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What we have learnt from systems theory about the things that nature's understanding achieves

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Abstract

The problem of knowledge has been centred around the study of the content of our conscience, seeing the world through internal representation, without any satisfactory account of the operations of nature that would be a pre-condition for our own performances in terms of concept efficiency in organizing action externally. If we want to better understand where and how meaning fits in nature, we have to find the proper way to decipher its organization, and account for the fact that we have found codes and replicators operating at a deep levels of analysis. Informational analysis deals with units of organizational stability but it takes them for granted and leaves open the question of their origin. Patterns are used when we recognize the same configurations at different places and try to explain through their recurrence, yet to make sense of the presence of signals and counter-balancing mechanisms disseminated in nature, an hypothesis is offered to the effect that feedback signals would have a role to play in the coming about of a world that is open to new configurations and submitted to a form of stability that is more attuned to system laws than overarching irrevisable ones.

Keywords

concepts, images, thoughts, epistemology, explanation, archetype, redundancy, cybernetics, feedback, information, choice, selection, genome, laws of nature, axiology, contingency

1. A word about internalism

The problems of knowledge have been centred around the presence in the knower of something more than the thing known, an image or copy of it. If indeed it is not wrong to say that we have images of things in our minds and that the problem of knowledge is to explain their efficiency in organizing external action, it is however more of a debatable point that the production of a concept could be suspended to a bridge between it and the world, which could alone establish its validity.

The problem is basically that, since we do not have access to reality in any other way than experience, we believe we could have a grasp of it through "ideas," and that those in turn would be weaker "impressions" produced in us by things material. It is assumed that we create some interface, and come to see it as representing reality so well that, by reproducing what is out there, we would have solved the enigma of knowledge. It is not difficult to see the connections of the program of artificial intelligence to this type of epistemology. We certainly can produce an *image* in our minds, but what about a *concept*? A post-modern philosopher such as Gilles Deleuze will speak of the business of the philosopher being to "invent concepts," a flimsy use as one would find upon closer examination.

2. In need of a "hard" epistemology

Is it not hopeless however, if meaning is superimposed by our inquiring minds, to strive so much in order to grasp the meaning of humankind's place in nature? Scientistic positions all share a common conviction that anthropomorphism must be combated and dislodged, wherever it may still hide, but they will also recognize that meaning truly enters on the scene with the arrival of the human creature. If a concept is something we have, if it is "emergent," why would we then devote so much effort to understand how the material basis for our minds is the way it is and why would we have to do it all along in the most mindless way possible?

What happens then to the will to avoid anthropomorphism, if all that is left to the human mind is a single option, namely to access the evidence through the concepts that this same human mind has forged, about which we have no guarantee that they touch anything out there? There would then be only one alternative, circularly disguised as a dual one: (1) anthropomorphism admitted as such, or (2) the obstinate development of an objectivity-seeking science, but about which we know that it only reaches out to itself, which is just as much anthropomorphic. There is only one way to escape this sort of infernal circle, which drove Hume almost mad, it is to recognize that our minds are not some meaningless scrap or by-product of the cosmic process, but that in passing by our minds we do reach something of the cosmological dynamism which really is operating "out there."

3. The foundation problem

Karl Popper struggled in the 1930's to solve J. F. Fries' trilemma, which stated that the only choices possible to ground our knowledge were: dogmatism, infinite regress, or psychologism. In front of this, Popper opted for a farewell to true justification and complete certainty, and made it so that our best tested statements would rest on ever moving quick sand, what he termed a "swamp." (Popper 1992: 93–4; 111; see also Popper 1994) If we keep in mind what we have just said, this will become a "miracle vs. regress" problem, and to avoid it one can look at the degree to which our ability to perceive, to do something with sensory impressions, would rather be transferred in us from a capacity already operating in nature. The main problem is therefore the grand loop: how to make sure that the concepts we have used consistently and built our knowledge upon have a survival capacity, and therefore the same efficiency the coded semiotic systems have? Can we legitimately say of those, which we have found to be operating in nature, that they answer to what would be required at a conceptual level?

