

From the Concept of System to the Paradigm of Complexity¹

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ABSTRACT

This paper is an overview of the author's ongoing reflections on the need for a new paradigm of complexity capable of informing all theories, whatever their field of application or the phenomena in question. Beginning with a critique of General System Theory and the principle of holism with which it is associated, the author suggests that contemporary advances in our knowledge of organization call for a radical reformation in our organization of knowledge. This reformation involves the mobilization of recursive thinking, which is to say a manner of thinking capable of establishing a dynamic and generative feedback loop between terms or concepts (such as whole and part, order and disorder, observer and observed, system and ecosystem, etc.) that remain both complementary and antagonistic. The paradigm of complexity thus stands as a bold challenge to the fragmentary and reductionistic spirit that continues to dominate the scientific enterprise.

Introduction: Mastering the Concept of System

In contrast with the idea of a general theory of systems (or even a theory specific to systems), I wish, in the following pages, to propose the idea of a system paradigm capable of informing all theories, whatever their field of application or the phenomena in question.

The first thing we must do is master the concept of system. Though system theory revealed the generality of systems, it did not uncover their "genericity." Although everything from molecules to stars, from cells to societies, is now regarded in terms of systems (in contrast with the previous century's notions of "matter" and "vital substance"), this generality is not, by itself, sufficient to determine the epistemological significance of the notion of system in all its conceptual complexity.

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As the concept of system now stands, though it is embedded in a general theory ("general system theory"), it does not constitute a paradigmatic principle; rather, the principle invoked is that of holism, which seeks explanation at the level of the totality, in opposition to the reductionist paradigm that seeks explanation at the level of elementary components. As I shall demonstrate, however, this "holism" arises from the same simplifying principle as the reductionism to which it is opposed (that is, a simplification of, and reduction to, the whole). I have already indicated (Morin, 1977, p. 101) how system theory has failed to lay its own foundation by elucidating the concept of system. The system paradigm remains larval, atrophied, and inchoate; system theory thus suffers from a fundamental defect: it tends to fall repeatedly into

the reductive, simplificatory, mutilating, and manipulative ruts from which it was supposed to have freed itself (and us along with it).

In order to make sense of the concept of system, we must postulate a new, non-holistic principle of knowledge. This will be possible, however, only if we conceive of systems not only in general, but in generic or generative terms—that is, in terms of a paradigm (a paradigm being defined here as the set of fundamental relations of association and/or opposition among a restricted number of master notions—relations that command or control all thoughts, discourses, and theories).

The concept of system has always played a fundamental role in defining every set of relations among component parts that form a whole. The concept only becomes revolutionary, however, when, instead of completing the definition of things, bodies, and objects, it replaces the former definition of the thing or the object as something constituted of form and substance that is decomposable into primary elements, as something that can be neatly isolated in a neutral space, and as something subject solely to the external laws of "nature." From that moment on, the concept of system necessarily breaks with the classical ontology of the object. (As we shall see, the object conceived of by classical science is a mere cutaway drawing, an appearance, a construct—something both simplified and one-dimensional that mutilates and abstracts from a complex reality that is rooted both in physical as well as in psychocultural organization.) We are aware of the universal scope of the shift from the notion of object to the notion of system; however, what we have yet to grasp is the radical nature of this shift and the truly novel point of view it brings with it.

I. The System Paradigm

A. The Whole is Not a Catch-All

Holism is a partial, one-dimensional, and simplifying vision of the whole. It reduces all other system-related ideas to the idea of totality, whereas it should be a question of confluence. Holism thus arises from the paradigm of simplification (or reduction of the complex to a master-concept or master-category).

Pascal had already given expression to the new paradigm introduced by the idea of system: "I consider it as impossible to know the parts without knowing the whole as to know the whole without knowing the individual parts" (Pascal, 1966 [1662], p. 93, Brunschvicg ed., #72). According to the logic of simplification, such a proposition leads to that impasse which Gregory Bateson called a double-bind: the two injunctions (to know the parts through the whole; to know the whole through the parts) seem bound to cancel each other out in

Figure 1.



vicious circle without entrance or exit. Rather, one must extract from Pascal's formula a higher kind of understanding founded on the constructive circularity of the

explanation of the whole through the parts and of the parts through the whole-that is to say, **an understanding wherein these two explanations complement each other by virtue of the very motion which joins them**, without cancelling out all of their competitive and antagonistic characteristics.

