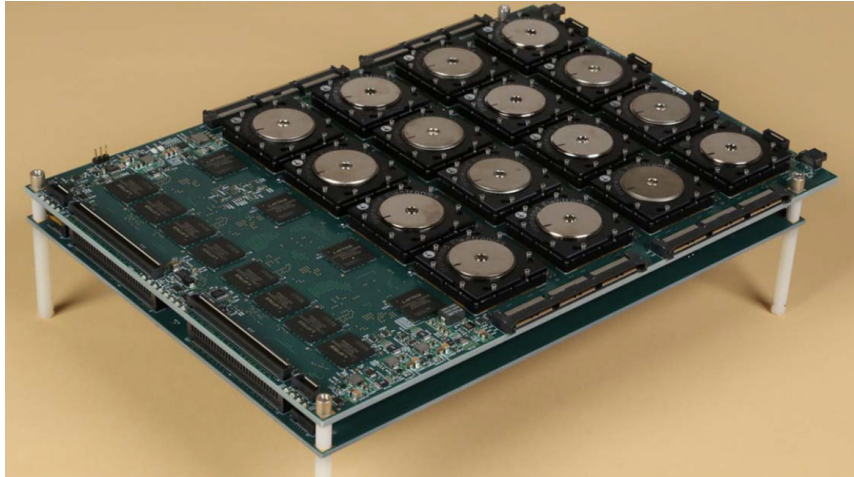
Circuit board with array of SyNAPSE-developed chips, 2014.
Image source: Wikimedia Commons.

For Malabou, these chips call upon philosophers to revisit and rethink a specific concept that still organizes the discourse of human-machine interaction, a notion epitomized by the original advertisement of and reporting on the new technology: *mimesis.* However, for Malabou the traditional notion of mimesis is insufficient for capturing the situation at stake here, as it remains attached to the old problem of the relationship between *phusis* and *techne* or nature and art. Malabou describes two decisive moments in the history of the concept: (1) The Platonic moment, where mimesis describes "a problematic of copying and reproducing, revolving around an understanding of art as fine art (painting, sculpture, poetry etc.)." Here, artists use the "intentionally deceiving technics of copying and reflecting, which blur the distinction between the actual/natural and its image."[35] (2) In the more complex Kantian moment, art is understood as a creation of a genius who finds inspiration in nature, not in order to copy or plagiarize the latter, but to interpret and reinvent it. Art does not operate via a purely mechanical reproduction ("*Nachmachung*") but rather produces *free* imitations ("*Nachahmung*"), by extension of which it achieves a level of freedom. However, art is produced by and through a genius that is itself "a gift from nature." Genius, as a gift of nature, stems from the very substance from which its art takes inspiration. In a reflexive turn, the "secret resources of mimesis" in Kant turn out to be *the mimesis of nature by itself:* "a reflection of the physis, nature's relation to itself"[36] as Malabou quotes Derrida's reading of Kant. "Mimesis is, in reality, nature's relation to it*self*," and art therefore helps the creation of *a self of nature* —"art thus makes something like a self of nature emerge."[37] For Kant Technology is excluded from this realm, because

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35   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."
36   Jacques Derrida, "Economimesis," trans. R. Klein, *Diacritics* 11, no. 2 (1981): 4.
37   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."

technology is purely mechanical. Living beings are organized like works of art: they are plastic and free productions of nature precisely in the sense described above, whereas a technical mechanism is not. In a clock, for example, one part is there for the sake of another but not because of it. In the former, parts work together "but are not self-created—they depend on external causes (the machine maker), whereas in living beings, parts, in a certain sense, create each other"[38]—through a process of reflexive self-relation that we could characterize as a recursive movement.