Some classical theories of knowledge had built up a world devoid of contingency, where theories would never need to be revised (Wimsatt 2007). In reaction to this, many have favoured an empirical approach, due to our experience of the danger of far-fetched theories that have not produced testable results. Their focus was on fostering discovery following our realization that the singular configurations of any fact will not be identical. In the analytical tradition of philosophy, nominalism has served as a symbol of this attitude, and is bound to continue to have an appeal for those who insist on methodologically considering that the configurations which we are going to meet in empirical research have something singular to them, which can be a condition of progress towards a greater analytical precision of science. It would however be more difficult to argue that our capacity to *recognize* these same configurations following the passage of time can be accounted for in the same way. If we consider the living systems where variety dominates, realizing that which is highly improbable, we could think in theory that they are better represented as a state where all configurations have a non-surpassable singularity. This organization however cannot be a mere stochastic jumble, since the description of the whole body could be had from the content of one cell. If we find that a rock is an accidental assembly of minerals, what are we going to say in front of a crystal, where molecular configurations are indefinitely repeated, and where nature seems to directly realize some geometrical archetype? Shall we say that it is absolutely singular? Not quite. It is on the contrary *redundant* and this obliges us to consider that the pattern to which this structure responds can perfectly exist outside of our immediate sensory perception.

4. A cybernetic vision of the problem

It is possible to look at the problem of the empirical basis in a different way. Do we ever have a capacity to be certain about the "right" way to decipher material reality? The standard answer would be: "no." The founder of systems theory, Ludwig von Bertalanffy, trained in the Vienna Circle ideas, would have at first answered like that too, but his originality was to refuse to listen to the sirens of a sense data epistemology. How do we come to a viewpoint which truly enables us to extract something from reality? Reality is in flux, the discovery of irrationals by the Greeks was one more reason to seek some realm where an experience of understanding could endure, yet many would say that we must resist this too strong idea to posit a realm of available forms.

How can we justify, with the bearing on us of the traditional categories of metaphysics, being on the side of the "thing" as opposed to the highly abstract ideas contributed by the mind? Saying the opposite of Bachelard, according to whom scientific rational knowledge was not interested in validating sensory report but rather in reconstructing the world *a priori*, the historian of science Michel Serres said that we must give back to things all of their rights before we intervene.[1] What if we also want to avoid merely comparing statements to other statements, to make up with a standard objection to a correspondence theory of truth? Is there a way to give to reality a "voice" that would scientifically make sense?

Henri Bergson anticipated a cybernetic theory of the brain when, in *Matter and Memory*, he argued that from presentation to re-presentation we do not get more but less (1959: 33–5). Living beings should be understood as "centres

[1] "*Rendre aux choses elles-mêmes la totalité de leurs droits avant d'intervenir.*" *Hermès*, IV, *La distribution*, Paris: Éd. de Minuit, 1977, 40.

of indeterminacy," who let themselves be crossed by functions indifferent to them while they isolate the other ones that are turned into their perceptions. Our representation of matter would therefore result from the elimination of whatever has no interest for us. Let us take a certain point in the universe. The action of matter passes there without resistance, and if we had a photograph of the process all we would see on a plaque, the image, would correspond to these same indeterminacy zones which add nothing, but make it so that real action passes and virtual action is contained. The "perception" of an unconscious material point, being instantaneous, is infinitely more vast and complete than ours, since it collects and transmits actions of all other points of the material world, while our conscience only sees certain parts.

The project of cybernetics was centred around the production, after some partial successes with prosthesis, of a mechanical model of goal-directedness. To achieve it, cyberneticists looked at systems that are governed by feedback and the search for homeostatic functioning. It was found that those were open to new information, but static when it comes to the integration of matter and energy, such as we see in temperature regulation or hormone level in the blood. A machine is made up of parts that do not change, whereas the living organism continually changes its components. Servomechanisms use information against the background of this stable structure, but living, sentient and thinking beings presuppose not only circular causality but dynamic metabolic reactions, termed "autokatakinetic" by Rod Swenson (1997). This gives rise to an "hinge" question, correctly formulated by Bertalanffy as the following: in what sense can we say an open system as a structure; and in what sense a feedback system can be said to be open? The concept that connects them both can only be that of information (Bertalanffy 1975: 136).

