

From Reason to Consciousness

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Abstract: The reigning paradigm of human society is a worldview based exclusively on a reductionist and determinist form of rationality. The unconditional adherence to this paradigm has become a threat for the continuity of human existence and for life on earth. I argue that the deficiencies of the present paradigm are the neglect of both a holistic perspective and the psychic foundation of our thoughts and actions. I present a two-component framework as basis for a new paradigm: first, systems theory to describe the dynamics of human action, and second C. G. Jung's model of the human psyche to understand the forces active in these dynamics. Since both components are still little known outside the circle of specialists of these fields, I present them in some detail in order to encourage their general acceptance. Jung identified the neglect of the unconscious and, as a consequence, the lack of a union of Ego and Self, as fundamental problem of modern man. Neurophysiological findings underpin his observations. As a first application of my framework, I try to understand the development of the collective psyche as a self-organization process driven by the archetypal infrastructure of the individuals. I point to the peril implied for humanity if it does not succeed to harness its psychic constitution. In this context, I discuss the possibilities to achieve the transition to the new paradigm. I attribute a central role to the individuation process of Jung. The step from the individuation of the individual to that of society must be brought about by a „bottom-up“ self-organization process.

Keywords: rationality; consciousness; systems theory; systems thinking; Jungian psychology; bicameral mind; individuation process

1. Introduction

In 1968, the Club of Rome was founded with the objective to bring to the attention of the global community that the resources of our planet and the capacity of its biosphere are limited. The vision of the Club of Rome resulted in the well-known study “The Limits to Growth” (Meadows *et al.*, 1972). For the first time, a scientific institution introduced a new way of dealing with reality: to view it as a complex system with interdependent variables. The authors used a world model consisting of eight variables interconnected by various feedback loops in order to simulate different scenarios of evolution. The simulations showed that, without a strict control of the variables, the system would reach an apogee and then collapse. The authors also showed that with strict birth control, recycling of resources, and a number of additional measures, a sustainable world could be realized, provided the corresponding steps were rapidly launched. In the introduction of their book the following appeal of then-secretary general of the United Nations, U Thant, was reproduced:

I do not wish to seem overdramatic, but I can only conclude from the information available to me as Secretary-General, that the members of the United Nations have perhaps ten years left in which to subordinate their ancient quarrels and launch a global partnership to curb the arms race, to improve the human environment, to defuse the population explosion, and to supply the required momentum to development efforts. If such a global partnership is not forged within the next decade, then I very much fear that the problem I have mentioned will have reached such staggering proportions that they will be beyond our capacity of control.

As we know, this opportunity was not taken. The growth of the world population and of the consumption of resources continued uncontrolled. In the 1992 update of their book (Meadows, D. *et al.*, 1992) the authors stated that, in the meantime, global society had crossed the limit of sustainability.

While the scientists had done their homework, the stakeholders of political and economic decisions failed to forge the partnership requested by U Thant. Instead of global partnership and cooperation, human society turned to global neoliberalism, the goals of which are diametrically

opposed to those formulated above (Neubauer, 2011; Hardt, Negri, 2000; Koetke, 2007). The center of interest shifted from industrial production to enrichment by financial instruments uncoupled from material values. A devaluation of the work force ensued, increased the gap between rich and poor and produced a master-slave society with top-down dominance. The population was distracted by consumerism which diverted their attention from politics and made it uncritically accepting the facts. The abundance of distractions dissolved family bonds and destroyed responsibility and solidarity, thus accelerating the cycle. In summary, the vast discrepancy between the recommendations put forward again and again by the scientific community, and the actual behavior of the global society, leads us to conclude that something is fundamentally wrong.

Human action, thinking, and behavior are governed by a mental construct. When it spreads among society, it becomes a worldview or paradigm. This fact seems obvious, but we never ask whether the present paradigm is the right one; it is just uncontested. Until now, humanity has not been able to initiate the turnaround demanded by U Thant fifty years ago, and from this we could argue that it is this paradigm which is fundamentally wrong. Hence, the aim of this article is to deal with the following questions: what are the determining elements in our present paradigm and what are its deficiencies? How did it arise? What could be the constituents of a new paradigm? How could it be brought about? I propose a framework as possible basis for a new paradigm.

