# The Smith of the Gods

## 34 - « The Future Seen under the Aspect of Systems Theory and as an Element of Psychogenesis »

**340-**Another apparent contrast between the nature of the inanimate and the animate is what is called the violent contradiction between the degradation of energy and evolution in the sense of Charles Darwin, between the law of dissipation in physics and that of evolution in biology. According to the second law of thermodynamics, the general tendency of events in physical nature is to go toward states of maximum disorder and leveling of differences, with as a final vision what is called the heat death of the Universe: all the energy ends up as regularly distributed low-temperature heat and the process of the world comes to a stop. On the contrary, the living world shows, in the course of its embryonic development and its evolution, a passage toward an ever higher order, an ever greater heterogeneity and more and more organization. Thus, on the basis of open systems theory, the apparent contradiction between the entropic evolution of matter and the anthropic evolution of the living disappears. In every irreversible process, entropy must increase. The variation of entropy in closed systems is therefore always positive: « order is continually destroyed ». However, in open systems, there is not only production of entropy by irreversible processes; entropy may very well become negative. This is the case of every living organism which receives complex molecules charged with free energy wrested from entropy and of a recombinable nature. Thus, living systems maintained in steady states can avoid the increase of entropy by recombining free energy; they can even evolve toward states of increased order and organization.

**341-**We can found our unitary perception of the world not on the hope, perhaps, of reducing in the last resort all levels of reality to that of physics, but rather on the isomorphisms that exist between the various scientific domains. To speak of what is called the « formal » mode, that is, the conceptual constructions of science, these isomorphisms mean structural uniformity of the schemas we apply. In « material » language, this means that the world, that is, the totality of observable events, presents dynamic structural uniformities made up of slow variables and fast variables which manifest themselves at the various levels or in the various disciplines as isomorphic traces of order. « This body of knowledge naturally refers to a semiology of forms, as to a kind of language of Nature. » Language, taken in the broadest sense of the word, includes not only discourse, but also writing and the symbolic system of mathematics. These are systems of traditional symbols not inherited but freely created. In the first place, this explains the specificity of human history with respect to biological evolution, tradition with respect to hereditary mutations which occur only over a long period of time. In the second place, physical trial-and-error, largely characteristic of animal behavior, is replaced by mental experience, that is, by an experiment carried out with conceptual symbols. It is for this reason that it becomes possible to go straight to the goal.

**342-**Going straight to the goal is teleological science in the metaphorical sense, that is, the regulation of events in the sense of maintenance, production and reproduction of organic entities, as Oparin taught us, which are general criteria of life. Real finality implies, however, that actions be carried out with knowledge of the goal to be reached and of their future final

result. The conception of the future goal already exists and influences present action. This applies to the simple actions of everyday life up to the highest achievements of the human intellect in science and technology. Moreover, the symbolic world created by men acquires a life of its own. It becomes more intelligent than its creator. The symbolic system of mathematics, for example, is stored in an enormous thinking machine, an Artificial Intelligence which, if a problem is posed to it, returns a solution on the basis of a determined process of symbolic chaining upon Big Data normally inaccessible to us, and provides solutions that could hardly have been envisaged in advance. Economics escapes us, the scalar and the numerical escape us, the symbolic escapes us. As a social power, the symbolic world which makes man human creates at the same time the bloody course of history. Contrary to the naive struggle for existence of organisms, human history is largely dominated by the struggle of ideologies, that is, of symbolisms which are all the more dangerous as they hide primitive instincts.

**343-**The domination of mass man and the suppression of the individual by an intrusive social machinery, the break-up of the traditional system of values and its replacement by pseudo-religions ranging from nationalism to the cult of status, to astrology, to psychoanalysis and to sectarianism, the decline of artistic, musical and poetic creativity, the complacent submission of the masses to authoritarianism, that of a dictator or of an impersonal elite, the titanic battles between an ever smaller number of super-states. These are some of the symptoms that occur periodically nowadays. We cannot alter the course of events which has produced what we call « man »; it is up to him, however, to apply his power of foresight to his establishment or to his own annihilation. In this sense, the question of knowing what course the scientific conception of the world will take is at the same time the question of man's destiny.

