

SEEING STONES AND
SPACES BEYOND THE
VALLEY

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Noodiversity, technodiversity

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Elements of a new economic foundation based
on a new foundation for theoretical computer science

1.

The “question concerning technology” and the ordeal of truth

Whoever we are, we all today face the “question concerning technology”¹ – and now (29 March 2020), we face this question in the experience of being confined by a pandemic. Confinement confronts us directly with our way of being simultaneously alone with our “connections” and collectively “connected,” and the pandemic opens up in an immense way the question of the exosomatic factor – in the sense of what Alfred Lotka called “exosomatic evolution” (192) – in the pathology of the biosphere-cum-technosphere.

We should very carefully reread Georges Canguilhem’s *The Normal and the Pathological* from this standpoint, through which we may finally begin to realize that “biopolitics” is above all a technopolitics, that is, a politics of noetic life in so far as it forms, with animal and plant life, but also with bacteria and viruses, a very singular archipelago, which with the Digital Studies Network we have called the archipelago of the living.

Before the pandemic, all of us were more or less in the midst of an encounter with the *Frage nach der Technik*, due to the consequences of one fact: computational technology has overturned our ways of life – by being concretized in myriads of “apps,” services, data-bases, in software and in algorithms, centrally controlled by a few platforms based mainly in two countries.

This concretization (in the Simondonian sense) led an associated techno-geographical milieu (Simondon, *On the Mode* 57–58; Stiegler, *Automatic Society* 22)

1 Including (and even usually) by denying it, by default, this denial and this default being symptoms of the extreme urgency of the question.

to be established in which the **element** is no longer, as in the case of the Guimbal turbine studied by Simondon, tidal waters, but rather the “human resource” provided by individuals, who have become “inforgs” (Floridi), and who, in so doing, individually and collectively constitute the functions of a reticulated planetary exorganism that is extraordinarily vulnerable and dangerously dependent.

In the future, computational technology is likely to bring yet further changes to ways of living (and not just to lifestyles). A reconsideration of its functions, shortcomings, limits and dangers must be placed at the heart of the debate concerning what we want the nature and culture of the post-pandemic world to be, but also and equally, the post-data-economy world, given that the data economy, based on an exploitation of machines and through them of the people who serve them, is skewed towards the abyss into which it is rushing: entropy.

2. Virology and virulence: the new dispute

This change over the last twenty-seven years brought by generalized reticulation (which in February 2019 involved 4.4 billion earthlings, according to Amsili and Maussion) mostly presents itself as a series of increasingly inextricable problems, to which are now added the problems of virology – and therefore of virulence, from the Latin *virulentus*, which initially meant “venomous, poisonous.”

It is from this point of view that we should read Jean-Luc Nancy's response to his friend Giorgio Agamben, when the latter accused states of using “something not too different from the normal flus” as a pretext for perpetuating a state of exception:

“the exception is indeed becoming the rule in a world where technical interconnections of all kinds (displacements, transfers of all kinds, absorption or diffusion of substances, and so on) are reaching a hitherto unknown intensity that is growing along with the population. In rich countries, too, this increase in population entails a longer life expectancy, and thus an increase in the number of elderly people and, in general, of people at risk.

We must be careful not to hit the wrong target: an entire civilization is in question, there is no doubt about it. There is a sort of viral exception – biological, informational, cultural – that for us becomes pandemic. Governments are nothing more than grim implementers, and attacking them seems more like a diversionary manoeuvre than a political reflection. (Nancy; translation modified)”

If there is indeed a state of exception, Nancy replies to Agamben, it is “a sort of viral exception.” These lines contain the expression of an **ordeal of truth** with regard to the **question concerning technology** – and with regard to the relationship between technics and life.

I would like to show here that:

- the challenge for thinking, especially after the pandemic, is and will always be to transform the problems posed by technics – become technology – into questions, that is, to turn technics into the object par excellence of thinking;

- the question of the exception is indeed essential, at once central and peripheral, and must be considered not just with Carl Schmitt, Walter Benjamin, Martin Heidegger and Michel Foucault, but with Vladimir Vernadsky, Georges Canguilhem and Alfred Lotka, and as the question of the relationships between entropy, negentropy and what Giuseppe Longo and Maël Montévil call anti-entropy;
- in the case of the noetic form of life, the question of anti-entropy must itself be transformed, from the exosomatic standpoint developed by Lotka, into that of antianthropology, by reconsidering the human fact from the perspective of a neganthropology;
- ultimately, and as a new foundation of political economy on a technospheric scale, as well as a critique conducted *from* this scale, which is also cosmotechnical, these questions, which are both conceptual and ideal, must be explored via a re-evaluation of the role of computer science [*informatique*] and cognitivism in the neoliberal apparatus, which has now become ultraliberal and libertarian; these questions require, from the basic sciences as well as from philosophy, economics and law, a new foundation for theoretical computer science – in the service of an anti-anthropocentric and neganthropological conception of the functions of machinic and automated calculation in the reticulated societies of the technospheric era.