Unmasking Rationalism

The existing paradigm is rationalism. We use reason to generate constructs of thought by associations and logical deductions. Rationality is the application of reason to distinctions, decisions or choices. Rationalism designates the exclusive reliance on rationality as a paradigm of human thought and action. Modern civilized society relies on rationality in most of its activities. It is the only accepted basis of action. This means that all its actions must be justified rationally, be it in politics, management, law enforcement, science, medical care or in daily life. Rationalism is the basis of laws and norms. Equally, it is the foundation of education systems on all levels. Democracy presupposes rational citizens. Human rights are based on "human beings endowed with reason and conscience" (The Universal Declaration of Human Rights (1948)). Over time, the result of a rational process has become equated to truth. All kinds of leadership are based on the authority of "truth". Finally, rationality is commonly equated to intelligence and consciousness.

Some scholars situate the origin of this reigning paradigm in the Pre-Socratics, others in Aristotle and still others in Descartes. Denizhan (2008) proposes the hypothesis that this "Contemporary Mental Model" originated during early agricultural societies. Harnessing natural powers like the cultivation of plants, breeding of animals and the utilization of wind and water led to the conviction that man could dominate nature. The regularity of the seasons allowed the planning of harvests and gave rise to causal thought and forecasting. The paradigm of rationalism evolved into Enlightenment and the techno-scientific era of the 19th and 20th century. The enormous success of this model in terms of increased quality of life encouraged humanity to place faith in its enduring utility. However, the ensuing explosive evolution of human activity led to an enormous increase of complexity. In the face of this complexity, rationalism, which advocates reduction and simplification, is outpaced by reality.

Aristotle was the first to explore rationality more deeply. He investigated logic as the fundamental process of rational thought and wrote down a number of its rules known as syllogisms (Aristotle, *Organon III*). He distinguished between rational thought as a cognitive process and the premises, a reference system of goals, causes, axioms, norms, laws, conventions, Leibnizian monads, "common sense"-assumptions or beliefs. Logical processes draw a correspondence between premises and conclusions, or between causes and effects. Rationality itself is a value-neutral method. Value is attributed to the result of the process by the "designer" on the basis of certain criteria. In short, Aristotelian logic is the foundation of the principle of causality which becomes the central element of rationality. Descartes (2008) subsequently added to the concept of rationality the principle of dualism which refers to the separation of subject and object, for instance a master slave relationship.

How does rationalism function in practice and what are its weaknesses? Rationalism is characterised by causality, i.e. the relationship between a cause and its effect. Causality narrows the field of perception to those causes which appear to be of direct concern for the problem under investigation. The environment of the problem, feedback loops and interdependencies between variables are

neglected. This neglect leads to the incomplete solution of a problem and sorcerer's apprentice scenarios. These are the deficiencies of rationalism as a process.

First of all, however, the premises are the weak point of the concept of rationality. They comprise both the variables to be selected and the initial conditions. By definition, the premises do not belong to the rational process itself. If it were so, the proof of the rationality of the premises would require prior rationally founded premises and so on in an endless chain ("Letztbegründung", ultimate foundation). All kinds of solutions have been proposed to define "first premises": confirmed experience, the essence of objects (Aristotle, *Metaphysics*, Book VII), "the will of god(s)", "obvious assumptions", and common sense are examples. In our present society with distributed competencies, the common practice is to entrust the choice of the premises to "experts", who have undergone relevant instruction. However, their choice can be compromised either by limited knowledge (bounded rationality, Herbert Simon, 1955), personal preferences or interests. Thus, the choice of the premises is the point where uncertainty or arbitrariness can be introduced into the rational process. Aristotle was first aware that a correct logical deduction does not imply that the conclusion is valid (true or false). The conclusion is only true if the logical deduction is correct *and* the premises are true.