This active loop is what constitutes the description and the explanation. At the same time, the maintenance of a certain opposition and of a certain free play between the two explanatory processes-which according to the logic of simplification are mutually exclusive- is not vicious, but fruitful.² Moreover, the search for explanation in the retroactive motion of each of these processes with respect to the other one (parts \leftrightarrow whole; whole \leftrightarrow parts) constitutes a first introduction of complexity at the level of the paradigm (for, as we shall see, **we would be mistaken to acknowledge complexity at the phenomenal level, while overlooking it at the level of the explanatory principle; rather, precisely at the level of principle is where complexity must be revealed**).

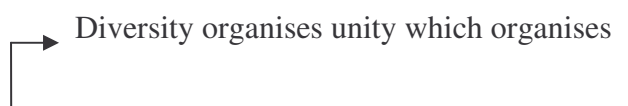
By the same token, we should conceive of systems not only in terms of global unity (which is purely and simply to substitute a simple macro-unity for the simple elementary unity of reductionism), but in terms of a *unitas multiplex*; here again, **antagonistic terms are necessarily coupled**. The whole is effectively a macro-unity, but the parts are not fused or confused therein; they have a double identity, one which continues to belong to each of them **individually** (and is thus **irreducible** to the whole), and one which is held in **common** (constituting, so to speak, their citizenship in the system). More than that, the examples of atomic, biological, and social systems show us that a system is not only a composition of unity out of diversity, but also a composition of internal diversity out of unity (e.g., the Pauli exclusion principle which creates diversification of electron shells around the nucleus; biological morphogenetic processes in which an undifferentiated egg develops into an organism composed of extremely diversified cells and organs; and societies which not only give a common cultural identity to diverse individuals, but also, by means of this culture, permit the development of differences). Once again, one must invoke a way of **thinking that flows in a circle** (see Figure 2) between two mutually-exclusive explanatory principles: on the one hand, the unifying way of thinking becomes increasingly homogenizing and loses diversity; on the other hand, the differentiating way of thinking becomes a mere catalogue and loses unity.

Again, this is not a question of "calculating the correct dose" or of "equilibrating" these

Figure 2.



Figure 3.



two explanatory processes; rather, one must integrate them in an active loop which allows us to grasp what is shown in Figure 3.

To take the problem of maintaining the relations between the whole and the parts, or the one and the many, as central is not enough; we must also see the complex character of these relations, which I will formulate here somewhat schematically (for further development, see Morin, 1977, pp. 105-128). To wit:

- ◆ The whole is greater than the sum of the parts (a principle which is widely acknowledged and intuitively recognized at all macroscopic levels), since a macro-unity arises at the level of the whole, along with emergent phenomena, Le., new qualities or properties.
- ◆ The whole is less than the sum of the parts, since some of the qualities or properties of the parts are inhibited or suppressed altogether under the influence of the constraints resulting from the organization of the whole.
- ◆ The whole is greater than the whole, since the whole as a whole affects the parts retroactively, while the parts in turn retroactively affect the whole (in other words, the whole is more than a global entity-it has a dynamic organization).

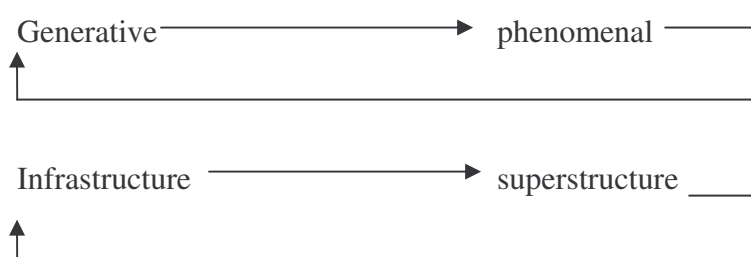
Within this framework is where such key concepts as being, existence, and life should be understood as global emergent qualities; such concepts are not primary (or radical or essential) qualities, but real instances of emergence. Indeed, being and existence are emergent from all processes containing feed-back loops (Morin, 1977, esp. pp. 210-216). Life is a cluster of emergent qualities resulting from the process of interaction and organization between the parts and the whole, a cluster which itself retroactively affects the parts, the interactions, and the partial and global processes that produced it. All of which yields the following complex explanatory principle: the phenomenal must not be reduced to the generative, nor the "superstructure" to the "infrastructure." Rather, explanation should seek to understand the kind of process whose products or end-results bring about a return to the initial state. Such a process may be called recursive (see Figure 4):

