Pharmacology of the Feedback Loop

Alexander Wilson

Jacob Von Uexkull described the circularity of the animal in its world in terms of closed networks of sensory-motor loops. He was one of the first to insist on the importance of the feedback loops between the organism and its world, which constitute its *Umwelt,* its environment. The *Umwelt* is the direct consequence of the specific sensory and motor capacities that constitute the adaptive equipment of the animal. In the language typical of *second order cybernetics*, the *Umwelt* is characterized by its *operational closure*. This concept of Franscisco Varela implies that all systems, by definition, can only encounter themselves: all systems are closed upon their own intra-environmental sensibilities. The world has no intrinsic reality, for it is the effect of the system's autopoietic process, and exists only insofar as it is *enacted* by the system. Varela contributed this concept to the discipline of immunology. In the old interpretation of the immune system, it was conceived as an army directed toward the exterior, a territorial defense mechanism that catalogued, reported and attacked foreign intruders. But today, it seems that this concept no longer holds, for the immune system knows no outside.

> Au lieu d'un catalogue dirigé vers l'extérieur, il faut prendre l'image d'un réseau qui atteint certains niveaux de stabilité et de cohérence. […] On ne peut plus parler de soi et de non-soi, mais simplement de soi et de non-sens, de ce qui n'a pas de sens pour le système.[1]

Without reserve, Niklas Luhmann is known to have transposed this concept of operational (or operative) closure to the social system (against the wishes of Varela). For Luhmann, psychic individuals are perfectly closed off from each other: they can never communicate with each other, know each other, act upon each other, for, as he infamously puts it, *only communication communicates*. With its systemic levels of the social, the psychological, the biological, and the linguistic, the human ecosystem is composed of systemic units that are tightly sealed. They may be *structurally coupled* to each other, allowing the translation of

[1] Varela, Francisco. (entrevue)
http://www.revue3emillenaire.com/blog/francisco-varela-au-commencement-fut-la-distinction…/

perturbations, but never is *information* transferred from one to the other. Even if their surfaces touch, and even if, in some cases, they interpenetrate, never a system encounters another. Each one being enclosed in its solipsistic world, no transfer of information can be possible.

Cybernetic operational closure is inherently related to what Quentin Meillassoux has named the *correlational circle,* which, according to him, haunts the philosophical tradition since Kant. For the actors of the philosophical movement known as *speculative realism,* the concept of *correlationism* refers to the entire philosophical tradition since Kant, which limits that which can be said about the world by insisting on its necessary correlation with the human being and its noetic appartus: the object always leads back to the subject. We can only know the phenomenon: the *noumenon*, if it does exist, is necessarily inaccessible to us. After Kant, the tradition is dominated by a refutation of metaphysics, grounded on a vague insistence (especially in the continental tradition) that we cannot say anything about the world-in-itself. In *After Finitude*, Meillassoux opposes the correlationist stance and its anthropocentrism, reducing it to an absurd solipsism, and insists on the contrary that there effectively does exist certain ways of piercing the phenomenal bubble to, at least minimally, speak about the world as it is without us, the world as such, outside the phenomenon. Meillassoux believes in the existence of an absolute that would be more than a correlate of our perception, one that would be indubitably other and independent. He seeks, as Descartes did, a logical support, an Archimedean point sheltered from doubt, that would reveal itself as an *a priori* truth, would confirm itself by itself, and especially, would remain to be true in our absence. His recourse to the ancestral is characteristic of his argument. But despite the patient technicity of his contention, what his line of reason finally achieves in defending—with recourse to the *sequence of the alephs* in set theory, clearly inspired by his master Alain Badiou—is that the laws of physics are not probabilistic, nor determined, but contingent and irrational. For Meillassoux, anything can happen at any moment, the laws of physics can change without warning, the stabilities we induce from repetition and habit are mere illusions, for the only thing *necessary* in the universe is *contingency* itself.