Bounded rationality is unavoidable. While human knowledge progresses steadily, the complexity which it produces grows too. The more it grows, the more the resulting information may be incomplete, uncertain or paradoxical. If information is incomplete or uncertain, one should either abstain from launching a process which can lead to uncontrollable consequences or weigh between necessity and risk. However, at both the personal and the collective level, it is also common practice to override valid premises willingly and to replace them by those which represent the personal interests of the actor(s). In this case, the choice of the premises is justified by „higher level considerations“, e.g. the „raison d'état“, eventually violating fundamental ethics. The disregard of the warnings of the Club of Rome and of U Thant of the 1970's is the most prominent example of this behavior.

It should have become evident from the foregoing analysis that we need a new paradigm in order to be able to shape our future.

In Search of a New Paradigm

Systems theory - a better tool to handle complexity

During the second half of the 20th century, systems theory was developed. L. von Bertalanffy (1968) formulated the epistemological foundation of this new field of science. The basic notion of his model is wholeness (p. 5): Problems should be modeled as systems or networks of interdependent variables, instead of being dissected into parts which are studied separately. Recognizing that some fundamental principles and rules of system theory apply "isomorphically" to all disciplines of science, he postulated that the role of the new discipline was "to formulate and derive those principles which are valid for 'systems' in general" (p. 32).

Since the time of von Bertalanffy, system science has ramified into many sub-disciplines (Castellani, 2011) and a considerable amount of work has been invested into the new field. Mathematical tools have been developed, in particular in the fields of non-linear dynamics (Strogatz, 1994; Sayama, 2015) and multi-agent systems (Kauffman, 1993; Sayama, 2015), and are applied to concrete problems in science and engineering (see Table 1 and **Appendix**).

However, von Bertalanffy considered systems theory not only as a scientific discipline, but also "as a reorientation of thought and world view" (Bertalanffy, p. XXI) and he was convinced that it would rapidly replace the reductionist worldview not only in all fields of science, but also in the daily life of everybody. However, this did not happen. The rationalistic worldview still prevails not only in the general public, but even in science itself. The new scientific perspective is still far from being an ubiquitous, generally internalized paradigm and replacement of the newtonian-cartesian determinism. Systems theory is not even systematically part of the curriculum of universities or colleges. It is, for instance, little known and applied in human sciences, medicine and law. Of course, regarding the common individuals in everyday life, mathematical models are inconvenient. They should practice the new paradigm in form of systems thinking, i.e. by using generic principles and

rules revealed and derived from systems research. This signifies however that the interaction between systems science and systems thinking is vital for the development and perpetuation of the new paradigm.

Systems theory has revealed the interdependence of physical, biological and social phenomena around us. As a processing procedure, it promises a better overall handling of complexity and a more adequate approach to the holistic understanding of reality. But what substitutes the premises? In the case of systems theory, the agents, the links between them, and the interaction forces must be defined. But we must be aware that the models of complex systems are also designed by human beings with a limit to their mental capacity. Thus, at a somewhat higher level we encounter the same limits as with the existing paradigm: incomplete knowledge and possibility of falsification by fraud or manipulation. As rationalism, systems theory is a value-neutral method.

Yet, the basic principle of systems theory is wholeness. Regarding incomplete knowledge, not only rationality is bounded, but wholeness, too, will always remain limited. Regarding falsification, we have seen, that, 40 years ago, against strong scientific evidence, humanity dismissed to respond to the appeal of the Club of Rome and „Limits to Growth“. Thus, we must conclude that there is a mechanism in our mind which overrules or paralyzes rational thought. Whether in science or in the general public, there seems to be a fear to acknowledge the existence of this mechanism. Hence, our image of ourselves is incomplete. It does not fulfill the requirement of wholeness. As long as we do not know who we are, we will not really know what we are doing and why we are doing it. Consequently, there is no basis for ethics and responsibility. As long as we will not have solved this problem, all technocratic efforts will remain futile, regardless of the paradigm which we adopt.

