Edgar Morin and the *Rhuthmoi* of Nature – Part 2

Sunday 2 February 2020, by Pascal Michon

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Modern *Rhuthmic* Theory of Becoming

Morin envisaged then the vexing theoretical problems raised by both these new ontology and new physics. What kind of concept would enable us to grasp the essentially temporal reality they were referring to? As a matter of fact, they obliged us to make "the most contradictory terms to cling together" with the danger of falling into sheer "mysticism."

> The old universe settled down into clear and distinct concepts of Determinism, Law, Being. The new universe isolates concepts, outstrips them, shatters them, obliges the most contradictory terms to cling together, in a mystic unity, without nonetheless losing their contradictions. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 58)

In order to rationally address the problem, Morin argued, we could however capitalize on the recent substitution by Prigogine of the cosmological conceptions concentrating only on entropy, as sheer loss of energy and disorganization, with more positive conceptions closely associating entropy and constructive organization, which were comparable with the two sides of the same coin (p. 67). As already noticed, Prigogine showed that entropy was not the only law to be taken into account, because there had been disorder before organization, which, consequently, was not the initial state. As a result, disorganization and organization had to be considered as parts in the same loop.

> *One sees that the second law considered order and organization as initial states because it did not know the preceding sequence:* disorder → interaction → order/organization → disorder. […] If there is a beginning (catastrophe), it carries in itself in an indistinct way, with its disorder, the law of order and the potentiality to organize, and cosmic history begins with the turning of the "tetralogical loop." Thus, the law of cosmophysics is this very loop, and the sequence of the second law is inscribed in fact in the tetralogical loop, enriching and completing it. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 68)

This thread of reasoning resulted in a plain *rhuthmic* model of the becoming based on a succession

of loops or, more accurately, on “an irreversibly spiraloid circuit” linking disorder to order and organization, and vice versa.

> It is a matter, therefore, of an irreversibly spiraloid circuit, produced by the original thermic catastrophe, and which does not cease to take shape through the relation disorder/order/organization. […] *a)* disorder produces order and organization (from initial constraints and interactions); *b)* order and organization produce disorder (from transformations). (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 69)

While, due to the second principle of thermodynamics, order was always subjected to decay, disordering and loss, disorder also acted as “a carpenter” *[il est aussi charpentier]* being “active everywhere.”

> In fact, cosmogenesis shows us that disorder is not only dispersion, froth, slaver, and dust from the world in gestation; it is also carpentry *[il est aussi charpentier]*. The universe was not built only despite disorder, it was also built in and by disorder. […] Disorder is active everywhere. It permits (fluctuations), nourishes (encounters) the constitution and the development of organized phenomena. It co-organizes and disorganizes alternately and simultaneously. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 71)

Morin formalized his model of becoming, which accompanied his ontological and physical model of “chaosmos,” with what he called “the tetralogical loop,” that is a loop linking disorder, interactions, order, and organization together.

> The tetralogical loop signifies that interactions are inconceivable without disorder, that is to say without inequalities, turbulences, agitations, etc., which provoke encounters. It signifies that order and organization are inconceivable without interactions. No body, no object can be conceived outside of the interactions which have constituted it, and of the interactions in which it necessarily participates. […] It signifies that the concepts of order and organization develop only in function of one another. Order develops only when organization creates its own determinism and makes it reign over its environment. […] Organization needs principles of order intervening across the interactions which constitute it. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, pp. 52-53)

To describe this temporal logic Morin preferred the term “dialogic” to that of “dialectic” which he considered as a mere phenomenal expression of a deeper principle.

> We need, then, a fundamental linking of the notions of order and disorder within the “tetralogue” disorder/interactions/order/organization. The fundamental linking must be of dialogic nature. I will be able to really define this term only later (v.2, ch.7); let us say here that dialogic signifies the symbiotic unity of two logics, which simultaneously nourish each other, compete against each other, live off each other, oppose and combat each other to death. I say dialogic, not to put aside

> the idea of dialectic, but to have it derive from it. The dialectic of order and disorder is situated at the level of phenomena; the idea of dialogic is situated at the level of principle, and already I am daring to promote it (but I will be able to demonstrate it only much later, in v.3) to the level of paradigm. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 77)

Another reason for rejecting dialectic was the domination of synthesis and ternary logic in the dialectic model since Hegel, whereas recent physics showed only permanent and endless opposition between a bunch of opposite principles with no synthesis sequence to reconcile them. Since there never were syntheses or moments of rests—as Simondon and Deleuze who underlined the necessity "to start from the middle"—Morin advocated starting "from the genesic, from chaos, namely, from the tetralogical loop."