- ◆ The parts are at once less and greater than the parts. The most remarkable emergent phenomena within a highly complex system, such as human society, occur not only at the level of the whole (society), but also at the level of the individuals (even especially at that level-witness the fact that self-consciousness only emerges in individuals). In this sense:
- ◆ The parts are sometimes greater than the whole. As Stafford Beer (1960, p. 16) has noted: "[T]he most profitable control system for the parts does not exclude the bankruptcy of the whole." "Progress" does not necessarily consist in the construction of larger and larger wholes; on the contrary, it may lie in the freedom and independence of small components. The richness of the universe is not found in its dissipative totality, but in the small reflexive entities-the deviant and peripheral units-which have self-assembled within it, as Gunther (1962) and Spencer Brown (1972) have observed. This idea is echoed in Pascal's dictum: "But even if the universe were to crush him, man would still

be nobler than his slayer, because he knows that he is dying and the advantage the universe has over him. The universe knows none of this" (Pascal, 1966 [1662], p. 95, Brunschvicg ed., #347).

- ◆ The whole is less than the whole. Within every whole there are penumbras and mutual incomprehensions-indeed schisms and rifts-between the repressed and the expressed, the submerged and the emergent, the generative and the phenomenal. There are black holes at the heart of every biological totality, especially every anthropo-social totality. The isolated individual is not the only one who has no knowledge or awareness of the social totality, this social totality is also ignorant and unconscious of the dreams, aspirations, thoughts, loves, and hates of the individuals; and the billions of cells constituting these individuals are themselves ignorant of these same dreams, aspirations, thoughts, loves, hates, and so on. If one places this conception of black holes, penumbras, schisms, and mutual incomprehensions at the very heart of the system paradigm, then this paradigm opens out spontaneously onto the modern theories of the individual unconscious (Freud) and the social unconscious (Marx).
- ◆ The whole is insufficient, which follows from the preceding.
- ◆ The whole contains uncertainty. We shall see below that one cannot with any certainty isolate or circumscribe a single system from among the systems of systems of systems with which it is interlocked and in which it is nested. This uncertainty is also due to the fact that, in the living world, we have to do with poly totalities whose every term can be conceived of both as part and as whole. Thus, with regard to Homo, which of the following is the system: the society, the species, or the individual?
- ◆ The whole contains conflict. I have already tried to show (Morin, 1977, pp. 115-122, 217-224) that every system contains forces that are antagonistic to its own perpetuation. These antagonisms are either virtualized/neutralized, constantly controlled/repressed (through regulation and negative feedback), or made use of and incorporated. In stars, the conjunction of contrary processes-one tending toward implosion, the other toward explosion-creates a spontaneous self-organizing, auto-regulation. Living organization can only be understood as a function of a continual process of disorganization, which degrades molecules and cells uninterruptedly as they are being reproduced. At the level of human societies, Montesquieu's idea that social conflicts caused the decline of the Roman Empire, but also its grandeur, must be understood systemically-as well as, of course, Marx's idea linking the class structure of society with class conflict.

Figure 4.



Also, we must found the idea of system on a non-totalitarian and non-hierarchical concept of the whole, and, more particularly, on a complex concept of the *unitas multiplex* as a means of access to poly totalities. This preliminary paradigm is, in fact, of capital social and political importance. The paradigm of holistic simplification leads to a neo-totalitarian functionalism and accommodates itself easily to all the modern forms of totalitarianism. In any event, it leads to the manipulation of the individual units in the name of the whole.

In contrast, the logic of the paradigm of complexity not only aims at "truer" knowledge, it stimulates the search for a complex praxis and politics. (I shall return to this point below.)

B. The Macro-Concept

The system problematic cannot be resolved by the whole-parts relation, and the holist paradigm overlooks two terms of capital importance: **interactions and organization**. Whole-parts relations must necessarily be mediated by the middle term of **interactions**.