Hence, on the one hand we have Luhmann and second order cybernetics, for whom the closure of the human system onto himself seems to pose no problem. On the other hand,

we have Meillassoux and the speculative realists for whom the correlationist insistence on closure signals an untenable solipsistic stance, but for whom the only other option seems to be an anti-pragmatic theory of passivity and resignation, that can only count on the absolute unpredictability of events. So for Meillassoux, we are not operationally closed. But we are strictly only open to the *hyper chaos* of radical contingency, which means that, as Peter Hallward has pointed out, each is open to a *hyper relative* world in which everyone can lay claim to their own private paradigmatic shifts, and thus a world in which everyone, just like in solipsism, lives in her own world.[2] Hence, in the context of this paper, it will be argued that both of these options are untenable. We will propose an alternative, a compromise between these two positions, that we will call *pharmacological*.

Pharmakon

Why did the Greeks only have one word for both poison and remedy? Well, the reason they only had one word was not because they could not decide between good and bad effects of various toxic potions, but simply because the word *pharmakon* refers to the category that subsumes them both. Pharmakon translates as: "bioactive substance" or "active ingredient". It means *drug*. It was precisely known that the active ingredient's properties would be good or bad depending on the context in which they were used. As such, it was neither, or more precisely, *potentially both*. "*Pharmakon"* did not refer to *undecidability* but rather to a specific category of potentials. For its part, the term *pharmakos* did not simply refer to the village *scapegoat*. The *pharmakos* must have first been somewhat like the shaman or the sorcerer typical of oral cultures, the one who lived peripherally, on the outskirts of the village, the one who used pysochoactive plants and was possessed by spirits, and hence the one who was blamed for the contingencies of life. The periphery is important: being neither the inside nor the outside, the *pharmakos* inhabited another space: the heterotopy of the boundary. The *pharmakon*, being neither strictly good nor bad, occupies its own place too, the space of articulation and potential.

Derrida writes:

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2 Peter Hallward. *Anything is Possible: A Reading of Quentin Meillassoux's After Finitude* dans Bryant, L. R., Srnicek, N., & Harman, G. (2011). *The speculative turn: continental materialism and realism*. Melbourne, Victoria, S. Aust.: re.press. p. 130-141

> Si le *pharmakon* est "ambivalent", c'est donc bien pour constituer le milieu dans lequel s'opposent les opposés, le mouvement et le jeu qui les rapportent l'un à l'autre, les renverse et les fait passer l'un dans l'autre …[3]

Would it not then be possible to contribute this third category, this *third space,* neither outside nor inside, to the debate between openness and closure? Is there not an alternative to the operational closure of second order cybernetics and to the hyper-chaos defended by Meillassoux?

Distinction and Self-Reference

In the 1960's, an obscure mathematician named George Spencer-Brown developed a mathematical system that demonstrated the productive force of the act of distinguishing. He writes, "The theme of this book is that a universe comes into being when a space is severed or taken apart," before he demonstrates with procedural patience and clarity that a single distinction, a single mark in the void, provokes the emergence of a network of complex interrelations, a universe. The theory developed out of his work as mathematician for the British railway system, where he faced the problem of making the railroad network topology more efficient through mathematical means. He discovered that the Boolean system of logic, which reduces algebra to two values—true or false—could be expressed fully with an even simpler notation. He invented a complete system of logical calculus with only one symbol: the mark inscribed in the void, the cross. From this first procedure of tracing a distinction in the a priori undifferentiated void, Spencer-Brown reveals to us the emergence of en entire world through a series of logical repercussions, among which the Boolean algebra and the primary arithmetic that corresponds to it. Even if Spencer-Brown's system can be interpreted as the Boolean logic of true or false, his system of notation with only one symbol is meant to explicitate the idea that *the action of distinguishing between two things always leads us to indicate one of them and not the other*. Distinction is equal to indication, that is to say, distinguishing always signifies *crossing* a distinction, and thus the action of observing, of seeing, always leads us to one side of the distinction, the marked side, the side of immediate interest. The very act of distinguishing, because it delivers us to the marked state, also obstructs that which is unmarked.