This is why I am not sure that I fully share Jean-Luc Nancy's point of view when he posits without further specification that, in relation to what he calls the "viral exception," governments are "nothing more than grim implementers, and attacking them seems more like a diversionary manoeuvre than a political reflection."

If it is obviously not a question of "attacking" anyone (as Nietzsche warned us long ago), we must nevertheless be aware that this kind of crisis of pharmacological virulence, and in that way of virology in exosomatization, will certainly not spare us from a regression precipitating the potential (murderous) "evil" of resentment towards scapegoats, which we can struggle against only by forging the weapons of a new critique (of scientific power, technological power, economic power and political power – and therefore of governments, and those who serve them, directly or indirectly).

3. Changing pansements to re-found theoretical computer science

What is at stake here is precisely the struggle against this regressive tendency, where:

- it is firstly a question of knowing the extent to which such a tendency can affect and infect a thought that claims to distance itself from this type of virus² – a question that is part of what I have called the careful thought [*pansée*] of noetic bandages [*pansements*] that always end up themselves getting infected (Stiegler, *Qu'appelle-t-on panser?* 1);

2 This is what was studied in Stiegler, *Pharmacologie du Front national*, which unfortunately has not been translated into English.

· it is at the same time a question of developing a new political reflection that challenges and calls into question (like the noetic treatment or bandage [*pansement*] that any form of philosophical thinking must always be) these governments, both upstream and downstream of these problems, and that challenges them and calls them into question – along with the economic powers that support and manipulate them – along with all those who have been in solidarity with them, from near or far, directly or indirectly, both positively and negatively.

Being in “negative solidarity” means participating in the role-playing of good guys and bad guys, who are “as thick as thieves” in that all of them want to be part of the same show – so as to change nothing, neither the cast nor the script, instead merely rearranging the sets and the staging. It is this spectacle that generates what are called “postures.”

Being compromised in this way – which it is not a matter of seeing as the corruption of the bad guys, but rather as a particularly thorny problem of noetic pharmacology, and where this is a problem that we all negatively and intermittently fall into³ – is something that concerns everyone, but more particularly concerns those professional thinkers that academics are in principle.⁴

In principle, academics bear in principle (that is, at the scale of a principle) the universal, and, in the name of this principle – namely, that of a profession, which, as a profession of professors, is necessarily always a “profession of faith” – they contribute (in principle – from the *arkhē*) to society (of which “governments” are a key dimension: that of decision) being gripped by what, through the problems that a society and a government encounter – including *the problem of a universal that always tends to become hollow, and thus to serve as an argument against the diversal*, which is also the local or peripheral (which is also to say, the plebeian, the Gilet Jaunes, migrants, and so on) – this professorial and academic body establishes as questions.

The problems that this society encounters are first of all the problems that it provokes, as a whole and through its contradictory behaviours, which are also dynamic contradictions – of positions and interests, that is, classes – where academic thinkers, who are in this respect “functionaries of humanity,” must be able to constitute these problems as established questions (and here, where the question of the established arises, it is not at all a question of restoring a figure of “mastery” constitutive of “modern metaphysics,” as every heir of Jacques Derrida tends to believe spontaneously with an atavistic and parochial attitude – that is: they tend to do what in French is called “hiding behind one’s little finger”).

Theoretical computer science has been abandoned by careful thinking [*pensée qui panse*], and more particularly by European philosophy, “French theory,” the heirs of Marxist thought and psychoanalysis, with the exception of Félix Guattari.

3 This remark is a response to a question from Paolo Vignola.

4 It would be at once indispensable, long, very difficult and no doubt sometimes very painful to delineate this “near” and this “far” in their countless nuances within this very compromise, whose sense here is not moral but epistemic. This question, which I outlined in Stiegler, *States of Shock*, and took up in the works that followed, fundamentally involves a reinterpretation of both what Marx posited at the beginning of *The German Ideology* and in the *Grundrisse*, and the question of *Gestell* in Heidegger – a question about which Derrida, as far as I know, always remained strangely silent.