This term is all the more important given the fact that most systems are composed, not of "parts" or "components," but of actions among complex units which are themselves composed of interactions. It has been justly remarked that it is not the cells, but the actions taking place among the cells, that constitute an organism. Now, the set of these interactions constitutes the organization of the system. Organization is the concept that gives constructive coherence, order, regulation, structure, etc., to the interactions. In fact, the notion of system comprises three different concepts;

- ◆ system (which expresses the complex unity and phenomenal character of the whole, as well as the complex of relations between the whole and the parts);
- ◆ interaction (which expresses the set of interwoven relations, actions, and reactions which collectively create a system); and
- ◆ **organization** (which expresses the constitutive character of these interactions as forming, maintaining, protecting, regulating, governing, and regenerating the system-in short, **the thing that gives the idea of system its conceptual backbone**).

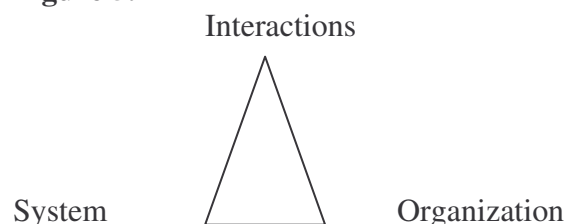
These three terms are indissoluble; each one implies the other two, and the absence of anyone seriously mutilates the macroconcept of system. The idea of system without the notion of organization is just as defective as the notion of organization without the idea of system. We are dealing with **a macroconcept**. We must recognize that our consciousness has been shaped by the paradigm of simplification and that the concepts we have at our disposal are atomistic rather than molar, chemical rather than organismic, isolated and static rather than co-productive, recursive, and interdependent.

The idea of organization first emerged in the sciences under the name of structure. But **structure** is an atrophied concept which refers more to the idea of order (invariant laws) than to that of organization. The "structuralist" vision arises from simplification (it tends to reduce the phenomenality of the system to the structure which generates it;

and it fails to take into account the recursive influence of emergent phenomena and the whole on the organization itself).

In most natural physical systems, and in all biological systems, **organization is active what one might call *organization***. That is, it includes the supply, storage, distribution, and control of energy, as well as its expenditure and dissipation through work. In a manner of speaking, ***organization* produces both entropy (that is, the degradation of the system and of itself) and negentropy (the regeneration of the system and of itself)**. Therefore, we obviously must conceive of the relation between entropy and negentropy in a complex manner-not as two terms in Manichaean opposition, but rather as **bound inseparably one to the other** (Morin, 1977, pp. 291-296). But, above all, we must conceive of organization as (a) the continual reorganization of a system tending toward disorganization; and (b) as continual self-reorganization-that is to say, not just organization, but **auto-re-organization**. As far as the organization of living things is concerned, there is yet another polarity: on the one hand, with respect to generativity (the genetic organization containing the putative program of the "genotype"), and on the other hand, with respect to phenomenality (the organization of the activities and behaviors of the "phenotype"). In other words, this is a question of **auto-(*genopheno*)-re-organization**. To complete the picture, we must add that such an organization involves an exchange with the environment, which itself furnishes organization (in the form of plant and animal nutriments) and **potential organization (in the form of information)**. This environment itself constitutes a macro-organization in the form of an ecosystem (the conjunction of the organizational level of the biocenosis within that of the biotope). Biological organization is at once a closed form of organization (preservation of integrity and autonomy) and an open form of organization (exchanges with the environment or ecosystem): therefore, it is an auto-eco-organization. Thus, from the least complex living thing (unicellular organism) up to and including the level of human societies, all organization is at the least an: **auto-(*geno-pheno*)-eco-re-organization**.

Figure 5.



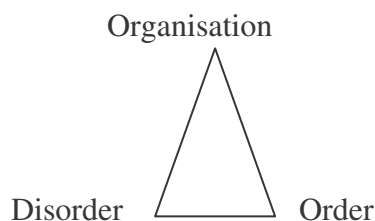
We see, therefore, that the problem of organization cannot be reduced to a few structural rules. Right from the start, **the concept of biological – and *a fortiori* social – organization is a super-macro-concept, which itself belongs to the macro-concept system/interactions/organization**.

Organization is a higher paradigmatic concept. The paradigm of classical science held explanation to consist in reduction to a principle of order (laws, invariances, averages, etc.). Here, this is not a question of replacing order with organization, but of combining them that is to say, of **introducing the principle of system organization as an irreducible explanatory principle**. In so doing, the concept of disorder is necessarily

introduced as well. Organization creates order (by creating its own systemic determinism), but it also creates disorder.