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[3] Derrida, Jacques. *Pharmacie de platon*, (1972). Garnier-Flammarion, Paris, p. 365

It hence becomes clear why this *calculus of indications* so strongly influenced the great names names of second order cybernetics: Von Foerster, Varela, and Luhmann. Because by itself it explains many characteristics of observation as were beginning to be understood in systems theory. It reveals that there is no indication without exclusion, no observation without selection of what is observed. Spencer-Brown explains how the space of the primary arithmetic and of the Boolean algebra results from this sole realization, that distinction is indication, and thus also a veiling.

> [In order for the world to see itself,] it must first cut itself up into at least one state which sees, and at least one other state which is seen. In this severed and mutilated condition, whatever it sees is *only partially itself*. We may take it that the world undoubtedly is itself (i.e. is indistinct from itself), but, in any attempt to see itself as an object, it must, equally undoubtedly, act so as to make itself distinct from, and therefore false to, itself. In this condition it will always partially elude itself. [4]

But Spencer-Brown's mathematical system does not stop at the description of the space of distinctions and the logic of observation that results from the original mark. What is more astonishing is his explicitation, in chapter 11 of *Laws of Form,* of the natural dislocation between the algebra from the arithmetic that underlies it. Certain expressions in the calculus produce very curious results. Certain specific statements produce loops that feed back onto themselves, infinite alternating or oscillating series that can never decide between the marked and unmarked state. He then goes on to demonstrate how these infinite series result from *self-referential* expressions, which he calls the "reentry", wherein the mark of a distinction is *identical* to the expression that it is part of. It is as though the expression's self-referentiality, that is, the reentry of the whole expression into its own part, produces an infinite delay that prevents us from ever stopping, or *halting*, on a specific value, or ever choosing between the marked and unmarked state, the cross and the void, or true and false.

According to Spencer-Brown, the delay that incessantly returns the true to the false and the false to the true, emerges from self-referentiality, and thus also from the constitution of the self as self, by its oscillatory movement of exteriorization and re-interiorization. It is at this

[4] Spencer-Brown, G. *Laws of form* (1979). New York: Dutton. p. 105 (ma propre traduction de l'anglais)

moment that a new logical value must be adopted, a third possible state after that of the marked and that of the unmarked: the *imaginary state*. The imaginary axis is the effect of this delay, of this perpetual postponement of *fixation* in the self-referential function. It is self-reference that provokes the emergence of this *temporality*, which gives to statements of this type an imaginary state, a state that is neither marked nor unmarked, oscillating incessantly between the two, in a perpetual movement of forwarding and return.

We thus have here the characteristics of the *pharmakon* as they are elaborated by Derrida: an articulation of the inside and outside in a movement of perpetual reference and deferral. And Spencer-Brown specifies that the production of this deferral in time emerges in situations where the system encounters itself, for in this situation the space can no longer contain a fixed identity, it is incessantly referred to its outside, at which moment it must immediately be refered to the interior, and so forth, forever. It is the consequence of the *observation of observation,* the central notion of what Von Foerster called the "*cybernetics of cybernetics*". For this oscillation between the inside and outside results from the fact that in self-reference, the exterior (that to which I refer or am referred) is the interior (the I who is referring or who is being referred). Time bootstraps itself out of spatiality, in a self-referential loop. It emerges as a result of self-reference like an imaginary dimension relative to the space of distinction. Space can only contain either the marked or the unmarked, either food or danger, either friend or foe, either remedy or poison. In the moment of self-reference, space is forced to unhinge itself and plunge into a non-extensive axis, the *intensive* axis of the temporal.

Furthermore, Spencer-Brown shows us that self-referentiality always already *consists* as a dimension of distinction as such. The simple fact that there is *reference,* implies that there must be self-reference, and thus also *temporality*. Time and *subjectivity* emerge from the same fundamental movement resulting from the trace.