If we look directly at our problem of meaning, a further move has to be made, and this is the recognition that meaning and intentionality allow us to introduce information in the world, Norbert Wiener himself devoting a whole book to invention where he emphasized both its highly unpredictable character and distinguished it from the simple operation of the laws of nature (1994: 104; 138). If we are allowed to introduce information in the world, and that information is another name for increased improbability, why would our brains suddenly start producing that which is ruled out by the theorems of information theory?

If we are inquiring about how knowledge happens, the true question is to determine what our thought does. It is a selection and re-orientation mechanism for those incoming messages. Our brain is a sorting system, and it is probable that animal responses, however limited, are still taking place in it. The human organism has a greater response capacity, which comes from the absence of a drive to exist within a closed loop, an *Umwelt* that would hold together by the completion of some sequential tasks. It is a fact that we can do partially inconsequential and even absurd things, that we can make mistakes concerning the statistical predictions about our behaviour. Those mistakes will break a code, create entropy and establish a greater capacity for choice. Mistake in this sense is freedom, and whoever would absolutely refrain from it would be merely functioning in a mechanical way. Animals will repeat the same sound and convey something by intensity and by relying more than we do on context. If survival alone was considered, this could be seen as better communication. We communicate things much more abstract, but they also introduce a mismatch in our communication, in the absence of feedbacks, or the absence of a need to *look* for them. Think of who has never experienced agriculture, let alone milking a cow, but who, as a government official, decides of the future of agricultural production in a country sitting in a remote office (Dansereau 1973: 135–7). This is also what happens when words are not referred to their environment, where they come alive. The consequences can be tragic, of such proportions as atomic bombs launched on major cities because an ultimatum was not correctly understood.[2]

5. Measuring what we do with things

It is therefore possible to think of the material world as a circulation and modulation place for signals. Balance and adjustment seem to be everywhere disseminated: when we sleep, we send signals for muscle release and inhibit them. When blood coagulates, clots are formed to be removed by a counterbalanc-

[2] See J. Singh, *Great Ideas in Information Theory, Language and Cybernetics*, New York: Dover, 1966, 4, referring to the Japanese word *mokusatsu* in reply to the Potsdam ultimatum of 1945.

ing system.[3] Gene duplications are probably what has made these systems act the way they do. We also know that a developing embryo obeys conflicting signals as well (Carroll 2006: 109–118; Leroi 2003: 39–45; 82–3). The phenomenon of coordinated macromolecules, of cell networks, of the building-up of forms establishes that nature as already put to use the messaging capacity to exchange signals. Can we say that the ultimate entities are endowed with the expression of meaning? Let us for a moment leave the question open. Methodically, let us break it down and first consider how the concept of *information* offers the most appropriate attempt at quantifying what processing units do with the obstacles and cues they receive from the world. This helps us to grasp how decisions take place according to a selection among alternatives.

In order to help clarify, let us use another way to introduce the idea of information. Jean-Paul Sartre wrote the following: "In the world 'the right way up' a message requires a sender, a messenger and a sendee. It only has the value of a means to something else. It is the content which is its end. In the world 'upside down' we are harassed by messages without a content, without a messenger and without a sendee." (1947 quoted in Robert 1983: 84) This was for him a way to justify the appearance of the "thrown" consciousness (*für sich*) problematically detached from the massive and inert *an sich*. If we want to rethink this problem, we ought to ask ourselves: how can philosophers say that we would be unaffected by so great a number of messages, only retain some, and then consider themselves capable of defining what knowledge is upon relying on so small a sample? Sartre was uninterested by the natural world. If he had been, he may have noticed that the "dual" type of communication he has in mind all the time is in part illusory, due to the number context-creating factors most of which are not even conscious. In the world of the cell, communicating merely anything would mean disappearing.

Should we look at precise mathematical relations in order to better understand how knowledge works? Mathematical knowledge is of a character so general that it does not speak about the world anymore. If we look at the debate reported in *Matière à penser* between the mathematician Alain Connes

[3] See my "Contenu, enjeux et diversité des acceptions de l'*Intelligent Design* en contexte étatsunien," *Connaître: Cahiers de l'Association Foi et Culture Scientifique* 26–27, September 2007: 17–23 where I have reacted to some of the affirmations of one of the proponents of Intelligent Design, M. Behe.

and the neurobiologist Jean-Pierre Changeux, on the face of it we can be sympathetic to some elements of Changeux's argumentation.[4] What is unbelievable however in his talk though is to imply that the objective mathematical coherence would simply be created by the stabilization of synaptic networks and could be shown, upon further analysis of our neurophysiologic structure, not to have any effects. The problem with that position is that the network of synapses needed to be stabilized in a certain *form* in the first place, so before saying that the brain has a capacity for generating patterns, there has to be a prior recognition that the brain is itself generated by information, it is given by it the form which it has.