On the one hand, systemic determinism can be flexible, containing zones of randomness, free play, and freedom; while on the other hand, as we have said, the work associated with organization produces disorder (entropy increase). In all instances of organization, the presence and continual production of disorder (degradation, degeneration) are inseparable from organization itself. In this respect, therefore, the paradigm of organization also entails a reformation in the way we think. From now on, explanation must no longer banish disorder or obscure organization; rather, it must always recognize the complexity of the relation shown in Figure 6. Thus, the new paradigm entails uncertainties and antagonisms by bringing together terms that are mutually interconnected. But the new scientific spirit inaugurated by Bohr consists in making progress in knowledge not by eliminating uncertainty and contradiction, but by recognizing them—that is to say, by bringing into the open the penumbra contained in all knowledge – that is, by making progress in ignorance! I use the word "progress" advisedly, because ignorance which is recognized, recorded, and, so to speak, deepened, is qualitatively different from ignorance which remains ignorant of itself.

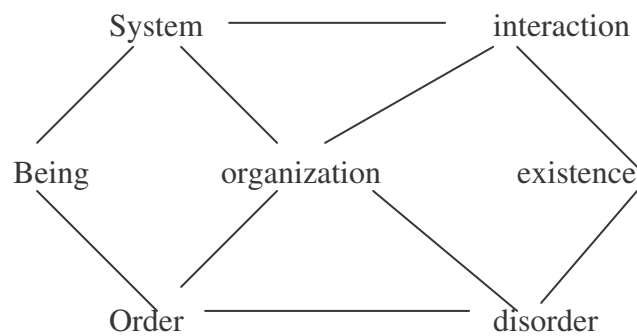
Figure 6.



Finally, we must break with the mutilating form of understanding which cannot conceive of system or organization except by eliminating the idea of being or existence. Elsewhere, I have tried to show that the idea of self-organization is productive of being and existence (Morin, 1977, pp. 211-215). This is of capital importance and is opposed to two types of thinking: one which can function only by obscuring concrete beings and existents (condemning itself to see only their skeletons, and in so doing condemning them to manipulations of every description); and the other one which can function only by revealing and focusing on the reality of existing beings (which is obviously of the utmost importance when dealing with living things in general, and with human beings in particular).

Thus, we see that a new knowledge of organization is capable of creating a new organization of knowledge. The old reductionist and atomistic paradigm, in which order was the only explanatory principle, is replaced by a new paradigm consisting of interrelations (which are necessarily associative in nature) among the notions shown in Figure 7.

Figure 7.



Instead of the old, solitary master-word, we now have a macroconcept which not only is molar in nature, but also contains circular relations between its terms in other words, **a macro-concept that is recursive.**

C. The Psychophysical Nature of the System Paradigm

The **paradigm of simplification** requires us to choose between two ontological views of systems: (1) either the system is a real physical category which imposes itself naturally on the perception of the observer, who must then take care to "reflect" it correctly in his or her description, or (2) the system is a mental category or ideal model, merely heuristic or pragmatic in nature, which is applied to phenomena in order to control, to master, or to "model" them.

The complex conception of system cannot allow itself to be trapped within this alternative. **System is a double-entry concept: *physis* \leftrightarrow *psyche*.** It is a chimera concept: a psychical head on a physical body. It is as described in Figure 8. And the following principles flow from the relations indicated in Figure 8:

- ◆ a principle of art (diagnostic principle);
- ◆ a principle of critical reflection (on the relativity of system concepts and frontiers), and
- ◆ an uncertainty principle.

The fact that the psychical and the physical nature of system are indissociable also entails the indissociability of the relation between the observer/subject and the observed/object. This leads to the necessity of including, not excluding, the observer in the observation.

This, in turn, leads to the necessity of elaborating a meta-system of understanding in which the system of observation/ perception/conception is itself observed/perceived/ conceived within the observation/perception/conception of the observed system. This, then, sets in motion a series of consequences which lead to **the complexification of our very mode of perceiving/conceiving the phenomenal world.** Whence the necessity for an even more significant paradigmatic and epistemological reform than the one we have envisioned up to this point, since **the connection between the knowledge of organization and the organization of knowledge demands a reorganization of the process of knowing.** This can be done by introducing a second -order reflection – that is, a knowing of knowing.