But Spencer-Brown was not the first to undeline the importance of self-reference in mathematics. Paradox has been known since antiquity to be the enemy of logic, which thus always strived to rid itself of self-referentiality and circular chains of reasoning. Whitehead's and Russell's project to establish once and for all the logical foundation of mathematical axioms tried meticulously to avoid paradox, that is, statements that are both true and false,

or undividable. But in 1931, a mere twenty years after the publication of the *Principia Mathematica,* the mathemetician Kurt Gödel, published his famous incompleteness theorems. He had realized that Whitehead and Russell's system mathematical system could be expressed as numbers, which lead him to imagine it as a number theory *about* numbers. For him, this self-embedding of the theory with its object signaled a the potential presence of a monster hidden in their system. Wanting initially to only critique the foundations of *Principia Mathematica*, he ended up going much further, and offered a demonstration that *for any system of natural numbers, there exist statements that are true but not provable.* We know today, and can affirm it without controversy, all systems of mathematics are necessarily *incomplete*, and furthermore, any sufficiently expressive theory will always be incomplete.

What is particulary important for us is the manner in which Gödel arrived at this proof: once again, it is by the circularity of self-reference, recursion. The Gödel statement, which proves the incompleteness of a mathematical system, is any statement of the type: "this statement is not provable". It is a statement that includes itself as part of the statement, and that negates its own demonstrability within the given system of logical distinctions. For in such circumstances, if the statement is effectively demonstrable, the system contains a contradiction and thus looses its coherence as a system. But if the system is effectively coherent, then the statement is confirmed, which means that the system is incomplete, since it is impossible from it to demonstrate the validity of the statement's claim.

This harkens back to the paradox of the liar, or the tragic philosopher Epimenides' famous paradox. Epimenides the Cretan says the Cretans are always liars. So how should we interpret this statement? If Epimenides is Cretan and thus really a liar, then in principle what he is stating is a lie ; but since he is admitting in the statement that the Cretans are liars, then he must be stating the truth. This forward-backward movement between true and false interpretation of the statement, like that between the marked and unmarked state, is the direct result of the statement's self-referentiality. Il mathematical systems are always incomplete, it is because the must contain self-referential statements, and thus potentially fall into these kinds of interminable oscillations between undecidable, or pharmacological, possibilities. There are undecidable zones in all systems of distinction, and these black holes,

these blind spots, are situated where on finds self-referentiality. Gödel thus exposes that self-referentiality is *implicitely suggested* by the coherence of the system.

But to my eyes, Spencer-Brown makes a bold step further. He shows us a kind of *consistency* of logical formalization that results from the *first distinction*. We must specify that there isn't, properly speaking, a first distinction. Certainly, the speculative experiment of supposing a first distinction serves as a kind of heuristic that reveals the world of interrelations that would spring forth from it automatically. But on the other hand, the world that springs forth from it demonstrates the *arbitrary character* of the first distinction: for without self-reference, and thus without the temporal, all possible distinctions are *potentially* or *virtually* first. Neither can be first without there being deferral in time, without some sort of temporal dislocation. In effect, the first distinction is not first, it is strictly *a-temporal,* as is the origin in Derrida's concept of the arche-trace: there is no origin, except as that reciprocally produced by the trace.

Circular vs. Linear Temporality

Let us recall now how human history can be read as the opening or unwinding of circular temporality. For Mircea Eliade, humanity has passed from primitive circular temporalities to the linear temporalities of modernity. History unfolds perpetually from the circle of oral cultures where most memory is erased with each generation, into the straight line of writing, which corresponds to the historical progress of societies. It is the process of unfolding, of deploying the circle into a line, of unwinding the loop, that also describes the passage from tragic temporality to the dialectic or rational temporality, articulated by Socrates; the dialectical approach allows Socrates to identify and unfold the circular arguments of the sophists. During thousands of years, with its analytical tools, which allowed it to operate ever more discrete observations, the process of *hominization* seemed to be elevating itself from the primitive circularity of the feedback loops that determine animal life. The human stood up, saw further, and progressed. The discretization of the world into marked distinctions was operated through technology, in particular with the aid of mnemonic supplements, or *hypomnemata*, which progressively loosened the knot of the infinite repetition of the moons, the tides and the seasons, through *transgenerational communication* that they permitted. Little by little, the human could inscribe its existence into posterity, and thus escape the eternal