Coming back to our problem, how therefore are we going to be assured that the "epistemic cut" made in reality through the idea of a binary selection working along a logarithmic transformation really represents the act of reality? For this to be defended, we would have to postulate that the selection giving us a result in bits is that of the system itself, in other words that our information concept really grasps reality to the point where units of meaningfulness would also be units of information, or "infons" as Tom Stonier suggested (1990). The connection here is not obvious, many have contested it, and

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[4] It can be read in English as *Conversations on Mind, Matter, and Mathematics*, trans. M. B. DeBevoise, new ed., Princeton: Princeton University Press, 1998. Connes will say that mathematical relations endure, exist out there in a strong sense just like the tree, the apple or the car on the street. It is a tempting position because we can try the same calculations as many times as we want and we will see the same relations holding. Yet some assumptions could be questioned if we looked at them carefully, for example we must remember that it is possible to see our act of mind, when we think of the Dedekind cut, as *creating* the irrational numbers, since we connect relations together, such as $\sqrt{2}$, or $9/7$. If we push things even a bit further, we can say that when we count one house, two and three, the house itself is not a pure and perfectly given entity; if we look we will see that the house, the chair, whatever example we care to take, as Berkeley makes plain – in *Towards a New Theory of Vision*, §109 in *Philosophical Writings*, D. M. Armstrong (ed.), New York: Collier Macmillan, 1974, 328 – is somehow conventionally read by us. Let our field of vision be reduced to a billionth of a centimeter: it is not all clear, as Whitehead saw – in his beautiful text "Mathematics and the Good" in *Essays in Science and Philosophy*, London: Rider, 1948, 80–1 – what a particular atom would be part of. The boundaries of common objects endure through stabilized effects of a large number of atoms in a de-coherence situation, but some atoms pop in and out of them. There might be numbers existing in our mind, and it is difficult to get out of there if we say they also exist in reality. The case for such a position is made even stronger if one correctly understands the theory of types: five of a type and five of another type have *different* meanings.

this is why at first it could only be mathematically referred to as the breaking of a pre-accepted code in the confines of an ergodic system; from there one could calculate the distance from equiprobability of every sign of the repertoire in use, more specifically for a particular event and prior to its selection, the logarithm of the reciprocal of the probability that this event would be selected. The units we are talking about, taken in themselves, do not represent a quantity of organization; in a real sense they are at first units of randomness working against the system's imposed contrivance.

When indeed we ask what is information, we can only answer that it is an abstract entity, even if it is the object of the animated field of computer science (more tellingly called in French "*informatique*," which also gave us the German "*Informatiker*" for a computer scientist). It separates form from meaning, yet despite what we just said if we want it to be something else than a tool useless for most human activities, it must be explained with the help of what is still meaning: it is an atom of non-random organization. This unit is secured, taken out of the flow of shuffledness that could wipe it off at any time. What we are speaking about is something that was the most improbable when it was emitted, but in the mind of the sender it was not the most improbable but rather the most certain, secured from a randomly-generated occurrence.

We may insist like Yockey that, since entropy can never be negative, Boltzmann's entropy and Shannon's information have nothing to do together (Yockey 1977: 381; see also Yockey 1992: 310–13), but we still have to account for the fact that, whereas there is an infinity of possible organizations of reality in theory, the quantifiable aspect of a unit of order would have to be stable enough to be integrated to others, it being possible to send to our receiver this concatenation to enable him to recognize units of meaning in such a framework on the condition that noise will not have eliminated them completely.