> Given this, one can envisage a theory. It would start, not from zero, nor from the initial "point," but from the genesic, from chaos, namely, from the tetralogical loop. It should not rest on order or disorder as on an ontological or transcendent pillar, but produce correlatively the notions of order, disorder, and organization. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 78)

This resulted in reintroducing "event-ness" or "happenings" into physics. Whereas the paradigm of classical science—"there is no science except science of the general"—obliged us to disregard singularity, the new physics was based both on an original "Happening" and on "cascades of happenings"—as if physics had been entirely historicized.

> The old universe had no singularity in its obedience to general laws, it had no event-ness [Fr. *évémentialité*] in its repetitive clockwork movements, no play in its inflexible determinism… The Universe which is born here is singular even in its general character. […] This universe a-borning *[cet univers naissant]* is born in Happening and is generated in cascades of happenings. Happenings, triply excommunicated by classical science (since it was simultaneously singular, aleatory, and concrete), re-enters by the cosmic front door. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 81)

In the general conclusion of the book, Morin underlined again the fundamental "event-ness" or "temporality" of the universe. Interestingly, in this instance, he cited Whitehead's philosophy of process.

> The universe produces its general laws from its own particularity. It is an enriched universe: matter is not the ultimate essence of this universe, it is an aspect, which takes on consistency with organization. It is a reanimated universe, moving, acting, transforming, becoming. There is nothing in the universe which is not temporal; there is no element whatsoever, from the particle to the most stable component of a stable system, which cannot be conceived of as event, that is to say as something which happens, is transformed, disappears. The cosmos itself is an Event, which continues its course in cascades of events in which particles arose, atoms were formed, in which suns light up, stars die, life is born. All active organization is an interlacing of events which disorganize and reorganize. Communicational/ informational organization is made up of only of

> events which it produces, captures, utilizes, resurrects… *Event,* as Whitehead says, *is the [unit] of real things.* It is the concrete [unit] which nature gives, not the abstract [unit] which measurement gives. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, pp. 375-376, my mod.)

Moreover, whereas classical physics had considered time as "reversible," in the sense that any given physical phenomenon could always be undone and taken back to its initial state, the new physics introduced the idea that time was actually "irreversible" since the things populating the universe as well as the universe itself could not be taken back to their initial states. "Everything was born" and "Matter ha[d] a history." A few pages below: "There is an *evolution of matter*" (p. 134).

> Physical order was unaware of the irreversibility of time until the second law of thermodynamics. Cosmic order was unaware of the irreversibility of time until 1965, when the universe entered into becoming. The eternity of the Laws of Nature was thus liquidated. There is no more frozen *physis.* Everything was born, everything appeared, everything began, once upon a time. Matter has a history. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 81)

Yet, this history should not be conceived in a neo-idealist way. Morin noticed that "the favorable hypothesis" suggested by the philosopher and Jesuit priest Pierre Teilhard de Chardin (1881-1955) according to which the universe developed its own richness only in an ascensional way, was one-sided and incomplete. Actually, order and organization had occurred, and still occurred, at a tremendously expensive cost. "Destruction and dispersion," "fruitless expenses" and "useless agitations" were largely dominant features of the universe, while organization was utterly exceptional.

> There is hemorrhage, waste, mess of which we must be conscious. The encounters produce more destruction and dispersion than organization. To constitute an organization, erect an order, keep a life alive, so many "useless" agitations, so many "fruitless" expenses, so many squandered energies, so many dispersive hemorrhages are needed! (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 83)

In fact, both kinds of history, the dispersive one derived from the second law of thermodynamics, and the ascensional one inspired by biological evolution, should be thought of as belonging to the same physical reality. The two perspectives, which were both born around the middle of the 19th century, should be associated.