According to Malabou, the recently developed synaptic chip is a technical artifact that defies this Kantian (as well as the Platonic) framework. The new chips, like mechanic clocks, do indeed depend on an external engineer, but their "internal regulations and cybernetic processes are 'their own', so to speak."[39] The new systems are able to redesign their own functioning and, as neural networks, create their own processes through repeated exposure and recursive alteration that mold them in unique ways. Malabou's question is therefore: Are we witnessing an emergence of "a self of technique"? And answers: "Perhaps machines do not have a self, *but* they have a relationship to them*selves*."[40] This looping of technology onto itself is a dimension that is not captured by the old notions of mimesis. AI does not just consist of an imitation of natural intelligence or nature's relationship to itself but of the "relationship of the *technology* to itself."[41] These phenomena are not just new versions of fine art (nature's relations to itself) but express a dialectical shift from quantity to quality: a certain imitation of a natural brain in synaptic chips through which "a relation of the technical system to itself also emerges and which breaks with the paradigm of the imitation of nature."[42] Of relevance is not only the relationship of machines to nature— but, in a further recursive loop, also, in Malabou's words, "the nature of the relation to this relationship to nature." Not just a free imitation ("*Nachmachung*") of nature's relationship to itself but "the production of an artificial self through the '*Nachahnumg*' of this relationship—a technological authentic mimetic self."[43] Malabou asks: "Are we dealing here with a new form of epigenesis? An auto-affection of technique by itself?" And responds: "Just like nature mimics itself through art, it seems that technology today mimics itself through nature"[44].

To return to Hui and the dialectical materialism of Engel's Marxist critique in the final section of this paper, one should note, via Stiegler, Malabou and Hui, the disjunction between the accelerating technical development described above and the discourse about these phenomena, exemplified by an outdated concept of mimesis and an inadequate understanding of technology as an instrumental tool exclusively operating in a linear mechanic fashion. For Hui, contemporary capitalism has already

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38   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."
39   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."
40   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."
41   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips.".
42   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."
43   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."
44   Malabou, "Epigenetic Mimesis: Natural brains and synaptic chips."

changed from a mechanistic mode of operation to a recursive one:

> In the time of Descartes, and later Marx (who described human-machine relations in the factories of nineteenth-century Manchester), automated machines performed homogeneous, repetitive work, like a clock. As Marx wrote, a craftsman-turned-factory-worker failed to cooperate with this kind of machine on both a psychological and somatic level because a machine enclosed within itself is a separated reality. Marx attributed this failure to alienation. In our time, however, automated machines are no longer based on the same epistemology. Rather, they are recursive—capable of integrating contingency into their operations."[45]

For Hui, the centrality of recursivity in the contemporary machinery is not fully addressed, so much so that a certain philosophical "organicism is still regarded as a remedy to industrialism today, even though the actualities of machines and industry in the twenty-first century are no longer the same as they were hundreds of years ago."[46] In such a situation, "Philosophy has to negate the totalizing tendency in organic thinking, which is in the process of being implemented in different technical apparatuses, from social credit systems to the 'superintelligence.'"[47] What has once been mobilized as an antidote against the alienation of the automated machines has become a mode of operation of the machines themselves.

However, already in the (late) Marx we can find a critical awareness of a recursivity and mechano-organicism that Hui sees neglected in a certain romantic discourse about machines and alienation. In *Capital Vol. 1*, Marx develops the general formula of Capital (M-C-M') precisely as a recursive loop in which every iteration creates a surplus that spirals beyond a simple return to a beginning, as is the case in the basic forms of circulation (like in the commodity circuit C-M-C or in the money circuit M-C-M). And it is not without polemic agitation that Marx describes capital as an "automatic subject,"[48] constantly changing from one form into the other, without becoming lost in its movement. Capital as self-valorising value is nothing but this recursive movement that "brings forth living offspring, or at least lays golden eggs."[49] The Marxian analysis of capital's self-differentiation, self-valorisation, and compulsion to repeat is akin to the psychoanalytic insight into the functional and emerging structure of the subject—a peculiar object which is constantly "on the move" while nevertheless remaining the same, an entity constitutively de-centered and entangled with a symbolic order that predates the individual as a machinery of meaning that is both its most intimate and most external (Lacan creates the term "extimicy" to describe this situation). What is at stake in both Marxism and psychoanalysis is

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45   Hui, "Cybernetics for the Twenty-First Century."
46   Hui, "Cybernetics for the Twenty-First Century."
47   Hui, "Cybernetics for the Twenty-First Century."
48   Karl Marx, *Capital: A critique of political economy.* Vol. 1, (London: Penguin, 1990), 255.
49   Marx, *Capital,* 255.

an inquiry into *subjective character of the automaton* as well as the *automatic character of the subject*.