It is so extreme to have severed meaning from formal selections that to be usable at all, the system backlashes and calls for this unit of non-random order being re-introduced. If indeed, the most random is the potential carrier of the greatest surprise and therefore of the largest amount of information, the most efficient amount of information is still given when symbols are all equiprobable, and each selection stays closer to 0.5. What is desirable is not to insert the greatest number of bits in a signal, but as Weaver already saw, to choose as often as possible in the same way with selections occupying the greatest possible number of nodes.[5] Another problem is that, due to the redundancy of our languages, we send at the same time the whole structure of the language, what we can see if we think of the number of letters that can be omitted from average-length English words without any damage to recognition. The high information content might not always be desirable, since once we receive it, we must work along with intensities and analogical recognition by seeing the same pattern at different places, which is the inverse operation. The most important seems to have the nature of a translation.

6. Grasping thought in all its dimensions.

Let us first consider the storage of information. When an organism activates or inhibits a certain regulatory gene, switches it backward or forward by some sequence-positions, in other words uses it for something slightly different than what its ancestors did with it—possibly storing such complementary instructions in the intron sequences of its genome as we are starting to discover—it gives the impression to be able to retrieve a combinatorial possibility hidden in what may prove in the end to be a practical knowledge of its own genome. Recall how, in the case of bacteria, it has been suggested that stress could cause the appearance of random mutations with, upon an opportunity for growth, an inverse transcription inserting it in the nucleus (Cairns 1988). DNA is part of a larger process of development where it is interconnected in a network with a set of proteins, the only active enzymes, which govern regulation and expression of structures in other proteins. To be able to do that, the gene must receive a set of instructions and be capable to follow them in situating whole body plans in space. It may be that nature has invented something like a GPS way before us. We are also recalled of the operation of the electron's spin, able to position itself in reference to a coordinate system, or of non-locality experiments in physics. It is unlikely that on the one hand, at phenotype level, the message could be protected from errors within the span of a few decades and eventually give up, bringing about the collapse of an organisms' material organization, while on the other hand, at the genotype level considered

[5] "Language [...] should do as well as possible as often as possible." "Introductory Note" in *The Mathematical Theory of Communication*, Urbana: University of Illinois Press, 1963, 27.

through the angle of phylogeny, those messages could be protected from noise deteriorations for millions of years. Experience suggests the introduction of an hypothetical function of the code's considerable redundancy, acting through loops which have the role of error-correcting codes. Otherwise, the genome could only be understood as a random walk, without any hint on the efficiency and stability of longer genomes such as those of eukaryotes, leading to the conclusion that, given the usual estimation of mutation rate (10–9), this structural stability would amont to a miracle (Battail 1997: 346).

What therefore is the first unaltered message, where we would discover nature "imprinting" meaning through form donation? It is doubtful that those linear chemical instructions in DNA left alone would do anything: it is after all a fairly inert molecule. The ribosomes do something with this "information" as would a semiotic system and this is being done according to internal constraints that are those of the cell in its capacity to assemble tri-dimensional shapes, proteins which requires a "know-how" that works in fact according to a triangulation, since there has to be a knowledge of what is possible, what is sustainable and what is not (Barbieri 2003: 145–162). If everything was coded, nothing would be done with it. To affirm like Yockey (2005: 19) that the genetic code is distinct and *uniquely* decodable is to be blinded by a DNA bias which seems like a shaky ground, especially when one recalls that bases are constructed by sequences of proteins through a metabolism that changes.

If now we assume that none of what was described in the last couple paragraphs has anything to do with meaning and ask ourselves: 'what is a thought?' we might find in a well represented tradition this constant reference to a geometrical archetype underlying our perception of shapes,[6] like that of a cat, an elephant, or a tree beyond which there is a rational connection, four paws, a head, a vertebral column and the way they relate: bilateral symmetry, body plans, group displacements, etc. It looks like it could be programmed through the identification of the proper theorem. If a thought is a stable structural sample originating in nature, if it is a message, it is a particular one in that we ought

[6] Already in Descartes: "And even though it might happen that one idea gives birth to another idea, that could not continue indefinitely; but we must finally reach a first idea, the cause of which is like an archetype, in which is contained formally all the reality that is found only objectively or by representation in the ideas." 3rd Meditation in *Discourse on Method and Meditations*, trans. L. J. Lafleur, Upper Saddle River: Prentice-Hall, 1952, 98.

to have it already to recognize it. We are informed because something puts us in a state of expectation, but we need to answer two questions: how we got to recognize it in the first place, and where can we see this rational necessity in such a geometric pattern? It is not possible to have a completely empiricist epistemology relying on information theory like that of Fred Dretske (1999), and oppose it to a rationalism that would only consider geometrical shapes in attempting to make reality more necessary than it is in our experience. We need both, and the problem with such information-based epistemologies is that, just like Neo-Darwinism, they do not provide any means of adjudicating where we get the non-random unit from.