Table 1: Concepts and generic rules derived from various system theoretical tools

Systems with continuous variables - Nonlinear dynamics (Strogatz, 1994)

- A non-linear dynamic systems with n variables is described by a set of n differential equations and a set of parameters. The phase space is the space of all possible states which the system can assume. The parameters describe, for instance, the specific characteristics of the environment into which the system is embedded. A system can start its evolution from any point of the phase space. As time evolves, the state will evolve within the phase space along a curve called its trajectory.
- A characteristic feature of nonlinear dynamics is the attractor. An attractor is the final stable state to which trajectories tend for $t \rightarrow \infty$. The unstable counterpart of an attractor is the repeller: trajectories diverge from it to infinity.
- All the trajectories which an attractor drains, form the basin of attraction of that attractor. No trajectory can enter or exit the basin. The phase space is partitioned into a number of basins of attraction.
- A set of parameter values of a dynamic system can be represented as a point in a parameter space. In certain regions of the parameter space, the dynamic behavior of the system may change drastically e.g. attractors may appear or disappear, the stability may change from stable to periodic or from periodic to chaotic. These points are called bifurcations.
- A rather common feature of non-linear systems is the sigmoid behavior (Fig. 1): an increasing force has no apparent effect on the system until a bifurcation point is reached at which the systems changes drastically, e.g. the rupture of a rope, earthquakes, the collapse of political, cultural, economic or ecological systems.
- Systems with at least three variables may exhibit extremely erratic behavior in certain regions of their parameter space (Chaos). In such chaotic regimes the behavior of the system is very sensitive to infinitesimal changes in initial conditions, i.e. trajectories starting from points infinitesimally spaced apart diverge after a certain time (prediction horizon) into completely different areas of the phase space. This inpredictability is inherent to the dynamics of the system and cannot be avoided by any finite increase of precision of the initial conditions (breakdown of the principle of absolute predictability of the old paradigm).

Complex systems (CAS) (Kauffman, 1993)

- Complex systems consist of a high number of interconnected and interacting agents. Examples: immune system, neuronal system, genetic regulatory systems, ecosystems, social systems, and networks like internet, electrical power distribution, railway systems. They are modeled and analyzed by Agent Based Modeling (ABM). Examples of ABM tools are Cellular Automata (p. 219), Random Boolean Networks (p. 182), NK landscapes (p.40), and Graph Theory (p.307).
- Complex systems originate, develop and die by self-organization, i.e. the spontaneous formation or decay of structures or patterns by the interaction of agents (see **Appendix**). The process of formation is called emergence. Emergent structures exhibit qualitatively new behavior which does not exist at the lower level of the interacting elements. Example: Our neurons don't know what we think.
- Depending on the values of their connectivity K , complex systems exhibit ordered, evolutive or chaotic regime:
 - If K is low, the system exhibits rigid order
 - If K is high, the system exhibits chaos
 - If K is medium, the system exhibits evolutive behaviorThe transition zone between order and chaos is called the zone of edge-of-chaos. There are indications that nature self-organizes the competition between order and chaos, i.e. tends to the edge-of-chaos. Order is necessary to allow the build-up of robust hierarchical systems, chaos is necessary to maintain possibilities of evolution at a high level.
- Complex systems start by developing first bottom-up before acting also top-down. Example: first ants, then ant hills.
- Self-organization requires a critical number of interacting agents and connections between them.
- Self-organized systems function with decentralized decision taking (no central authority).
- The fitness of multi-agent systems breaks down to a medium level, if
 - the mutation rate \gg selection rate (error catastrophe)
 - the number of agents and the connectivity are high (competing constraints, complexity catastrophe)
- Forcing structures (see **Appendix**) produce highly stable and ordered systems, i.e. attractors.
- Complex systems are characterized by robustness and resilience
- Complex adaptive systems (CAS): living systems are complex adaptive systems. They increase their chance of survival by strategies of defense, camouflage, genetic or behavioral adaptation.