The materialist account of pattern-formations via processes of recursive facilitations delineated in this present paper allows for the re-articulation of a notion central to the Marxist critique sketched above: the concept of ideology. The critique of ideology is often misunderstood as a critique of appearances, as an unveiling of false images that supposedly mislead, cover up, or objectify an underlying reality. This interpretation gives rise to a set of structural problems regarding the epistemological possibilities and normative grounding of such forms of critique (see Habermas, Jaeggi et al.). The materialist account of pattern-formations elaborated here allows for an inversion that sidesteps such deadlocks: Such an approach does not primarily concern the question of how one can penetrate (false) appearances to reach an underlying reality, but rather how something like (false) appearances can emerge out of the "flat plane" of whatever is just there so much so that they are constitutive and operative in the field from which they emerge.

The terms "illusionary character" or "form of appearance" [*Erscheinungsform*] repeatedly used by Marx speaks to the particular kind of materialism that is fundamental for the Marxian project as a whole and is operative in at least three ways for his critique of political economy:

1) Marx shows why classic bourgeois economists are wrong, in the sense that their theories do not match objective reality. Here, Marx is scientific in the classical empiricist/positivist sense (*adaequatio intellectus ad rem).*
2) Why their theories take the form that they do, in the sense that they are the *necessary* expression of a reality that is, in fact, "wrong" (Ideology as "necessary false consciousness.")
3) And that capitalism as such is constituted by certain "appearances"— though very peculiar ones, with a strange ontological status, in the sense of the term "real abstractions" or "ghostly objectivity" at work in the commodity.

The alignment of psychoanalysis and Marx's critique more specifically enables us to understand capitalism as a social formation which both produces and is produced by certain necessary false appearances, that, albeit virtual, fictional, or abstract, nevertheless are of very concrete material character and potency. Marx's prime example of such "real abstractions" (Alfred Sohn-Rethel) is money, an emerging concrete "incarnation" of abstract value:

> It is as if alongside and external to lions, tigers, rabbits, and all other actual animals, which form when grouped together the various kinds, species, subspecies, families etc. of the animal kingdom, there existed also in addition *the animal*, the individual incarnation of the entire animal kingdom.[50]

A concept of recursivity and contingency brings into focus what is at stake in the infamous, because all too often vulgarized, base/superstructure model associated with the concept of ideology, according to which there is "real" material world of relations of production between bodies acting and a derivative and distorted world of the mind and culture that is determined by the former (recalling Krämers critique of body-mind dualism). Joan Copjec puts it concisely:

> The base/superstructure model makes the superstructure the mirror reflection of the base, its adequate, identical image. The base subsumes and names all the superstructural phenomena that are its products. It contains them so that the two, base and superstructure, together form a closed system. This model turns on the assumption that one presence directly effects another; the base, for example, directly effects the superstructure. The immediacy of the link makes the relationship indexical (as well as iconic). To say that there is an identity between two terms, two presences, is to say that nothing (no truth) has essentially been lost in the transfer from one to the other.[51]

The critical distinction of base and superstructure only makes sense if one understands it under the heading of a *process of facilitation* that accounts for the *emerging structures* in which the *contingency* plays an essential role, where a shift from quantity to quality gives rise to a self-perpetuating system of materially grounded appearances and abstractions that goes so far as to disguise its own potential mutability and plasticity through a process of traditionally called "reification."