By the same token, the radical dissociation between the sciences of *physis* and the sciences of the mind—that is, between the sciences of nature and the sciences of culture, or the biophysical sciences and the anthropo-social sciences – appears to us as an ongoing

Figure 8.

PHYSICAL	PSYCHICAL
by virtue of its formative and existential conditions (interactions, conjunction of ecological constraints, energetic and thermodynamic conditions and operations); even a system of ideas has a physical component (biochemical-physical phenomena linked to cerebral activity, Le., the need for a brain).	by virtue of its distinguishing and isolating conditions, and by virtue of its choice of conceptual focus (system, sub-system, supra-system, eco-system).

mutilation and an obstacle to any serious knowledge. If the ambition to reconnect these disjointed sciences seems absurd, to accept this disjunction would be even more so.

Therefore, if we are not yet capable of accomplishing this reconnection, we must at least bring into face-to-face contact:

- ◆ the observer with the observed system;
- ◆ the subject with the object;
- ◆ culture (which produces physical science) with *physis* (which produces biological organization which produces anthroposocial organization, and hence culture).

In this way the process of distinguishing, which is fundamental to all cognitive acts, becomes complex. It appears to us as the result of a transaction between the observer and the world that is observed – a transaction in which either one of the participants can very well deceive the other one. In any event, this process takes place within a given culture (which provides the paradigms which permit and require distinguishing), and thus involves, among its other aspects, an ideological component. If science cannot be reduced to ideology (that is, if science cannot be viewed solely as the ideological product of a given society), one must nevertheless acknowledge the ideological component in all scientific knowledge. Scientific knowledge cannot be spared from ideological critique, and thus from self-knowledge – and that also applies to those who think they possess the true science and denounce the ideology of others.

D. The Paradigm of Complexity

In all of the preceding discussion, the fundamental term in need of clarification was complexity. What is recognized as complex is most often the complicated, the

entangled, and the confused, and thus something that cannot be described, given the astronomical number of measurements, operations, computations, and so forth such a description would require. However, those who recognize this complexity at the level of phenomena generally share the belief that it can be explained at a fundamental level in terms of a few simple principles that allow for an almost infinite combination of a few equally simple elements.

In this way, for instance, the extreme complexity of speech can be explained by means of structural principles allowing for the combination of phonemes and words. Similarly, the discovery of a double-helix structure allowing for combinations based on a four-letter chemical alphabet is thought to have revealed the key to living organization.

Certainly, such explanations are of immense import; for example, they allow us to understand at one and the same time the unity and the diversity of complex phenomena (like human language or the language of life). However, by no means do they exhaust the problem of explanation. Structural linguistics does not explain the meaning of speech, any more than the genetic code explains the various existing phenomena – this cluster of emergent qualities – we call life. To be sure, since molecular biology has explained the chemical machinery of life (although not life itself), it has come to regard life as a mythological notion (or in any event as unworthy of science), and so has banished life from biology. But what it ought to do is just the reverse: reflect on the inadequacy of all explanatory principles based on simplification. Complexity is not merely the phenomenal froth of reality; it is in the principles themselves.

The physical foundation of what we call reality is not simple, but rather complex. The atom is not simple. Even the so-called elementary particle is not a simple primary entity: it oscillates between being and non-being – between wave and particle – and it may itself contain components which by their very nature cannot be isolated (quarks). At the macro cosmic level, the universe is no longer the ordered sphere dreamed of by Laplace. It is both dissipation and crystallization, both disintegration and organization. Uncertainty, indeterminacy, randomness, and contradictions appear, not as residues to be eliminated by explanation, but as ineliminable ingredients of our perception/conception of reality – thus spelling ruin for simplification as an explanatory principle. From now on, all of these ingredients must nourish the elaboration of a principle of complex explanation.

Complexity cannot be simplified – that is the moral of the system paradigm. It is complex because it forces us to unite ideas which are mutually exclusive within the frame work of the principle of simplification/reduction (see Figure 9).

It is complex because it establishes mutual implication-and therefore necessary conjunction-between notions which that classically disjunct (see Figure 10). It is complex because it introduces a complex concept of causality – in particular, the idea of an eco-auto-causality. (The notion of auto-causality-which always requires an external causality-is synonymous with recursive causality, in which the organizing process elaborates the products, actions, and effects necessary for its own generation or regeneration.)