If we place ourselves at the level where conscious decisions are made, we see that many symbols we rely on are invested with a freely assigned significance. How would we know what was meant by a word, if all we had is someone looking at something and pointing while naming it in a language we do not know, as in Quine's examples to substantiate the radical translation problem? (Quine 1990: 68–79) How can we enter a conscience and find out what meaning it gave? That is the same problem as the one we just found in the epistemological attempts based on information selection: Putnam correctly objected that they could not be translated in language, since the forms of propositional calculus from probability measure we would end up with would be syntactically indistinguishable, so that only an external input could give us their key: from them alone we would have no clue about the context (1986: 263–4). Without a prior recognition of the fact that our very brain and nervous system are coded for, in other words that the capacity for understanding is itself built-up as the result of a form's operation, there is a conjuring trick in saying: "the meaning is now mine, I am its only possessor," when in fact none of us can freely create meaning, unless it be done in a community of speakers sharing the same pre-assumed and evenly distributed rules. How can we be able to point to something in the first place? Wittgenstein had it right when he said we know because nature gave us something, and not so much because we would have done anything.[7] In this sense, we can understand Michael Dum-

[7] "*Es ist immer von Gnaden der Natur, wenn man etwas weiß*," *On Certainty*, § 505, G. E. M. Anscombe and G. H. von Wright (eds.), New-York: Harper & Row, 1972, 66.

mett's criticism of Quine's holism as being devoid of any internal structure (Dummett 1978: 377).

Wittgenstein further said in *On Certainty* that commonly to say we know and to say we see are almost the same thing (1972: §90; §204). This would be the way through which knowledge works. Yet knowledge is intuited *when it grows* as a "bisociation of matrices," and what one sees is more like a wave than a particle (Koestler 1990: 59; 220). To know means that we have to put a *halt* on seeing something and to let the carriers of information from the world affect us. When we know, we contemplate some archetype that the "eye of the mind" can focus on. However, by trying to bring everything to it, by disassembling the complexity of perception, we would be mislead, since only this constant inflow will enable us, by having a recognizable pattern present at different places simultaneously, to intuit that this is so and by conformity to a token, in the sense of a substitution instance. We need to "fly over" a situation for this to happen, in the sense of being freed from a mechanical device's only way to decipher a message, which is in a linearly scanning way. Any efficient organizing action has a structure comparable to that by which the δημιουργός operates in Plato's *Timaeus* (28*a*–29*e*)[8]. We can make the hypothesis, answering a question raised earlier in §3, that things that affect us, that create those vibrations, have their own way of seeing those same archetypes but in being modelled after them (think of crystals, keeping in mind that geometry is not just in a platonic heaven but in the shape of space according to mass). What inanimate bearers of that information, such as those previously mentioned that are highly patterned, do not have is an interest in *staring* at them. They do not generate a formal world besides the empirical one, and one hypothesis would hold that they *inhabit* it already.

[8] "God and the forms have to be kept distinct in Plato for the reason that the activity of God as producing a world 'like' the forms is the one explanation Plato ever offers of the way in which the 'participation' of things in forms is effected. If 'God' simply meant the same thing as the forms, or as a supreme form, it would remain a mystery why there should be anything but the forms, why there should be any 'becoming' at all." A. E. Taylor, *Plato: The Man and His Philosophy*, London: Methuen, 1963, 442.

7. A more modest approach to knowledge

A way of "regionalizing" our understanding would be to recognize, in a sense suggested by some authors and among them Gerhard Schurz (2001), that most laws that operate are not of the strict type that would extend their application at all places and times. Most laws are system laws which have a normality background against which they are stated, they correspond to empirical observation and yet could always lead to a revision of knowledge where we would have to un-do previous conclusions. We therefore avoid an understanding of the logic of inquiry so stringent that it only classifies high abstractions, without regard for that "finer" logic that would operate on the hidden details that are only known for the time being as governed by some least-known principles (Bachelard 1965: 112). What about other ontological preferences than the Parmenidean exclusive valuation of "oneness" in concept? Let us say for instance that we would adopt a vision of knowledge progression where it is not the purified all-embracing formula that is sought, but the "voice of the many" according to an epistemological reflection of some principle of plenitude: how indeed to think of a world where the trees, the flowers, the eggs of amphibians and fishes would be understood as to their over-abundant presence?