That this specific dimension of our time has been abandoned to the ideologues of neoliberalism, who hide behind their computational pseudosciences based on a confusion of science and quantification (and which are cognitivist in this sense), is due, at the same time, to the fact that:

- philosophy no longer practises
- mathematics; mathematics has tended to merge with mathematical physics, and through that with an obsolete yet hegemonic mechanism, something that Husserl already identified in *The Crisis of European Sciences* as a tendency dating back to algebraization;
- these forms of mathematics inspired by mathematical physics and applied via algorithms have been appropriated by a rudimentary and even destitute cybernetics, by an information theory that is merely a *bricolage*, and by a use of technics that consists above all in eliminating

This amounts, then, to a way of taking up the *Frage nach der Technik* – and this is what I will attempt to do in what follows, as a way of opening up a dialogue with Yuk Hui, and, through him, between what used to be called the West (which now consists only of ruins under a setting sun) and what is still and more than ever called China.

4.

The entropic orientation of the capitalist stage of exosomatization and the failure of philosophical engineering

In the conceptual framework that I have tried to develop over the past decade, the problems caused by technology raise questions about the pharmacology of exosomatic organs at different scales (shifts of scale, based on relations of scale, presuppose distinctions between levels, which constitute the various scales of locality ranging from the cell to the biosphere, and to the exosphere that now surrounds it, constituting the technosphere through this ring by which life and humanity find themselves encircled – like the iris and the pupil of a tired cyclopiian eye).

The change in our ways of living, effected through the generalized digitalization of existences that today occurs in all dimensions (and this totality itself raises an immense and immensely new question), this change, whether already accomplished or yet to come, seems to be skewed, one-sidedly oriented, in a sense that each day seems increasingly inevitable and damaging: this one-sidedness is that of entropy.

Digital change, which has now been concretized as a process of *planetary reticulation* (see Longo) dominated by network effects, and therefore herd effects, and hence by virality (as “memes”⁵ and “mimetic desire”⁶), proves day after day to be ever more disappointing, and each day contains less of the hopes that had

5 In Richard Dawkins's sense.

6 In the sense in which Peter Thiel appropriated this notion put forward by René Girard.

been aroused – over the course of about two decades (roughly between 1985 and 2005).

These hopes, which now appear instead to be lost illusions, first emerged in the restricted circle of free software designers – an organization of developmental work (developing coding) based on sharing the knowledge formed through these activities, completely different from the classical model of the industrial division of labour (and on the basis of a new intellectual property right), with principles forged around 1985 at Berkeley and MIT. (Only André Gorz really saw the fundamentally new character of this organization of industrial work, after two centuries of the hegemony of the industrial division of labour as analysed by Smith, then Marx, then Durkheim.)

Ten years after the interventions of Richard Stallman led to the Free Software Foundation, which will bear the seeds of a philosophy of right in some way based on “philosophical engineering” (an expression notably used by Tim Berners-Lee⁷), these hopes became much more widely shared with the public launch of the World Wide Web – which would also generate the “tech bubble” and the speculative “madness” of Nasdaq.

All of this, however, will turn out to be the *preliminary* basis for a *movement to automated financialization*, initially launched in the early 1970s with the aid of Bernard Madoff,⁸ which undoubtedly originally contributed to the process of financialization that itself paved the way for the new wave that would be known as “neoliberalism” and the “conservative revolution.”

These “hopes” of escaping from, on the one hand, the condition (in the Arendtian sense) of a “one-dimensional man” resulting from the culture industries and from the age of *Dummheit* specific to what Adorno and Horkheimer called barbarism (xiv), and, on the other hand, from the establishment of a cybernetico-nuclear age that appropriates the potential contained in the decentralization of networks and the editorialization of the World Wide Web based on feedback loops and a computational regime of recursivity, and of what I more generally call recurrence⁹ – these hopes would begin to decline, and in hindsight to become dangerous illusions, when social networks, combined with smartphones, began to put an end to the social web, also called the Web 2.0, and more generally to the logic of the web itself.

Let us make clear, here, that the Ars Industrialis association was set up above all by positing the *inherently pharmacological* character of these technologies, understood also as new stages of the process of grammatization, after those that struck the West (and struck its coins and founded its markets), on the one hand as linear writing, and on the other hand as mechanical grammatization (making possible automation). Let us also note that it was by combining these achievements with the Chinese technologies of printing, maritime navigation and explosives –

7 Not without problems.

8 The Nasdaq is both an index and the organization of an automated market, whose president from 1990 to 1993 was Bernie Madoff, later sentenced to 150 years in prison, and one of the founders – as early as 1971 – of automated trading quotes.