Figure 9

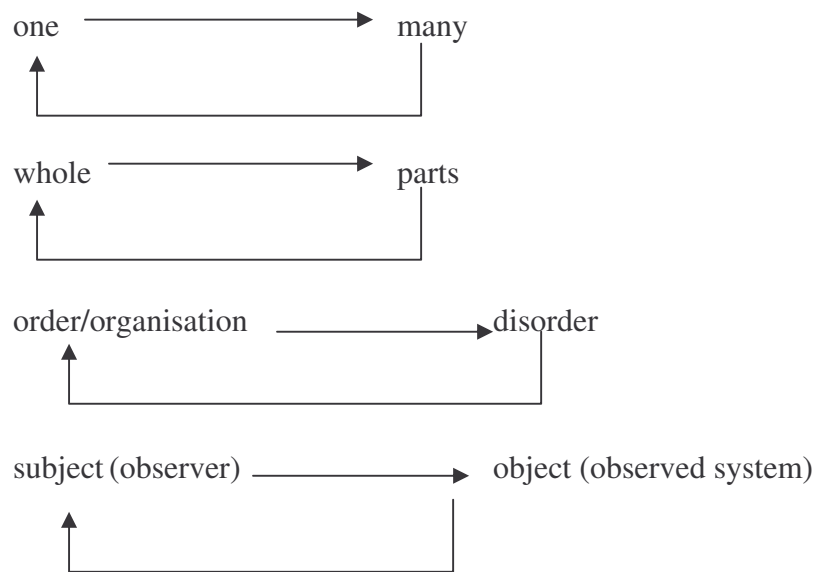
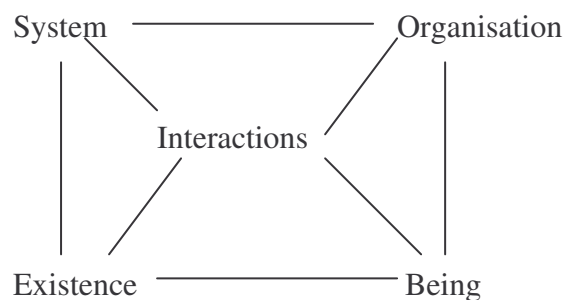


Figure 10.



II. Systemised Theories

System is better understood as a generic, rather than a general, concept. It is generic to a new way of thinking which can then be applied in a general fashion. But in order to be applied in a general fashion, it **has no need of a general theory of systems**. Rather, the organization/system dimension should be present in all theories bearing upon the physical universe (including the biological, the anthroposocial, and the noological realms). If these theories were considered as so many branches of a general theory of systems, they would reduce the diverse phenomena perceived to the system dimension alone. By contrast, what is required is a differentiation among theories bearing upon types of phenomena with each having its own nature (that is, each of which has a physics, a chemistry, and a thermodynamics-thus an organization, a being, and an existence-peculiar to itself).

Moreover, General System Theory, which is founded solely on the notion of the open

system, is wholly insufficient when applied to living or social systems. What we must do, then, is reconsider our physical, biological, and anthropo-social theories so as to deepen their system/organization dimension and to uncover their connections with (a) the key concepts of organization, and (b) a way of thinking capable of creating a dynamic feedback loop among terms which are simultaneously complementary, competitive, and antagonistic.

Otherwise, we will fall back into the same old vices of reduction, homogenization, and abstraction that system theory claimed to cure.