One such account could be found in Alfred Sohn-Rethel who goes so far as to daringly suggest that the mental abstractions at the foundation of modern science are not a product of thought but a product of structural obfuscated concrete spatio-temporal action, an action that comes *before* thought—namely, the mechanism of exchange via money that becomes the dominant form of social synthesis in capitalism: abstractions are "in the head, but not from there." The bulk of Sohn-Rethel's argument rests on the implications of the concrete practice of commodity exchange: 1) The reduction of all positive material qualities in the act of exchange; 2) the fact that use and exchange values are mutually exclusive; 3) the immutability of the commodity during the exchange; and 4) its apparent transubstantiation.[52] This

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50   Karl Marx: *Capital* (1867 edition) [https://www.marxists.org/archive/marx/works/1867-c1/commodity.htm]
51   Joan Copjec, "The Anxiety of the Influencing Machine," *October* 23, (1982): 47.
52   See Alfred Sohn-Rethel, *Intellectual and Manual Labour: A Critique of Epistemology* (London: Macmillan, 1978).
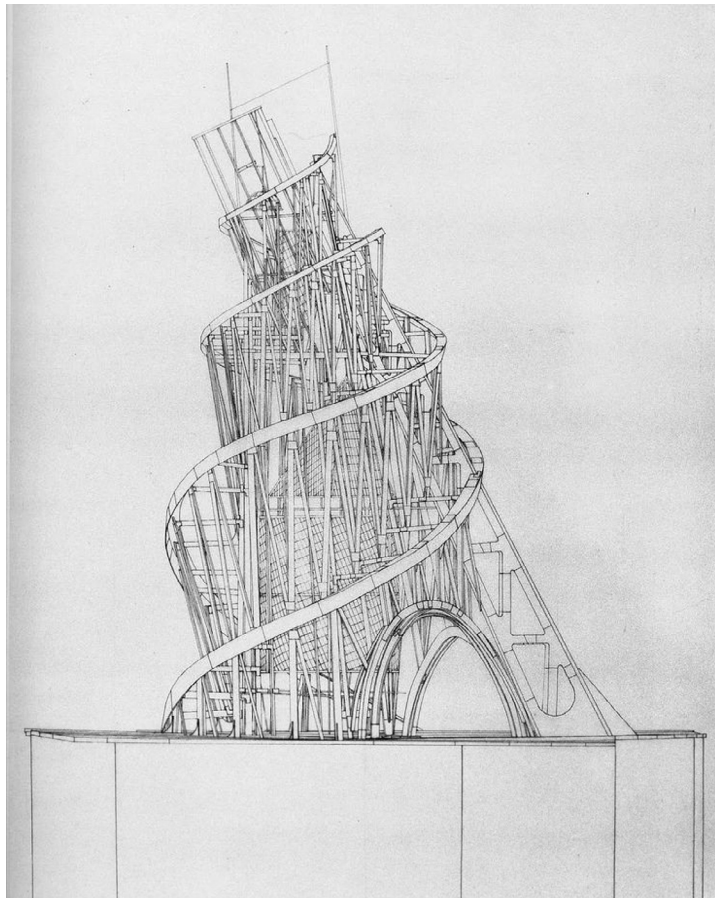
The spiraling architecture of the Tatlin Tower, project for a monument to the Third International (1919–20). Sketch by Vladimir Tatlin.

dynamic resonates with Stiegler's structure of the proto-mirror stage discussed above, where a relation has precedence over and constitutes the very things that are related. The term "real abstraction" marks a specific ambiguity operative in a capitalist mode of production regarding the distinction between the "who" and the "what": Who or what is abstract? Who or what is abstracting? What comes first, action or thought?

Capitalism produces its own system-immanent illusions and misconceptions, its own occlusion, structurally cloaking itself and facilitating the material conditions for its own reproduction, creating a second nature that is as real (and brutal) as the first— but also, as Marx wagers, melts what was solid into air and produces openings that may turn the spiral into a sprint that could allow for a jump to a different mode of production all together. It is the resonance between Freud's and Engel's accounts of pattern-emergence that helps us to pinpoint the specific materialism that is at stake both in psychoanalysis and Marxism, insofar as both disciplines underline that materialism involves the double effort to understand "the material character of abstractions and the abstract character of matter"[53]— that is the inherent twist, the loop that mediates between these two realms.