> Now, each of these two times had arisen at the same moment, in the middle of the nineteenth century. The first, that of the second law, drew *physis* toward degradation, the first rumble announcing the great cosmic diaspora. The second, on the contrary, was that of ascensional evolution, or progress. It had penetrated society since 1789 and burst upon biology. (Darwin. *The Origin of Species.* 1859) But biological time was going inversely to entropic time, and as they had each arisen in a sphere hermetically closed to the other. […] Now, we can finally break the schizophrenia between these two times which are unaware of and flee each other. They are

> simultaneously one, complementary, concurrent, and antagonistic. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 84)

As we shall see, the existence of "organizations," biological as well as physical, was based simultaneously on stabilizing cycles and loops, irreversible transformations, and unexpected events. This meant that the historical time of the universe was in fact, as in Bachelard's view, "syncretic" or "complex" (p. 83).

> To this already very complex time, we will have to integrate, when we examine the problem of organization, the time of reiterations, repetitions, loops, cycles, repeated beginnings, and we will see that these repetitive times are nourished and contaminated by irreversible time (cf. Part II, ch.2), just as they are perturbed by event-full time: their movement is always spiraloid and always subject to the risk of rupture… The great time of Becoming is syncretic. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 84)

Later in the book (part 2, chap. 2, sec. IV), Morin elaborated further this first view with a few considerations drawn from what he called the "fundamental dynamism" of the cosmos and its population by "active organizations." Contrary to what most philosophers claimed, he first noticed, time was not only an incessant irreversible flow. It contained both the notion of passing and that of recursion. It was both "sequential" and "looping," "irreversible and circular."

> Time is part of the internal definition of all active organization. Activity is clearly a phenomenon in time. But time, from the moment it introduces itself into active organization, becomes bifid, dissociates itself at entry into two times without ceasing to remain the same time and finds itself again at exit. It is sequential time, which in fact imbues and pervades the system, and it is the time of the loop which recloses on itself. This is to say that time is doubly part of the definition of active organization since it is both irreversible and circular time. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 213)

The result of this double movement was not any longer linear but "spiral-like."

> The unity of this double yet single time, associated yet dissociated, is like spiral movement, simultaneously irreversible and circular, returning on itself, biting its tail, closing itself up continuously in its re-opening, re-beginning itself continuously in its flow. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 214)

Second, Morin emphasized, this double "spiral time" was constantly interrupted by "accidents, perturbations, lapses," i.e. "chopped up by a thousand small, worrisome events."

> This spiral time is fragile because it is tied to physical improbability and because it is at the mercy

> of ecological dependence. It is not the time of clockwork rigor [...] The time of the regenerative loop knows accidents, perturbations, lapses, which continuously threaten being and existence. This is to say that spiral time hauls in itself event-full [Fr. *événementiel*] time. It is chopped up by a thousand small, worrisome events. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 214)

Morin's conclusion was thus the same as in the first part of the book when he referred to a "syncretic" or "complex" time of Becoming. These three forms constituted "complementary, concurrent, and antagonistic times," which together formed "the Time of life" (p. 215). In living beings, but also in societies, this complex structure of time appeared from the play between: 1. internal degradation and disorganization, aphazard external perturbations; 2. negative retroactions, regulation, intended to cope with these disorganizations and perturbations; 3. positive retroactions (accentuation, amplification, acceleration of a process by itself on itself) which could "play a genesic role."

> We are going to see that, in the biological sphere, and especially in the anthropo-social sphere, positive retroaction, while remaining disorganizing but also because it is disorganizing, can play a genesic role, namely create diversity, newness, complexity. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 218)

In the general conclusion of the book, Morin came back once more to this view. Time was not sheer "degradation, progress, sequence nor perpetual cycle" but "rich and complex" which meant "complementary, concurrent, and antagonistic."