9 Recurrence is the dynamic principle of what I call the idiotext. On the general notion of recurrence, see Stiegler (Technics and Time, 3 144), and, on the idiotext, see Stiegler (Technics and Time, 2 64, 243; “Postface” 862–68).

making possible primitive accumulation – that the modern West was able to impose its global domination on a world that was on the way to becoming a technosphere (and is now in the process of de-Westernization).

The “end” of the “social web” began with the appearance of smartphones and social networks and was subsequently combined with the 2008 financial crisis, which led to an intense acceleration of “platformization” (Daniel Ross, “Carbon and Silicon,” in Stiegler and the Internation Collective, ch. 10). Becoming thus disillusioned, these hopes were then massively instrumentalized by the libertarian/transhumanist movement – thus continuing the mutation of neoliberalism after the Thatcher–Reaganite conservative revolution that defined the end of the twentieth century, a mutation concretized through the process of “smartification” described by Evgeny Morozov.

5. Dystopias and improbabilities

More or less consciously – and more or less overwhelmed – we all believe that this becoming, which seems bound to become more “dystopian” every day, unless something utterly improbable happens, will continue ever more systemically, and therefore more inevitably: until the break [rupture]. And we all wonder whether this viral archi-event will not in one way or another turn out to be this rupture – which would not, obviously, necessarily be good news, unless it can be turned into a massive reinvention.

The dystopian character of the current state of affairs with respect to digitalization is due to what Geert Lovink calls “platform nihilism” – and to what we at Ars Industrialis have called “net blues” (Stiegler, *Automatic Society* 13). As for the meaning of “break” with regard to the pandemic, we can all understand that it is an opportunity to renew the “shock doctrine” (Klein), foreshadowing a new leap towards the totalizing radicalization of the reticular and technospheric Leviathan. What precisely would this doctrine be, if it exists, and what would be a counter-doctrine?

According to my own earlier analyses, we should firstly ask here: what does improbable mean in the era of the hegemony of probability calculations? The improbable is diversity – in this case, biodiversity, noodiversity. The probable (which is always relative to the most probable¹⁰) is the entropic tendency towards the elimination of the diverse. But the improbable is also the unexpected, the unforeseen, the “black swan,” which is also to say, the flaw at the origin of a possible collapse.

The feeling of being overwhelmed derives above all from this obvious fact: the world in which we live is based on calculation, and calculation has itself become hegemonic with informational machines – such that information is functionally calculable – where the hegemony of calculation achieved by conceiving information in this way (as the result of a calculation) amounts to the elimination

10 A relativity from which it can deviate locally and temporarily, as, for example, a probability constituted by an order or an organization.

of the diverse, that is, of the beneficial improbable that alone is capable of deferring the multiplication of unforeseen, toxic improbable events.

Calculation, which cannot calculate everything, contrary to what the operators of “soft totalitarianism” strive to impose through their totalizations, generates that unforeseen against which only diverse improbabilities protected from calculation could prove resilient. This is the starting point of a proposal to relaunch research into theoretical computer science – whose central argument, however, will not be presented here, though it is based on analyses partly summarized in a text entitled “Capitalism as Epistēmē and Entropocene” (Stiegler, *The Neganthropocene* 139–51), of which I here recall three points:

1. Capitalism is an *epistēmē* materialized by the fixed capital of the reticulated production apparatus that capital has become. This *epistēmē* hegemonically reconfigures all instruments of calculation by functionally integrating¹¹ them as instruments of statistics, measurement, simulation, modelling, observation, production, logistics, mobility, guidance, bibliometrics, scientometrics, marketing, self-quantification (the “quantified self”), and so on.

2. Information is the allagmatic (see Simondon, *L’individuation* 529–36) operator of this *epistēmē*, a computational technology utterly homogeneous with a capitalism that subjects all those exchanges in which psychic and social life consists to market calculations. This calculation, which sets up reticulated artificial intelligence, is based on cognitivism as the general paradigm of all forms of knowledge.

3. The cognitivist *epistēmē*, however, is an anti-*epistēmē*: it can develop only by installing a process of generalized proletarianization.¹² The correlationist mythology of “big data,” as it is developed, for example, by Chris Anderson in “The End of Theory,”¹³ is a perfect example of the way in which ideology has been reconfigured – both through the cognitivist paradigm and through marketing, which is itself now reticulated, mimetic and computational.¹⁴

In the remainder, we will limit ourselves to investigating the question of the relationships between improbabilities and forms of exosomatization, in particular with respect to standardization, and in so doing attempt to enter into a dialogue with Yuk Hui’s thesis concerning what he calls, on the one hand, technodiversity, and, on the other hand, and correspondingly, cosmotechnics.