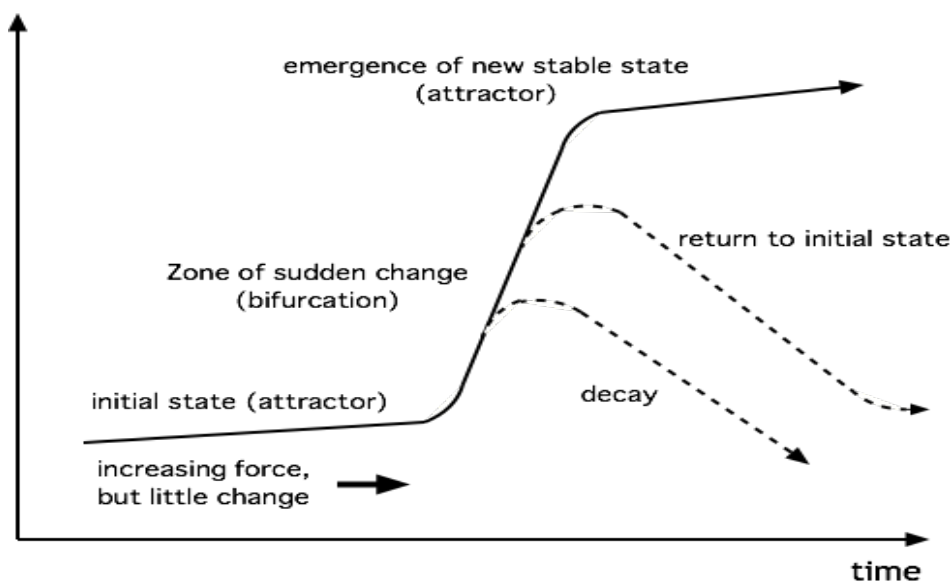


Figure 1. Sigmoid behavior: a common feature of non-linear systems.

Psychology - Learning to know who we are

Self-knowledge is linked with our psyche. While current neurophysiological research emphasizes the exploration of the functioning of the brain, only secondary attention is paid to the functioning of the psyche. The following excursion into psychology is intended to emphasize the importance of psychology even in fields of science which seem not to be concerned by it. Psychology should be a part of any model of the individual and society. Similarly as for systems thinking, the scientific community is called upon to promote its dissemination into the general public in due form.

Psychology as a scientific discipline was initiated by S. Freud (1975) and C. G. Jung (Jung, 1972; Jacobi, 2003, 1973) more than a century ago. The central element of psychology is the notion of the unconscious. Freud derived the existence of the unconscious from hypnosis experiments: participants executed orders received under hypnosis after they returned to a normal conscious state, but without remembering the origin of their action (Freud, p. 30). According to Freud, the unconscious is a repository for contents of the mind which are undesirable or socially unacceptable and therefore repressed, i.e. instinctual desires, traumatic or painful experiences or reminiscences (Freud, p. 107). These contents cannot be recalled by any mental effort. The other essential element of Freud's model is the drive (Freud, p. 307). Freud distinguished between life instincts (Eros) and death drive (thanatos) which he saw in a polar relationship as constructive and destructive counterparts.

In order to understand C. G. Jung's model (Fig. 2), we must distinguish between structure, function and dynamics of the different elements of the psyche. The Ego is the structural element by which we interact with the real world. It is composed of a conscious and an unconscious part, the personal unconscious, which is specific to each individual. At a deeper level we have the collective unconscious, a structure common to all human individuals independent of their ethnic or cultural affiliation. The collective unconscious is the seat of the archetypes (Table 2) (Jung, Aion; Edinger, 1992; Gray, 1996). The personal unconscious is the repository of the complexes. The complexes are the result of the interaction of the archetypes with contents either of the personal unconscious or coming directly from the outside world. They function as unconscious inputs to our consciousness which is unaware of this hidden influence. There, without our notice, they determine our thoughts and actions. The psychic functions form a self-regulating system similar to the endocrinian system of physiology.