53   Samo Tomšič, "The swarming of semblances, or the 'ontological scandal' of language in Lacan," November 27, 2018, lecture at ICI Berlin. https://doi.org/10.25620/e181127/

References

Derrida, Jacques. "Economimesis." Translated by R. Klein. *Diacritics* 11, no. 2: 2-25. Baltimore: Johns Hopkins University Press, 1981.

Copjec, Joan. "The Anxiety of the Influencing Machine." *October* 23: 43-59. Cambridge, MA: MIT Press, 1982.

Engels, Friedrich. "Dialektik der Nature." In *Karl Marx and Friedrich Engels Werke (MEW)*, Vol. 20, 307-620. Berlin: Dietz, 1973.

Engels, Frederick. "Dialectics of Nature." In *Collected Works*, Vol. 25, edited by K. Marx and F. Engels, 313-590. New York: International Publishers., 1987.

Freud, Sigmund. "A Note upon the 'Mystic Writing-Pad.'" In *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, Vol. 19, 227-234. London: The Hogarth Press, 1925.

Freud, Sigmund. "Project for a Scientific Psychology." In *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, Vol. 1, 281-398. London: The Hogarth Press and the Institute of Psycho-Analysis,1950.

Hui, Yuk. "Cybernetics for the Twenty-First Century: An Interview with Philosopher Yuk Hui." Interview by Geert Lovink. *e-flux Journal* no. 109 (September 2019). https://www.e-flux.com/journal/102/282271/cybernetics-for-the-twenty-first-century-an-interview-with-philosopher-yuk-hui/.

Hui, Yuk. *Recursivity and Contingency*. London: Rowman & Littlefield International, 2019.

Krämer, Sybille. "Was also ist eine Spur? Und worin besteht ihre epistemologische Rolle? Eine Bestandsaufnahme." In *Spur. Spurenlesen als Orientierungstechnik und Wissenschaft*, edited by S. Krämer et al., 11-33. Frankfurt am Main: Suhrkamp, 2007.

LaFrance, Adrienne. "When Robots Hallucinate." *The Atlantic*, September 3, 2015. https://www.theatlantic.com/technology/archive/2015/09/robots-hallucinate-dream/403498/.

La Mettrie, Julien Offray de. *Machine Man and Other Writings.* Translated and edited by Ann Thomson. Cambridge: Cambridge University Press, 1996.

Leroi-Gourhan, André. *Gesture and Speech.* Cambridge, MA: MIT Press, 1993.

Malabou, Catherine. "Epigenetic Mimesis: Natural Brains and Synaptic Chips." [Video]. Research Network for Philosophy and Technology, October 14, 2021. https://www.youtube.com/watch?v=8J235FFSO2A.

Marx, Karl. *Capital: A Critique of Political Economy.* Vol. 1. Translated by Ben Fowkes. London: Penguin, 1990.

Sohn-Rethel, Alfred. *Intellectual and Manual Labour: A Critique of Epistemology.* London: Macmillan, 1978.

Stiegler, Bernard. *Technics and Time, 1.* Stanford: Stanford University Press, 1994.

Tomšič, Samo. "The swarming of semblances, or the 'ontological scandal' of language in Lacan." [Lecture]. ICI Berlin, November 27, 2018. https://doi.org/10.25620/e181127.

Weinrich, Harald. "Typen der Gedächtnismetaphorik." *Archiv* für *Begriffsgeschichte* 9, 1964.

Winkler, Hartmut. "Traces: Does Traffic Retroact on the Media Infrastructure?" In *Traffic: Media as Infrastructures and Cultural Practices*, edited by M. Näser-Lather and C. Neubert, 92-113. Leiden: Brill, 2015.