11 In the sense of function integration described by Simondon: the process of concretization inasmuch as it leads to what he also calls associated techno-geographical milieus. On the recent evolution of the latter, which Simondon did not have the opportunity to analyse, see Stiegler, *The Re-enchantment of the World; Automatic Society; The Age of Disruption; and Au-delà de l’Entropocène*.

12 In the sense developed on the basis of the example of Alan Greenspan in the first chapter of Stiegler, *Automatic Society*.

13 And cf. the response by Kevin Kelly, and my commentary in *Automatic Society*.

14 On the relationship between ideology and marketing, see Stiegler, *Pharmacologie du Front national* 11.

6.
The dynamic supports of the “third world”
and the present dissolution of reason

We feel and see that a systemic elimination of diversity is underway, and that it has everything to do, on the one hand, with technology, and, on the other hand, with calculability – technology being rationalized and through that inherently tied to calculation, which is not the case for technics, which is empirical, and inherently tied to know-how [*savoir-faire*]. This elimination makes us suffer, but we are not aware of it, we do not know it, and for a very specific reason: the knowledge that would allow us to think and care [*de penser et de panser*] for this fact, and thus to bring it to the stage of law, has still not been developed. Its constitution will be the key issue both in the aftermath of the pandemic and in the re-foundation of a theoretical computer science.

The project of relaunching a theoretical computer science that would take the need for diversity functionally into account presupposes the constitution of a neganthropology – so as to effect a bifurcation in the Anthropocene era and towards the Neganthropocene (Stiegler, *The Neganthropocene*). Such a neganthropology presupposes digital studies, whose principles and primary objects were proposed at the Centre Pompidou in 2012. It has since given rise to an informal network, the Digital Studies Network, and to a book, *Digital Studies: Organologie des savoirs et technologies de la connaissance*.

It was argued in *Automatic Society* and in the French reissue of *La technique et le temps* (in a new afterword entitled “Le nouveau conflit des facultés et des fonctions”¹⁵) that *automatic calculability involves a delegation of the analytical function of the understanding to an automatic retentional system* that leads to a hypertrophy of the understanding and to a regression of reason in the Kantian sense – as the faculty of deciding, operating through a syn- thesis that is also called judgement. In his post-thermodynamic resumption of these Kantian questions, Alfred Whitehead revived this singularity of a synthetic function that would not be soluble into the analytical faculty. And in *Objective Knowledge*, Karl Popper highlighted the irreducible link between what he called the “third world” and exosomatization.

This position on the contemporary hypertrophy of the understanding and on the function of reason follows on from the argument set out in *Technics and Time*, 3, where it was posited that the imagination, as Kant defined it in the first edition of the *Critique of Pure Reason*, then the schematism, as he explains it in the second edition, are not transcendental dimensions of the mind, but configurations that are established and metastabilized through hypomnesic tertiary retentions (the reissue of *La technique et le temps* specifying that these first appear in the Upper Palaeolithic). All of this relates to Popper’s “third world”: hypomnesic tertiary retentions are the dynamic supports of this third world.¹⁶

The possibility of dissolving the singularity of reason via the automated understanding has been the basis of *computational cognitivism*, which in recent

15 An earlier version of this text is available in English: see Stiegler, “The New Conflict of the Faculties and Functions.”

16 I owe to David Bates, then to David Berry, this connection with Popper.

decades has been imposed on a vast scale, together with so-called analytical philosophy and contemporaneous with the spread of digitalization. This domination will prove to be utterly homogeneous with neoliberalism: Friedrich Hayek and Herbert Simon met during the restoration of the so-called “neoliberal” doctrine undertaken by the Mont Pelerin Society (with which Popper was also involved), positing that the market is a system of information, and that everything that is good is calculable in terms of such information. Both Hayek and Simon, then, prescribed the notion of democracy as a space for free information – but where such freedom actually means the freedom to reduce all reality to calculability, that is, to subject all realization (all future) to the hegemonic law of the market and all knowledge to this entropic condition. Unfortunately, Popper compromised himself in this coup against real democracy, which is always the protection, not of the majority, nor for that matter of the minority (these are accounting concepts), but of diversity – which must be cultivated in each citizen, and as a potential for neganthropic and anti-anthropropic resilience.