Conclusions

1. System is not a master-word for totality; rather, it is a root-word for complexity.
2. We have to raise the concept of system from the theoretical level to the paradigmatic level (I could say as much, if not more, about the cybernetic concept of machine-everything said here about the idea of system is valid a fortiori for the idea of machine).³
3. The problem is not to create a general theory covering everything from atoms, molecules, and stars to cells, organisms, artifacts, and society. Rather, the problem is to consider atoms, stars, cells, artifacts, and society – that is to say, all aspects of reality, including, and in particular, our own-in a richer way in the light of the complexity of system and organization.
4. Under the reign of the paradigm of simplification/ disjunction, being, existence, and life dissolve into the abstraction of system, which then becomes the successor to all the abstractions, obscuring the richness of reality and provoking its unbridled manipulation. In contrast, the inevitable effect of the development of a complex concept of system/ organization will be to cause being, existence, and life to emerge once more.
5. In other words, as long as the idea of system remains at the level of theory, it in no way affects the paradigm of disjunction/simplification. System theory thought it had overcome this paradigm (just as it thought it had overcome the atomization of reductionism); on the contrary, however, its "holism" becomes a new kind of reductionism by reducing everything to the whole. Only at the paradigmatic level- where the true extent of a system's potential complexity can be revealed-will the idea of system be able to open out onto a new complex organization of thought and action.
6. We begin to catch a glimpse of a new form of rationality. The old rationality was content to fish for order in the sea of nature. But it caught no fish-only fishbones! By allowing us to conceive of organization and existence, the new rationality allows us to perceive not only the fish, but the ocean as well-that is to say, that which can never be caught.
7. The old rationality organized on the basis of order (that is, through the act of ordering). The new rationality, however, orders on the basis of organization (that is, the play of interactions between the parts involved and the whole). In this sense, organizing must replace ordering. The more complex the organization, the more it harbors those forms of disorder we call freedom.
8. Organization is not an institution, but a continually generative and regenerative activity at all levels based on computation, strategic planning, communication, and dialogue.

9. The system paradigm demands that we master, not nature, but the desire for mastery (as Michel Serres has urged),⁴ which opens up for us forms of action which necessarily entail self-consciousness and self-control.
10. Such a principle leads to a praxis that is at once responsible, liberal, libertarian, and communitarian (each of these terms being transformed through its interactions with the others). It also leads to the rediscovery of the problem of wisdom and the necessity of establishing our own form of wisdom. This is the sense in which the search for new wisdom must be an effort to overcome the split that has occurred in the West between the world of reflection and the world of social praxis.

Translator's Notes

1. This paper titled "Le systeme, paradigme ou theorie?" was first read as the inaugural address to the Congres de l'A.F.C.E.T, Versailles, November 21, 1977. It was published in *Science avec conscience*, Paris: Fayard, 1982, pp. 172-189; and reprinted in *Science avec conscience*, new edition, Paris: Points/Seuil, 1990, pp. 238-255.
2. Cf.: "We foresee the possibility of transforming vicious circles into virtuous cycles which become reflexive and begin to generate complex thinking" (Morin, 1977, p.9).
3. See Morin, 1977, pp. 255-282.
4. See Serres, 1982, esp. Chapter 2, "Knowledge in the Classical Age: La Fontaine and Descartes," pp. 15-28.

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About the Author

Edgar Morin was born in Paris in 1921. He entered the French Resistance in 1941. In 1951 he broke with the Communist Party. He is currently Director of Research at the Centre National de Recherche Scientifique in Paris, as well as co-director of the Centre d'Etudes Transdisciplinaires: Sociologie, Anthropologie, Politique at the Ecole des Hautes Etudes en Sciences Sociales. Morin has authored or coauthored some thirty books in the fields of sociology, cultural criticism, philosophical anthropology,

political theory, and epistemology. His major work, the four-volume *La Methode*, is his contribution toward a new "paradigm of complexity" which, while implicit in leading developments across the disciplinary spectrum, is at odds with the fragmentary and reductionistic spirit that continues to dominate the modern scientific enterprise.

One of the leading figures on the contemporary French intellectual scene, Morin refuses to be pigeon-holed as a sociologist, a philosopher, or a cybernetician, preferring to be known simply as a "thinker."

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Suggestions for Further Reading

Bougnoux, D., Le Moigne, J.-L., and Proulx, S., eds. (1990) *Arguments pour une methode: Autour d' Edgar Morin*. Paris: Seuil. (Morin volume in the prestigious *Colloque de Cerisy* series)

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Morin, E. (1977-1991) *La Methode*. 4 vols. Paris: Seuil. (Vol. I. *La Nature de la nature*, 1977; Vol. 2. *La Vie de la vie*, 1980; Vol. 3. *La Connaissance de la connaissance*, 1986; Vol. 4. *Les Idees: Leur habitat, leur vie, leurs moeurs, leur organisation*, 1991.) (Morin's magnum opus)

Morin, E. (1990) *Science avec conscience*. New ed. Paris: Points/Seuil. (Originally published: Paris: Fayard, 1982.) (Collected essays)

Morin, E. (1990) *Introduction a la pensee complexe*. Paris: ESF. (accessible summary statement of Morin's philosophy of complexity).