If the object of perception carries a message, creates an effect and is therefore able to cause, and if the mind has a capacity to read something, is it that is has a community of form with it? And what would that be? The node that we called earlier a "non-random" unit? This raises a question since, as C. S. Peirce remarked in commenting on Leibniz, are we to consider that the computing, comparing and selecting element is able to create new meaning, to see new things, or does it have to be modelled after a machine that transforms energy into work but does not feed on work to re-engineer fresh and ordered potential energy[9]? Are we therefore saying that a mind could invent its own understanding, in contradiction to all know physical and natural processes? This problem of an effect without a cause is also the one mentioned earlier

[9] "That a piece of mechanism could not do work perpetually without being fed with power in some form, was a thing perfectly apparent to him; yet he did not understand that the machinery of the mind can only transform knowledge, but never originate it, unless it be fed with facts of observations.", "How to make our ideas clear" in *Collected Papers*, §5.394, C. Hartshorne and P. Weiss (eds.), Cambridge: Belknap Press, 1960.

around cybernetics. And if the mind is to read this understanding, where does it find it?

8. A vision of axiology through that of the whole

Things are often presented to us as though we had to choose between an almost frozen and a-temporal universe and another one in which even God would not know the future. In fact, the choice is not between predetermination, translatable in physical laws and a so-called "open" universe. Determinism may be the project of reason, but nothing says it has to be thought of as the action of some transcendent agent directing by constraint each one of the degrees of freedom offered to material entities.

If we admit the rising ladder of complexity, this does not mean that we automatically admit, by the same token, the growth of a freedom irrationally defined. Émile Boutroux underlined in *The Contingency of the Laws of Nature* (1916) the growing indeterminacy that we will encounter as we climb that ladder and the consequent presence of contingency even in physico-mathematical laws.

We must consider the problem of non-linear dynamics about which we can only talk linearly. We can only proceed step by step by analyzing one distinct and clear idea at a time. This is what we do in mathematics and it is very efficient, but we do not possess any other objective and agreed upon universalizable language. We cannot determine the future behaviour of many things at once, think of the three- or the *n*-body problem that gave rise to deterministic chaos. From this general recognition, we come to what gave us the algorithm, since those are instructions and chains of recursively defined steps that cause a state of affairs and make sense *for us*. But the claim that nature works algorithmically, made a decade ago by Daniel Dennett with the support of Richard Dawkins (Dennett 1996: 59–60; 206–7), is a curiously idealistic position to hold for a would-be materialist. We have no evidence that nature processes things in this "one idea at a time" mode, being affected by the limitating filtering mentioned earlier when discussing Bergson's hypothesis.

The problem is that of relating our scientific explanation, the particular set of concepts that we have extracted from it, back to reality. The non-human animal does not quite have this problem, it does not pause and consider things abstractly and so it does not build edifices of concepts: it rather grasps what it must do in a particular situation and, sure enough, it has an instinct but it would not be fruitful to use too rapidly a dialectical binary conceptuality and pretend that we simply have to switch from abstract thought to instinct to have the true nature of life. Instinct is not so much a different way of being intelligent as it is a way to relate all together a certain cycle that precisely exceeds the focus on the one idea that we talked about. Although ill-defined as a concept (Bateson 1977: 38–58), what the instinct helps us to see is the absence of a feedback from the environment that *we* could use to reconcile our thoughts and projects and their disruption of the world's equilibriums.