7. Why precisely is the question of technodiversity so essential at the end of the anthropocene era?

When Yuk Hui raises *the question concerning technology in China*, and initially presents this question of technics (before entering into the question of technics *in China*) as that of **technodiversity**, he takes this notion of diversity as a way of challenging the hegemony of a universal calculability that would be concretized by a machine that prescribes arrangements, themselves calculable, between:

- on the one hand, this machine and the technical system within which it functions, of which it becomes at the same time the clock, the memory and the central unit, that is, the operator (as *processing* unit);
- and, on the other hand, social systems, along with biological and geographical systems, where this thoroughly computational technical system takes hold of all these systems by calculating them, and where, in so doing, it dissolves them through feedback loops – themselves based on recursive functions, the difficulty of which was emphasized by Pierre Livet – that operate continuously, in real time, and by reducing every transaction to a calculation on a market.

Note here that:

- The computer, wrongly defined by cognitivists as a Turing machine, becomes the cellular element (in the sense that it becomes a smart-cell-phone) of a computational network collecting, processing and distributing data through feedback loops working several million times faster than the nervous systems that form those local networks that are also called, depending on the context, psychic individuals, citizens or consumers.
- As the aggregation of *psycho-technical apparatuses* that Luciano Floridi calls *inforgs*, the technosphere amounts to a megamachine in Lewis Mumford’s sense, and, in this way, it constitutes a new type of higher complex exorganism (Stiegler, *The Neganthropocene* 132–34; *Nanjing Lectures* 286), where the platforms that exploit this megamachine claim to replace political sovereignty defined by its

aims with a sovereignty of computational efficiency that utterly ignores formal causes, final causes and material causes.

• It is in this context that today the question of technodiversity imposes itself on all “global citizens,” while from Yuk Hui’s perspective it arises firstly from the perspective of China inasmuch as the latter is not reducible to the West – of which, moreover, it has become the great challenger.

It is in this contemporary context that it is appropriate, for example, to return to the conditions in which Leibniz paid close attention to Chinese writing – and to what it contains that may present a sovereign dimension of the spirit that would perhaps have always escaped the Western mind.¹⁷

The dissolution of reason is now effected by the “data economy” as an industry of traces, but it got underway in the twentieth century with the culture industries that were already substituting rationalization for reason (modernity being achieved at this price, as modernization). This literally disintegrating and hyper-rationalized dissolution (*logos* being entirely replaced by the *ratio* that is the algorithm, that is, *the ratio* – and every ratio, in the accounting sense, is, as soon as it appears, an algorithm) is equally a disintegration of the very notion of universality. And this is accomplished today through a misuse of the notion of the machine, and in this case the abstract machine theorized by Alan Turing.

This is how Western universalism can become, not an emancipatory reason that respects the diversity of people, but a rationalization that alienates all resources according to its own (that is, Western) interests. This process imposed by cognitive technologies¹⁸ continues and completes what was initiated with cultural technologies¹⁹ on a completely different register than spiritual technologies.²⁰

Here, therefore, the question arises of knowing if modernity means saying yes or no to the universality of those tendencies historically developed by the West, and especially as technology, which concretizes the laws of universal science – and in particular, on the one hand, the physics of Newton, and, on the other hand, the mathematics of calculability. To approach these questions, we must first return to André Leroi-Gourhan’s notion of universal technical tendencies, the characteristic features of which are briefly recapitulated by Yuk Hui in *The Question Concerning Technology in China* (8–10).

17 It is one of the great merits of Derrida’s *Of Grammatology* that it is attentive to this issue – and to this escape that was then called “logocentrism” and “ethnocentrism.” Yuk Hui and I have long hoped to be able to organize a symposium on these questions in China – which could be entitled *Characteristica Universalis, Theoretical Computer Science and Games of Writing*.

18 This is how we refer to the set of digital technologies that constitute a new cognitive function in what we describe as an exosomatic organogenesis of the faculties and functions of reason (see Stiegler, “Le nouveau conflit des facultés et des fonctions”).

19 Those discussed by Adorno and Horkheimer, after Benjamin, and without having completely grasped the stakes of what the latter called reproducibility (which is a reproducibility: see Stiegler, *Technics and Time*, 3).

20 Spiritual technologies are implemented by Ignace de Loyola and his missions to serve spiritual exercises in response to the Lutheran dissemination of spiritual technologies, firstly through the Bible translated as a book for everyone, faith or fidelity being redefined in this way as a reading practice. Benjamin Franklin will redefine this programme through Calvin by guiding it towards the account-keeping books in which ratios will appear, fidelity being thus redefined as calculation.