> The universe of old physics could not cope with time, or rather, time could bring it nothing but degradation. The new universe is consubstantial with a rich and complex time: it is neither the simple time of degradation, nor the simple time of progress, nor the simple time of sequence, nor the simple time of perpetual cycle. It is, in a way simultaneously complementary, concurrent, and antagonistic, all of these diverse times, while still remaining the Same. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 376)

Modern *Rhuthmic* Theory of Individuation

As we saw, Morin's theory of becoming culminated in a theory of individuation he called "organization." Disorder allowed interactions, which allowed in turn the emergence of local pockets of order and organization. The organizations, i.e. the beings, the existing things, were thus based both on a certain internal order "intervening across the interactions which consitute[d] [them]" and a certain external rule "over [their] environment" (p. 53). Naturally, the emergence of organizations caused in turn new disorder in the environment, which allowed new interactions, etc.

To specify what he meant by the term "organization," Morin started from the concept of "system" as it had rapidly emerged in various sciences since the 1900s to oppose both the traditional views naively derived from architecture and the newest views based on sheer dispersion and probability.

In micro-physics, he recalled, the particle lost all substance, all distinction, and was now defined only by "the interactions in which it participated," and, when it was part of an atom, by "the interactions which [wove] the organization of this atom" (p. 95). It was "a Gordian knot of interactions and exchanges" (p. 95). Therefore, "*the particles [had] the properties of the system much more than the system [had] the properties of the particles*" (p. 95 – Morin's italics). The atom thus became the model of an "organized object or system."

> Since then, the atom steps forward as a new object, the organized object or system whose explanation can no longer be found solely in the nature of its elementary components, but is found also in its organizational and systemic nature, which transforms the characteristics of the components. […] we see that the universe is founded, not on an indivisible unity but on a complex system! (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 95)

The same revolution had occurred in astro-physics which did not limit itself any longer to one solar system moved by a clockwork rotation of the planets around the sun, but discovered "myriads of sun-systems, organizing sets which self-maintain[ed] by spontaneous regulations" (p. 96). Similarly, modern biology introduced the idea of system to replace both the idea of living matter and that of vital principle, that had become obsolete, and give a more satisfactory account of the cell or the organism (p. 96). Finally, right from the start, sociology considered society as a system, in the strong sense of an organizing whole irreducible to its components, the individuals (p. 96).

While the Universe itself, due to its ongoing expansion and dislocation, could certainly not be seen as a system (p. 65), the concept well applied to the innumerable "islands and archipelagoes" that had formed ever since the big bang, including living organisms and human societies. The universe was "an astonishing architecture of systems."

> All the key objects of physics, biology, sociology, astronomy, atoms, molecules, cells, organisms, societies, stars, and galaxies constitute systems. Outside systems, there is only particle dispersion. Our organized world is an archipelago of systems in the ocean of disorder. All that was object has become system. All that was even an elementary unit, including and especially the atom, has become system. We find in nature masses, aggregates of systems, unorganized flows of organized objects. But what is remarkable is the polysystemic character of the organized universe. The latter is an astonishing architecture of systems built one on the other, one between the other, one against the other, implicating and dovetailing one with the other, in a grand game of masses, plasmas, fluids of micro-systems circulating, floating, enveloping the architectures of systems. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 96)

Similarly, "Nature" constituted an "extraordinary solidarity of mortised systems."

> The phenomenon is what we call *Nature*, which is nothing but extraordinary solidarity of mortised systems [*systèmes enchevêtrés* – entangled] building one on the other, by the other, with the other, against the other: Nature is systems of systems in chaplets, clusters, polyps, bushes, archipelagoes. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 97, my mod. – same

> idea p. 107)

According to Morin, systemic phenomena had thus become evident everywhere during the 20th century, but the concept of system itself had not been satisfactorily elaborated. Even Ludwig von Bertalanffy (1901-1972) in his *General System Theory: Foundations, Development, Applications* (1968) had not gone far enough. The biologist had rightly chosen holism over reductionism, but he had not pursued the paradoxical nature of complex unity. We had to go even beyond holism and reach to the organizational circuit.