return. The *coup de grace* of linearity was perhaps Darwin's theory; after Darwin, the temporal loop had to die, for the advance of evolution destroyed any hope of entertaining a privileged link with God. Zarathustra's cry, *God is dead, we have killed him,* is the reflection of what at the time seemed to be the end of religious tautology, the end of logical acrobatics aiming to prove the existence of God. But Nietzsche predicted that the challenge of the *eternal return* would come back to haunt us—that is perhaps all it can do, return—and in ever more mysterious incarnations.

This is exactly what has happened in the 20th century. For, in addition to the discovery of mathematical incompleteness and the emergence of cybernetics and of its notion of the feedback loop, physics and cosmology found themselves running into the problem of logical circularity in self-reference. Right at the beginning of the century, the *observer* appeared in the midst of quantum equations. We discovered that the action of making a measurement on a quantum object determined the collapse of the wave function. Prior to observation, the quantum object has contradictory superimposed properties, and it is the action of measuring that decides on one or the other. Science found itself once again faced with the correlational circle, for the quantum object *is* the correlate of the detector that observes it.

Moreover, in 1973, the Australian astrophysicist Brandon Carter, at a conference celebrating the 500th birthday of Copernicus, articulated what he called the "anthropic principle" in cosmology. Copernicus had been the first in the western tradition to fully deny the geocentric model by proposing that the sun, not the earth, was at the center of the solar system. The notion was canonized as the *Copernican Principle*, which refutes the existence of a privileged point of view in science. Brandon Carter, half a millennium later, nuanced this posture and declared that even if the human is not the center of the universe, our point of view is nonetheless privileged to a certain extent. For the fact that we are here to observe it means that the universe must have properties that permit a sufficiently evolved, scientifically advanced, biological life form like our own to exist on some planet within it. The anthropic principle is tied to the problem of the *fine tuning* of the universe. It is as if the Big Bang and the 13 billion years of cosmological evolution had happened so that we, in our time, be here to witness it. For the physicist John Archibald Wheeler, science was forced to admit that in its study of the universe, science participates in its unfolding. In effect, we seem to live in

what Wheeler called a "participatory universe" that would be unthinkable without some form of *subjectivity*, without some kind of observer who, as soon as he witnesses it, determines the universe by provoking the symmetry breaks that characterize it.

Asymmetry and Subjectivity

Even if the question of the symmetry of time is still a field of debate in the philosophy of science, it is undeniable that, if we agree with the probabilistic monism of contemporary science, and posit that the universe is *time-symmetric* or that it is *temporally reversible*, then it becomes difficult to explain temporally-directional phenomena like the arrow of time in thermodynamics, or the outward propagation of the wave, without recourse to some notion of subjectivity. We are to understand that if we see the universe we see, as irreversibly moving in the direction of higher entropy, it is because we are *oriented* within it: we are negentropic organisms, and thus *pointed* in the direction of the universe's expanding and cooling. Our *being-toward-death*, is perhaps nothing more than a reflection of this negentropic resistance to entropy. The way contemporary physics sees it, this orientation in time corresponds to our *asymmetrical* selection of the universe due to our thermodynamically oriented nature, whereas "objectively", time is perfectly symmetrical and all processes are reversible.

Now let us recall the argument against the absolutization of totality, articulated on the theory of transfinite sets, that Meillassoux (after Badiou) develops to defend his speculations on the necessity of contingency. His argument is that it is impossible to totalize the *all,* for according to Cantor's set theory, the set, by definition, contains itself, its full set, as a subset of itself, in addition to its other subsets. This means that the set of all sets contains more than it contains, which is evidently paradoxical. We thus imagine an infinite series of inter-embedded sets of increasing cardinality, the *set of all sets* perpetually being surpassed by its contents, outnumbered by its parts. Moreover, the impossibility of totalizing the set of all sets poses an obvious problem for any cosmology that defines the universe as *time symmetric.* For the time symmetry of the universe rests on the possibility of a temporal *objectivity*, in the sense of a *point of view that sees all,* or in other words, a set of all sets. This suggests that we should question the plausibility of the current posture in cosmology, that insists that the

asymmetry we observe is illusory in relation to symmetrical reality, since in order to be symmetric, it must also contain itself as an objective totality.