These questions become unavoidable at the end of the Anthropocene (as announced, variously, by the IPCC (Intergovernmental Panel on Climate Change), IPBES (Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services), the signatories of “Approaching a State Shift in Earth’s Biosphere” (Barnosky et al.), the appeal made on 13 November 2018 in *BioScience* (Ripple et al.), the February 2020 “L’appel de 1000 scientifiques” in which a thousand French scientists call for rebellion, and so on), because this era makes obvious the extreme danger brought by the elimination of biological and noetic diversity, where the operator of such a liquidation is the current stage of exosomatization that functions as generalized digital grammatization. At this stage, which presents itself in a more or less eschatological way (in a sense that is not here religious), how should we interpret what Leroi-Gourhan calls universal technical tendencies?

8. Tendencies and milieus

Should we, for example, follow the point of view of the accelerationists (taken up by Toni Negri), according to which it would be a matter of re-orienting reticular platform technology in the right direction (that of social justice and a re-established economic rationality, if we follow Nick Srnicek and Alex Williams, for example)? Or should we diversify techno-industrial concepts – a bit like the aftermath of the crash of 1987, when it was asserted by the American stock market authorities that an “idiomatization” of automated trading programs was essential in order to avoid systemically reinforcing downward trends (see Distler), as occurred, according to studies carried out afterwards, when then Secretary of the Treasury James Baker publicly suggested that prices were too high?

With respect to technodiversity, and in order to understand Yuk Hui’s position with respect to it – which seems to be an objection to what Leroi-Gourhan says, and consequently to my own work in so far as I take up his thesis of universal technical tendencies²¹ – two points must be taken into consideration:

1. The question of the milieu, as Leroi-Gourhan poses it in *Milieu et techniques*, and as the milieu of the “ethnic cell” (here, Leroi-Gourhan evokes by analogy the work of Claude Bernard) is always already divided into mutually diffracting milieus, in the form of the interior milieu, the technical milieu and the exterior milieu – in the process of exosomatization²² that Leroi-Gourhan himself called exteriorization; in this way, there is never the milieu (no more than there is the language), but milieus, which are originarily divided (which can and must be compared to the fact there are always already languages – idioms, idiolects, dialects, patois) in a more or less noticeable way.

21 And here, it would be necessary to clarify the position put forward in *The Question Concerning Technology in China* on the process of concretization as Simondon describes it with respect to machinic becoming, a point that is all the more crucial since with this concept Simondon responds to Wiener, and to his consideration of the feed-back between machines and organisms, that is, with respect to the recursivity that is the subject of Yuk Hui’s most recent book, *Recursivity and Contingency*.

22 In this way constituting the course of this exo-somatization of exosimples and exocomplexes. On this point, see Giacomo Gilmozzi et al., “Localities, Territories and Urbanities in the Age of Platforms and Faced with the Challenges of the Anthropocene Era,” in Stiegler and the *International Collective*, ch. 2, and Stiegler, *Qu’appelle-t-on panser?* 3.

2. On the other hand, we must differentiate *exosomatic* exorganogenesis and *exomnesic* exorganogenesis: exomemorization (see Stiegler, *Qu'appelle-t-on panser? 2*) as the production of *hypomnesic supports*; and, starting from these differently *différent* differentiations, so to speak, we must make out the conditions of the expression of universal technical tendencies, which are only tendencies, and which, when they are fully realized, are never realized other than as *nightmares*: by destroying everything that in principle makes them diffract *neganthropically*, a diffraction raised in principle by Leroi-Gourhan but ignored by Simondon when he postulates a process of machinic concretization – leading to the constitution of associated milieus whose reticulated expansion (via cybernetics) constitutes what Heidegger called *Gestell*.

Before moving on to further analysis, a commentary on these two points is required.

9. What is a tendency?

The conditions of the expression of universal technical tendencies – that is, of the limitation and orientation of the process of technical individuation, the expression of which is always limited – vary according to the types of exomnesic grammatization through which these expressions are produced.

Since the Upper Palaeolithic (during which the process of grammatization began), exomnesic grammatization has produced the hypomnesic supports of social systems (in the sense of Gille and Luhmann: from shamans to academies, research bodies, courts and jurisdictions, parliaments, and so on, via churches, temples and theocratic organs of all kinds). The conditions of the expression of universal technical tendencies vary precisely according to the types of advances made in the processes of exomemorization – tied as they are to grammatization.

What is it that makes tendencies *tendencies*, and *only* tendencies? It is firstly because a tendency does not exist: it always plays out along with a counter-tendency, which thus together form a bipolarity through which extends what Simondon calls the indefinite dyad. This duality, which is also a duplicity, is what Nietzsche posits through the figures of Dionysos and Apollo, and *eris*. And it is what Bergson will reformulate in other terms – by taking thermodynamics and the singularity of life into account in that process which is the “heat death of the universe.”