An overview of scientific developments shows a strange phenomenon. Independently of one another, similar general principles begin to take shape in various scientific domains. In this direction, science has particularly brought to light the aspects of organization, totality and dynamics, and has broadly shown their influence in the various sciences of Form and of morphogenesis. These conceptions are characteristic of modern physics confronted with classical physics. In biology, they are brought to light by the « organic conception », it is Organology, represented by the science of systems. Similar conceptions are found in medicine, in psychology (Gestalt), in stratification theory, and in modern philosophy. This opens immense perspectives, the hope of a unity of world vision, hitherto unknown. How does this unity emerge? Is it rather the fact that the whole is worth more than its parts, or a set of general systemic principles?

**344-**Remember! As early as 1937, von Bertalanffy answers this question by wishing for a new scientific domain which he calls the « general systems theory ». It is a logico-mathematical domain whose task is to formulate and derive the general principles which apply to « systems » in general. In this sense, the exact formulation of terms such as those of totality and sum, of differentiation, of progressive mechanization, of centralization, of hierarchical order, of finality and of equifinality, etc., extends their influence into all the sciences that deal with « systems », which implies their logical homology. The mechanistic world view of the last century was closely tied to the domination of the machine, to the theoretical conception of living beings as machines and to the mechanization of man himself.

However, these concepts forged by modern scientific developments draw their most obvious examples from life itself. One may thus hope that this new world concept of science is an expression of the evolution toward a new dimension of human culture. The foundation of the open systems model is the dynamic interaction of the components. The foundation of Wiener's cybernetics is the feedback cycle in which, thanks to a feedback of information, the desired value is maintained, a goal is reached, etc. Open systems theory is a generalization of kinetics and thermodynamics. Cybernetic theory is founded upon the feedback and the information necessary to the system. Entropy functions do not explicitly contain time. This is true both of the classical entropy function of Clausius for closed systems and of the generalized function of Prigogine for open systems and irreversible thermodynamics.

**345-**The only known attempt to fill this gap is a further generalization of irreversible thermodynamics by H. G. Reik in 1953, who tried to introduce time explicitly into the equations of thermodynamics. A third problem that can be envisaged is that of the link which exists between irreversible thermodynamics and information theory. Order being the foundation of organization, it is therefore the most fundamental problem of biology. In a sense, order can be measured by a negative entropy in the conventional sense of Boltzmann. This was shown, for example, by Schultz in 1951 for the non-random arrangements of amino acids inside a protein chain. Their organization, contrary to a random arrangement, can be measured by a term called chain entropy. There exists, however, a different approach to the problem, in terms of yes-or-no decisions, called bits, governed by information theory. As is known, information is defined by a term formally identical to negative entropy, which brings to light a correspondence between the two different theoretical systems that are thermodynamics and information theory. It seems that the next step is the elaboration of a dictionary allowing one to pass from thermodynamic language to that of information theory and vice versa. It is evident that, for this purpose, generalized irreversible thermodynamics will have to be employed, for there is, in open systems, only the survival and the elaboration of an order which do not contradict the fundamental principle of general entropy.

**346-**As we have seen before, living systems undergo a more or less rapid exchange of their components: degeneration and regeneration, catabolism and anabolism. The living organism is a hierarchical order of open systems. What presents itself as a permanent structure at a certain level is in fact maintained only by a continuous exchange of components at the level just below. Under these conditions, the multicellular organism maintains itself by changing its cells, the latter by changing their structure, the latter by changing their chemical compounds, etc. As a general rule, the rates of renewal are all the faster as the components considered are small. It is a good illustration of the flux of Heraclitus, in and thanks to which the organism survives. Here again, characteristic differences with closed systems are obtained. Closed systems in general tend asymptotically toward equilibrium states. On the contrary, in the case of open systems, false-start phenomena may occur, as is the case in many physiological phenomena. We may envisage that it is here a process in an open system; certain mathematical characteristics of it are then predictable. The image of man as robot, whether metaphysical or mythical, and its persuasive power reside only in the fact that it corresponds very well to the mythology of mass society, to the glorification of the machine and of profit as the only motor of progress. Unbiased observations easily show the falsity of these basic hypotheses. The Stimulus-Response scheme leaves aside all that part of behavior which is the expression of spontaneous activities, play, exploratory behavior and every form