Quite remarkably, Morin then referred to Ferdinand de Saussure's definition in his *Course in General Linguistic* (notes from 1906 to 1911 published in 1916) as one of the best and the earliest one, since it introduced for the first time the idea of organization. We must here give credit to Morin to have recognized, against most of his contemporaries including deconstructionists, that Saussure was not a "structuralist" but a "systematist" and to, consequently, have half-opened a path between his own implicitly *rhuthmic* theory of complexity and the explicitly *rhuthmic* theory of language that was emerging since the 1950s with Benveniste and more recently Meschonnic, as we will see in another chapter.

> Finally, the definition of Ferdinand de Saussure (who was a systematist rather that a structuralist) is particularly well articulated and evokes [*fait surgir* – brings out] especially the concept of organization by linking it to that of totality and interrelation: the system is "an organized totality, made up of interdependent elements holding together and not able to be defined except one by the other in function of their place in this totality." (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 99, my mod.)

Limited to the sub-concepts of *totality* and *interrelation*, the concept of system was insufficient, though. It had to be enriched with that of *organization*, that is to be dynamized and endowed with a genuinely generative aspect.

> In fact, it is not sufficient to associate interrelation and totality; one must tie totality to interrelation by the idea of organization. In other words, as soon as the interrelations between elements, events, or individuals have a regular or stable character, they become organizational and constitute [a "whole" – *un tout*]. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 99, my mod.)

Whereas a system was merely a "*global organized unity of interrelations between elements, actions, or individuals*" (p. 99, my trans.), the organization was the "arrangement of these interrelations" which "produced and reproduced" the system. The organization was a *self-organizing unity*.

> Organization is the arrangement of relations between components or individuals which produces a complex unity or system, endowed with qualities unknown at the level of components or individuals. Organization interrelationally ties [note: by fixed and rigid dependences, by active

> interrelations or organizational interactions, by regulatory retroactions, by informational communications] diverse elements, events, or individuals which henceforth become the components of a whole. It assures relative solidarity and solidity to these ties, thus assures the system a certain possibility of duration despite chance perturbations. Organization, therefore: *transforms, produces, binds, maintains.* (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 101)

However, Morin did not want to hierarchize the two concepts which had to be thought of as parts in the same loop, which moreover should include that of interrelations.

> My aim here is to associate them, since system is the phenomenal and global character which interrelations take, whose arrangement constitutes the organization of the system. The two concepts are tied by that of interrelations: any interrelation endowed with some stability or regularity takes on an organizational character and produces a system. There is, therefore, a circular reciprocity among these three terms: interrelation, organization, system. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 101)

In order to clarify, as much as possible, the functioning of this loop, Morin elaborated in the following sections the concept of "*unitas multiplex*" or "organized complex unity" (p. 102-112).

The fact that a system was made up of elements linked to each other through an organization that regulated their interactions resulted, first, in a series of positive consequences. The arrangement produced the "emergence" of new properties at the level of the whole as well as of the parts.

> We can call emergences the qualities or properties of a system which present a character of newness in respect to the qualities or properties of the constituents considered separately or arranged differently in another type of system. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, pp. 103-104)

The concept of "emergence" was important since it denoted, simultaneously, the production of radically new beings or properties, that is some sort of "events" (p. 105), and some degrees of tiering within each system, "the emergent qualities rise one on the other, the heads of some becoming the feet of others" (p. 108).

On the one hand, whether for atoms, molecules, or human societies, "the whole was always more than the sum of its parts" (p. 103). Quoting from Serres, Morin underlined the significance of the phenomenon of emergence for understanding the nature of no less than matter, life, language, and humankind. He also alluded, a few pages below, to "consciousness" (p. 108).

> It is quite remarkable that the apparently elementary notions that are matter, life, meaning, humanity, correspond in fact to the emergent qualities of systems. (Serres, 1976, p. 276)

> (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 104)

But on the other hand, the parts were also much more than isolated parts. They were transformed and enriched by their existence within the whole. Individual aptitudes for "language, craftsmanship, and art," for instance, were the result of positive retroaction of the whole upon the parts.