It is only from the subjective point of view that there is *asymmetry*, and only from an absolutely objective *non-point* of view that there is pure symmetry. But it is my contention that, following the paradoxes of transfinite sets, both of these poles reveal themselves as untenable. Meillassoux is correct in that there can be no pure objectivity, for the set of all sets cannot be totalized. But what Meillassoux misses is that this argument holds for all sets, not just the set of all sets. So it also means that there can be no pure subjectivity, no pure closedness in the first place, because by definition, subjectivity, *as a subset* of the whole, also cannot contain itself. It is not closed: it escapes itself through its parts, bootstraps itself out of itself. Subjectivity as asymmetry presupposes the correlationist exclusion and veiling he opposes. Paradoxically, it is the same self-veiling nature of (self) observation, which Meillassoux opposes in the individual (and which he reduces to linguistic correlationism or idealist solipsism) that allows in the first place for his argument against the totalization of the set of all sets, for if the whole can never be totalized it is because "it must first cut itself up into at least one state which sees, and at least one other state which is seen. […] In this condition it will always partially elude itself."

The universe can thus not be objective, for objectivity is outside of time (which is subjective) and can thus not account for the contingent event. But there is a sense in which Meillassoux's argument for a hyperchaotic universe leads him to defend a position as untenable as that of the solipsist.[5] For now hyperchaos can thus be applied nowhere and to nothing: it does not allow for the actualization of the event, for no set can contain itself enough to be affected by an event, no set can loose itself to the event for it has nothing to loose in the first place, or more precisely, it is always already lost to a single event of self observation. As Deleuze would say, nothing in this paradigm becomes the event's *quasi-cause*, for there is nothing for the event *to happen to*. Indeed, hyperchaos is the inversion of

[5] I agree here with Peter Hallward's argument against Meillassoux :
Peter Hallward. *Anything is Possible: A Reading of Quentin Meillassoux's After Finitude* dans Bryant, L. R., Srnicek, N., & Harman, G. (2011). *The speculative turn: continental materialism and realism*. Melbourne, Victoria, S. Aust.: re.press. p. 130-141

soplipsism: to the berkleyian idealist solipsism of an anti-symmetry and absolute closedness, where *nothing really happens*, hyperchaos substitutes the absolute symmetry of the non-totalizable openness of the *non-all,* where there is *nothing to happen to*.

But the pharmakon seems to point us toward a third alternative, one that allows us to understand the world as a hybrid of closure and openness, between hyper solipsism and hyperchaos.[6] Objectivity and subjectivity only obscure the depths of the strange attractors that tessellate the pre-individual field. We should avoid reducing everything to one or the other, to the marked or unmarked, for it is what happens in the interstice that counts : there is all the richness, the complexity, the consistency of the world.

So, to the open and hyper chaotic universe of Meillassoux, *and* to Luhmann's universe of inter-embedded closures, I believe we must oppose the universe that Deleuze, after Joyce, called a *chaosmos*. A universe that is intrinsically hybrid, that is stratified between chaos and order, between openness and closure. It becomes equally nonsensical to consider time as a process that passes from the past to the future. Indeed, according to Deleuze, time can only pass from the virtual to the actual, and this, by traversing the intensity of the *plane of consistency*. All the possible results of the dichotomy of self-other, subject object, interior-exterior, remedy-poison, dissolve into the consistency of the process of actualization, just as the inside and outside unfold out of the pharmakon. And the mistake is to always try to reduce everything to one of the many attractors in the chaosmos. The universe is hybrid, and the pharmakon is its consistency.