A tendency is a (counter)tendency in relation to another (counter)tendency with which it forms an open dynamic system (which over-determines a set of transductive relations at a more restricted scale, wherein subsystems form – such as occurs in endosomatic life, where the organism is a dynamic system composed of organs themselves composed of cells). What, in human life, makes the counter-tendency a counter-tendency? This is the question raised by Bergson, which he describes as the question of a *mystical opening*, which is always in play in any mechanics (ch. 4) – and not just in Newtonian mechanics and its “mechanicism,” but in Pindar’s sense of *mekhanē* (Stiegler, *The Age of Disruption* 92, 157, 290).

The highly specific situation induced by what is sometimes called “disruption,” however, where the question of technodiversity arises as what should

come to counteract a state of fact that argues for a single tendency (which is a contradiction in terms, since this would no longer be a tendency but a state – and a state of this kind is well known: it is what we call death, the question here being that of the “mortality of civilizations”) – this specificity of disruption lies in the fact that **exosomatic technologies and exomnesic technologies are now integrated** by the **mathematical machines** forming the digital stage of grammatization, thus establishing a stage of exosomatization that is utterly incomparable to those that came before.

10. Tendencies and entropy

This integration is what characterizes “platforms” (as described by Frank Pasquale, for example) based on the algorithmic, which amounts to the new computational “general equivalent”: tending to replace money. But by imposing itself as a state of fact, and no longer as a mere tendency to synchronization extended out by its diachronization, the “universality” of this tendency irresistibly generates an anthropic entropy that is fatal for the biosphere-cum-technosphere.

The challenge is therefore to reintroduce, between exosomatization and exomemorization, the conditions for a variability capable of reconstituting a noodiversity – a variability of a noodiversity that is obviously also a technodiversity, and which alone can cultivate a biodiversity capable of preventing the technosphere from destroying the biosphere. This requires a reconsideration of noesis, its faculties and its functions, from the exosomatic standpoint, and as a noogenesis (see Stiegler, “Postface”).

Exosomatic technologies, which we encounter in exosomatization in a way that differs from the endosomatic mode, are a matter of physics and biology, a question of what Simon- don called mechanology and what Canguilhem called organology, and belonging to what, after Lotka, we should consider as exosomatic evolution. Exosomatic evolution does compose with endosomatic constraints (Canguilhem tries to approach this question in *The Normal and the Pathological*), but it exceeds them, even if it can never completely overturn them: this was, for example, precisely Stephen Hawking’s situation, living his life almost but not completely without endosomatic constraints – for if he had somehow completely gone beyond these constraints, he would not have died.

This having been said, and before going any further, let us come to the third point. The technical milieu (in the sense defined in *Milieu et techniques*) is always in excess over the interior milieu, and it brings connections to other interior milieus (other “ethnic cells”) by entering into resonance with their technical milieu – and by traversing their common exterior milieu.

Today, this traversal saturates the exterior milieu: there is no longer any external milieu, there is no longer anything except an interior milieu that, consequently, is itself exhausted, devoid of its potential for nourishing heterogeneities, that is, for interior milieus that last up until the moment they are disintegrated by connections traversing and linking interior milieus through technical milieus – the technosphere no longer consisting of anything but a single technical milieu.

Exomemorization leads to the exorganization of a meeting between three layers:

- a **physiological layer**, as in the case of non-hypomnesic exosomatic organs, articulated with endosomatic organs;
- a **nervous layer**, constituting the cerebral characteristics of the exosomatized, exorganized, hypomnesically constituted being, where all of this presupposes educational models, that is, social rules;
- a **logical layer**, which was for a long time (in the West) a matter of *logos*, of the *skholē*, and of *otium*, but which, with logical machines (themselves based on the microphysical properties of matter), have become a matter of technology.

Between the second and third of these layers, symbolic exorganizations (in the first place, idioms) are woven. The arrangement of these three layers is what characterizes higher complex exorganisms.

The great challenge of these questions will be, particularly in the post-Covid period, to constitute a new theoretical computer science in the service of an economy of negentropy, with a view to reaching the Neganthropocene era, based on a neganthropology, and inscribing, at the heart of that theory, the incalculability and irreducible différence of the understanding and reason – playing out across the imagination, where the latter is itself constituted by hypomnesic tertiary retentions, and where Leroi-Gourhan's universal technical tendencies constitute **techno-logical schemas**.

To be continued.