> In human society, with the constitution of culture, individuals develop their aptitudes for language, craftsmanship, art, that is to say that their richest individual qualities emerge within the social system. Thus, we see systems where macro-emergences retroact as micro-emergences on the parts. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 105)

However, Morin was very critical of the substitution of a certain "reductionist blindness (which sees only the constitutive elements)" with a no less limiting "holistic blinding (which sees only the whole)" (p. 109). He particularly targeted here von Bertalanffy whom he reproached for not seeing clearly the central role of organization and complexity in systems.

> Systems theory has reacted to reductionism, in and by "holism" or the idea of the "whole." But, believing to go beyond reductionism, holism has in fact brought about a reduction on the whole: whence, not only its blindness on the parts insofar as parts, but its myopia on organization insofar as organization, its ignorance of the complexity at the heart of global unity. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 110)

Similarly as strict individualist methods, strict holism had to be overcome. In fact, systems induced also negative consequences. Each particular arrangement imposed new "constraints" and caused losses in the whole as much as in the parts.

> The internal determinism, the roles, the regularities, the subordination of components to the whole, the adjustment of the complementaries, the specializations, the retroaction of the whole, the stability of the whole, and, in living systems, the mechanisms of regulation and control, systemic order in a word, are translated into so many constraints. Every association implies constraints: constraints exercised by parts interdependent one on the other, constraints of the parts on the whole, constraints of the whole on the parts. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 110)

So, a system was a "complex unity" where components were held together while remaining distinct by their function, but also abandoning themselves to the organization to ensure their sustainability. The system was only viable if the parts enjoyed sufficient room for their own action but also if the gregarious forces were stronger than the dissipative forces. It was thus based on *tense loops linking its various levels* or on *active antagonisms*.

> Every system whose organization is active is in fact a system where antagonisms are active. Regulations suppose a minimum of antagonisms on guard [*qu'elles refoulent* – that they repress]. Retroaction which maintains the constancy of a system or regulates a performance is called *negative* (negative feed-back), a very enlightening term: triggered by the variation of an element, it tends to annul this variation. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 118, my mod.)

Actually the systemic constraints were so powerful that they resulted in the repression of important characters which remained obscure but always capable to reemerge if the opportunity was given to them. This was, Morin commented, the lesson given by Marx and Freud concerning the social and psychic unconscious (p. 125).

> While emergences develop into phenomenal qualities of systems, organizational constraints immerge in a world of silence the characters inhibited, repressed, compressed at the level of parts. Every system includes, thus, its immerged, secret, obscure zone where suppressed virtualities stir. The duality between the immerged and the emergent, the virtualized and the actualized, the repressed and the expressed is a source of scissions and dissociations in great living and social polysystems. (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 124, my mod.)

But the role of constraints entailed also a second characteristic. There were naturally various degrees of complexity from the lowest in "crystal groups," mobilizing only similar and distinct components, to the highest in "living organisms," composed of "billions of cells which remain differentiated, diversified, and individualized (possessing organizing autonomy)" (p. 113). Thus, every increase in complexity implied "an increase in variety" as much as "*a more supple and complex direction*" based, for instance, "on inter-communication and not on coercion."

> As I see it, every increase in complexity is translated by an increase in variety within a system; *this increase, which tends to dispersion in the type of organization where it is produced, requires thenceforth a transformation of organization in a more supple and complex direction.* The development of complexity requires, therefore, both a greater richness in diversity and a greater richness in unity (which will be founded for example on inter-communication and not on coercion). (*Method*, vol. 1, 1977, trans. J.-L. Roland Bélanger, 1992, p. 114)

Morin's conclusion concerning the concepts of system and organization could be, once again, compared to Lucretius' theory of individuation, despite the time distance. Quite like, according to Lucretius, a building could stand and resist decay because of the tiny angles its apparently straight architecture was based on, systems could persist in their being thanks to the active antagonisms they were, so to speak, riding. Just as Lucretius' "building" was a dynamic cone where myriads of contrary fluxes reached for a time equilibrium, Morin's "organized complex system" was based on active internal looping antagonisms. This meant, based on the latest science, reactualizing the peculiar concept of *equilibrium by disequilibrium*, which, one remembers, allowed Lucretius to bridge the divide between Heraclitus and Parmenides, between flow and form, without depending for individuation on Plato's solution by "participation to ideal Forms."

Next chapter