The Big Bang might be construed as the *fixed point attractor* of objectivity. Like the first distinction, or the arche-trace, it is a substantive mark, and can only supplement actualization. It holds all of becoming in a single point, outside of time (the cosmological singularity). But each moment of self-reference produces its own intensive singularity that bifurcates from the spatial plane and produces its independent temporal axis. There is

[6] Against the predominance of the closed system in second order cybernetics, Mark Hansen has proposed an interesting alternative, with which the pharmakon aligns perfectly, that he calls the system environment hybrid, drawing from, among others, the Simondon's individuation and Guattari's notion of the machine.
Mark B. H. Hansen, *System-Environment Hybrids* dans Clarke, B., & Hansen, M. B. N. (Eds.). (2009). *Emergence and Embodiment: New Essays on Second-Order Systems Theory*. Duke University Press Books.

therefore, strictly speaking, no *Big bang,* for all the *little bangs* that compose it resist their totalization. The universe would be better understood as a web of strange attractors, chaotic attractors that have as their first characteristic to be withdrawn and plunged into the infinite regress toward a multiplicity of initial conditions.

Let us take one last example before we conclude: according to the discoveries of the theory of complexity, such as in the work of Stuart Kauffman, self-organising systems seem particularly attracted to the *edge of chaos*.[7] A self-organizing system is not simply selective and retentive, it is not simply negentropic: in order to be efficient, it must situate itself on the edge of chaos. A system that is too ordered remains fixed and crystallized, incapable of evolving, of varying, of creating new forms that can survive in the changing environment. By contrast, a system that is too chaotic cannot hold enough order to contain itself, not enough structure to inscribe a memory, a logic, a program. But between these two poles, there exists as third regime: where order is liberated from the fixed point attractor and rises into differentiation, but also where chaos allows itself just enough body to not evaporate and loose itself. Christopher Langton, in the 90's, even discovered that the *universal computer* potentially emerged in the fine layer that separates the regime of order from the regime of chaos. For it is there, between order and chaos, that virtual computing can spontaneously occur, as described by Alan Turing in 1936: a virtual machine that would read both the description of the machine it simulates and the data it computes from the same series of variations inscribed on the edge of chaos.

So if we grant the edge of chaos this potential capacity to virtualise autonomous universes, to simulate them, as does Turing's machine, then the self-organizing universe escapes itself perpetually in its race toward higher entropy. The edge of chaos is thick, for if the virtual is reborn on this edge, if little universes are simulated somewhere between the birth and the heat death of the universe, it also means that perhaps, somewhere on the path to higher entropy, the universe reaches a zone where the system's behavior bifurcates into heterogeneous dimensions. This recalls physicist Lee Smolin's theory of the *fecund universe.* He

[7] Kauffman, S. (1996). *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity* (1st ed.). Oxford University Press, USA.

speculates that each black hole in the universe produces its own Big Bang behind its event horizon, with its own forces and constants. Each universe only produces offspring (little bangs) to the extent that it produces black holes. The black hole acts upon the system of the universe, somewhat like the self-referential statement acts upon the mathematical system. Smolin's black hole is the pharmakon of the universe, its exteriorization, its escape, its flight from self, just as Gödel's self-referential statement is the pharmakon of mathematics. The pharmacological is composed of this fractal-like web of inter-embedded holes and strange attractors that weave themselves around each process of individuation and constitute its preindividual field.

The pharmakon in this sense relates to the concept of the *()hole complex* in Negarestani's *Cyclonopedia*, where each whole escapes itself through its own self-referential (black) holes, that form where cyclones and spirals conspire and become complicit, sharing inward folds and spires, and perpetually defer totalization. The point here is that the pharmakon should no longer be reduced to a mere undecidability between outside and inside, between poison and remedy, for it is rather the *consistency of individuation* itself. Absolute closure and absolute openness are nowhere to be found. There are only pre-individual individuals, there are only partly discrete identities, there are only partly continuous continuums, for the fabric of the universe *is* intrinsic hybridity, and the body of becoming is composed not of organs, but of holes, escape tunnels and lines of flight.