So *where* is the optimal form? Optimality may give the impression of resulting from a statistical process. Biologists such as Mayr have emphasized how much, in the Darwinian perspective, there is no essence, the wholes that seem identical to us are in reality all different (2001: 75–6). If we go further and we say that an individual is a packet of genes, we will say that it bears different alleles in distinct *loci* and that the result, the form 'horse' or 'man' would only be perceived through the magic of a word without referent since it always changes. I suggest that this perception that gives us the impression of defining a stable essence, the same in all, might still go unchallenged in its existence; we might rather have to consider that the cybernetic regulatory signals for on and off switching that have built it would not be where we expect them to be in a stochastic model. Those may not only be valencies, chemical attractions and repulsions but, related to them yet more fundamental, capacities for choice creating a "ratchet effect" in an inventive universe (Bronowski 1974: 147), that would specify a necessary but by no way sufficient condition. The inability to find the same perfection of a form in all the members of a species would not mean that the idea of form can be discarded, but rather that this form is the best available due to operating and opposed constraints, in other words the less perturbed result of feedback signals that this entity as experienced.

If there are serious reasons to think that nature operates according to a principle of choice and exclusion of alternatives, the contingency and "eventful" character of our world is no obstacle to a theory that would show an attempt to migrate between one type of pattern- and archetype-imposed necessity to a type of conditional necessity that would help us think about this large, indefinite, and unpredictable requirement of choice.

If we see meaning at certain branching points, we are not to look for the power of integration in gaps of material systems, but rather and negatively in avoiding the inconsequential position that laws would give rise to a capacity for indeterminacy so great as that which we meet in us. This is where a theological insight comes into our thesis, without need to inject it from outside. Modern explanation, it has been argued, explains by transforming efficient causality into a formal one (the Hamilton-Jacobi equation), and in so doing "de-ontologizes" reality and gives us an ever impoverished understanding (Largeault 1985: 53; Petitot 2001: 48–54). It does not think according to the direction which would allow for information increase, which could be thought of as the measurable face of a rediscovery of the ontological plane. It has even defined the concept as disorder, against the background of a process, deemed impossible, where some Demon would be able to invert that relation, securing order by tweaking a process towards a highly improbable molecular configuration. There are understandable scientific reasons why science would have proceeded the way it did, defining information as a "dis-disorder" instead of apprehending it directly. Maybe the way out of this fascination with disorder and chaos is to look for meaning in systems of coherence of an important number of parts (Laughlin 2005: 207–8).

From a philosophical vantage point, we can say that we reach a probabilistically defined knowledge, and contrary to a common misconception, it is not essential that this probability be heightened considerably. What matters is that we be able to ask the right question, and operate according to the right partitioning when we so do, as has been shown by Wesley Salmon (1990: 68–83; see also Salmon 1984). This is not in any sense a destruction of an idea of the whole, that of a "cosmos," but it is an expectation that this would come about through a power that is not ours. In this sense the Kingdom of God starts with the recognition that "πάντα δι' αὐτοῦ ἐγένετο" (in Him all things were made) according to *John* 1:3. The "all" that we prefix to that proposition is not the sort of "all" that Wittgenstein talks about when he criticizes infinity because in this understanding we would only consider things under a particular property and say that all the countably finite members of the set bound by a simple conjunction have it. What is a substantive whole such as we mean in "*all* things were made …"? These were already the questions of Raymond de Sébond whom Montaigne translated and criticized, they are the questions of natural theology: in this business of knowing, what about the contingent events? The things that unfold in a prophetic and messianic history? How can this cohere with an explanation of the world's rationality? Sébond was already thinking about a God who should not be seen as the *maker* of all in the Stoic way (Funkenstein 1986: 37–8), a fabricator of the universe and so therefore contained in it as its "engine," but truly as its Creator (Hooykaas 1999: 23–5). This is behind our seeing the "all" as a qualitative whole.

Is this kind of perfection only *for us*? It is hard to go from a particular symphony, a particular sunset being perfect in the sense of both intensional logic and the Polish logician's mereology, to predicate this perfection of the whole unrestricted, because nobody can grasp the whole in this way, since it is in flux, Heraclitus' *panta rhei* capable of destroying in the end all our categories. We will only have a grasp of this concept through intimations, in particular things that are universally a model of other things. We will map the relations they have that always obtain. If we see things in such a way that the system of these concepts will go down our way, then we will not be able to leave room for things becoming. This will confirm our knowledge that God has composed and divided His image in creation, but the way this comes to us is through recognition of patterns that are hidden under their effects and still create a harmonious whole, which only comes through the ability to see things together, and to explore the way the world works by both subordinating and elevating what is lowly. Heraclitus was in this sense one of the first theologians, reminding us that "Nature loves to hide." (Diels-Kranz, §123)

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