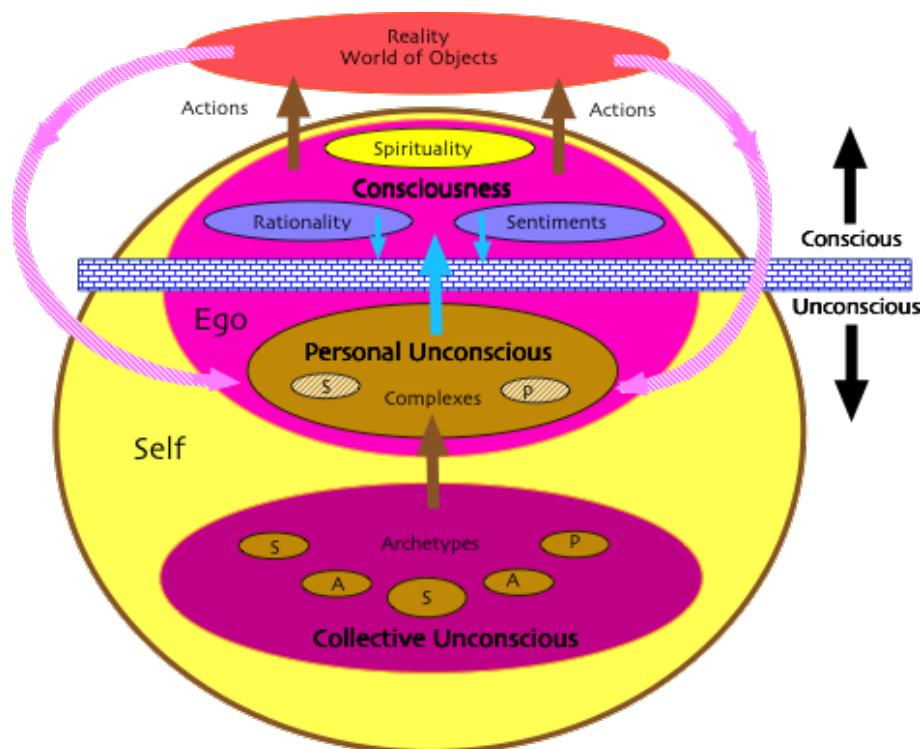


Figure 2. The Jungian model of the human psyche

Table 2. The Jungian archetypes (Jung, Vol. 6, "Definitions").

- **Persona:** the "mask" which we present to others or to the outside world in order to subsist and to be recognized. The persona reflects our relation to others and to the world. On the one hand, the persona is essential for individuals in order to integrate themselves into society. On the other hand, if the persona dominates the ego, the individual may become either narcissic or tyrannic. A balanced psyche requires the control of the persona by the Self.
 - **Shadow:** the dark side of the psyche. Elements of our character which we unconsciously hide from others and ourselves, and which are not acknowledged by the persona or the ego. Associated with the shadow is the phenomenon of projection (see below). The repressed elements are projected onto external circumstances, persons or institutions. Both Jacobi and Gray have pointed out that the shadow may be either personal or collective (Jacobi, p.113; Gray, p. 264). The shadow may also hide positive, undeveloped traits of a person.
 - **Animus/anima:** the component of the opposite sex in the psyche. It determines sentiments, moods, intuitions, creativity, and the relation to the other sex. Projection of the contrasexual part of the psyche onto a person of the other sex. A woman is attracted by the rationality of a man, a man is attracted by the spirituality of a woman. As "inner guide", animus/anima combines with the Self to guide the individuation process (see below).
 - **Self:** the Self is both archetype as well as guiding instance of the totality of the psyche. As guiding instance, it structures and orders the psyche and controls the balance between conscious and unconscious (reconciling paradoxes). As archetype it provokes and guides the individuation process. Negative aspect: inflation or alienation (see below). The Jungian notion of the Self has no equivalent in Freudian psychology.
 - **Ego:** the ego is not an archetype, but grows out of the Self as consciousness. Ego (consciousness) and Self (as unconscious archetype) are complementary. The ego is the center of consciousness. The fact that the unconscious keeps locked certain psychic contents limits the extent of consciousness.
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The dynamics of the psyche is determined by the libido, enantiodromia and the archetypes. The notion of libido characterizes both psychic force and psychic energy (Jacobi, p. 57): an individual may have a strong will of realization, but a low psychic energy which is quickly consumed in a burst of effort. Enantiodromia, "running in opposite directions", is a discovery of Jung based on the empirical observation that the different functions of the psyche develop opposite counterparts, e.g. coercing consciousness may provoke a compensatory counter-movement by the unconscious. *Coniunctio oppositorum* designates the reunification of the opposites.