of creativity. Environmentalism is refuted by the elementary fact that not even fruit flies or Pavlov's dogs are unique, as any student of heredity and behavior should know. From the biological point of view, life does not consist in the maintenance or the restoration of an equilibrium, but essentially in the maintenance of disequilibria, as the doctrine of the open-system organism reveals. The search for equilibrium means death and decadence. Psychologically, behavior does not only seek to attenuate tensions, but also to construct new ones. If this stops, the patient becomes a mental body in decline in the same way as a living organism becomes a body in decline when the tensions and forces which keep it away from equilibrium disappear.

**347-**In this line, mental illness is essentially a disturbance of the systemic functions of the psychophysical organism. For this reason, isolated symptoms or syndromes do not define the « sick » being. Look at some classical symptoms of schizophrenia: « loss of associational structure » and unbridled chains of associations. Similar examples are found in poetry and « bravura » rhetoric. Auditory hallucinations; the « voices » that told Joan of Arc to free France. Penetrating sensations; a great mystic like Saint Teresa recounted an identical experience. The fantastic constructions of the world; those of science surpass all those of schizophrenics. It is not a question here of playing on the theme « of genius and madness », but of showing that it is not one single criterion but its integration that makes the difference. Psychiatric disturbances are clearly defined in terms of systemic functions. With reference to knowledge, the multiple worlds of psychoses, impressively described by the writers of the phenomenological and existentialist schools, are the product of their brains. But our normal world is also shaped by emotional, motivational, social, cultural, linguistic factors, etc., amalgamated with a so-called correct perception. Illusions and disillusions, hallucinations, at least in dreams, exist in the healthy individual; the mechanisms of illusion even play an important role in the phenomena of fidelity, without which a consistent image of the world would be impossible. The contrast between what is normal and schizophrenia is not the fact that normal perception is a plane mirror of reality « as it is », but that schizophrenia has subjective elements which become savage and which disintegrate. The same holds true at the symbolic level. Scientific notions such as that of an earth moving at an unimaginable speed through the universe, or like that of a solid body formed essentially of empty space where minuscule atoms of energy mingle, placed at astronomical distances, contradict our everyday experience and our « common sense » and are more fantastic than the visions of schizophrenics. Nevertheless, scientific notions are true, that is, they fit into an integrated schema.

**348-**Similar considerations apply to motivation. The concept of spontaneity traces the boundary. Normal motivation implies autonomous activity, the integration of behavior, suppleness and adaptability to changing situations, the spirit of serendipity, the free use of symbolic anticipation, of decision, etc. This brings to light the hierarchy of functions, and particularly the superposition of the symbolic level upon the organic level. This is what explains that behind the organic principle of « spontaneous activity », the « humanist » principle of « symbolic functions » is fundamental in considerations of systemic theory. The question of knowing whether an individual is mentally sane or not comes down in the last resort to knowing whether he has an integrated universe compatible with a given cultural framework. This is the theme of the essay « Psychopathology of a Plains Indian » by Tobie Nathan. As far as one knows, this criterion includes all the phenomena of psychopathology

compared with what is normal, and leaves room for a dependence of mental norms upon culture. What may be compatible with one culture may be pathological for another, as cultural anthropologists have shown. This concept has precise implications in psychotherapy. If the psychophysical organism is an active system, reeducational and complementary therapies are an evident response to it. The evocation of creative potentialities will be more important than passive adjustment. If these concepts are correct, more important than excavations into the past will be the vision of present conflicts, the attempts at reintegration and orientation toward goals and toward the future, that is, symbolic anticipation. This, of course, is a paraphrase of the recent tendencies of psychotherapy which are founded upon personality as a system. If, in the final analysis, many neuroses are existential and result from the absurdity of life, then « logotherapy » that is not « logo-centric », that is, therapy at the level of symbolic representations, will have a role to play. It thus appears that, without falling into the trap of the « all or nothing » philosophy and other deprecating conceptions, a systems theory of personality provides a sound basis for psychosis and psychopathology and opens the door upon a « systemic-type psychology ».