The archetypes are the source of some typical behaviors which require a closer look:

- **Projection** is the effect of the shadow archetype. When the individual is confronted with the repressed contents of its unconscious, i.e. faults or frustrations, projection can occur. Some examples are refusal to take notice of reality; escape into illusions, distraction, consumerism; refusal to admit mistakes, omissions; hiding or trivializing compromising facts; lying; addiction; seeking a position of dominance; attacking persons which are believed to have a more balanced personality. In the worst case, the individual becomes violent or criminal.
- **Inflation and alienation (Edinger,1992)**
The loss of contact with the Self can cause a pathological reaction of the Self archetype itself. In this case, the psyche can take two opposite wrong turns: inflation or alienation. Inflation can occur, if the individual encounters no opposition against its actions or thoughts. It starts to overestimate his possibilities and forces. If the person is in a position of power, the result on the social plane can be tyranny, repression, violence or injustice. On the contrary, if it encounters

resistance and is frustrated, the ego cannot develop and the individual finds himself in a psychic no-man's-land (alienation).

- Participation mystique (Jung, Vol. 6)
“Participation mystique” is the designation given by Jung to a social system formed by persons who compensate their lack of contact with the Self by joining a group of people suffering from the same psychic deficiency. One can say that they search outside of themselves the identity which they are unable to develop by themselves. Naturally, people may join groups also for practical reasons without any psychological pre-context. Under certain circumstances, participation mystique may also have a positive aspect.
- Ego-Self relationship (Edinger, 1992)
As shown in Table 2, the relation between Self and Ego is determining for the psychical health of a person. During childhood and adolescence, the development of the ego has priority. The individual must develop its ego in order to be able to assume its role within society. However, as Edinger (chap. 1) has shown, during this process the ego must remain under the control of the Self. If the contact with the Self gets lost, the individual is at the mercy of his unconscious, i.e. the archetypes deploy their destructive potential. The psyche of the individual will remain fragile. It will lack self-confidence and suffer from existential anxiety.
- Individuation process (Jung, Vol. 6, “Definitions”)
Jung discovered that existential anxiety has a compensating counterpart: the individuation process. At certain moments in life, the Self may irrupt into the perception of the individual and reclaim its rights. It emits a signal to the mind by dreams, visions, near death experiences, or simply by insights surging from nowhere. The individual becomes able to see some critical contents of his unconscious, not the unconscious as a whole. These “appeals” offer the chance to bring the ego and Self together again in a harmonious relationship. However, they are only initiating “can-openers”. They must be followed by the cumbersome work to overcome the corresponding behaviors, i.e. to withdraw the projections. A strong libido is required and rational capacities such as maturity, intelligence or a well-developed common sense are helpful to progress on this path. If successful, the individual will overcome the existential anxiety and reach a state of inner peace. The individuation process is a spontaneous appeal of our Self which cannot be initiated by any voluntary conscious effort. Examples are Dante’s *Divine Comedy* (Mazzarella, 2001), Mozart’s *Enchanted Flute*, or more recently, Lars von Trier’s film *Melancholia*.

The bicameral mind

At the time of Jung, neurophysiology was still in its infancy. During the second half of the 20th century, research in this field increased considerably. A subject of particular interest for this article is the discovery of the bicamerality of the brain. By observing the remaining cerebral capacities of patients after recovery from different forms of lesions of the brain, Sperry (1968), Gazzaniga (1970), and others found that the two hemispheres of the brain work in different modes. Anthony Stevens has thoroughly summarized this work and I shall therefore follow to a large extent his coverage of the subject (Stevens, chap. 13).

The research established that

- The left hemisphere processes information sequentially, analytically or rationally, is the center of speech and reading, and subjects the world to purpose, planning and design.
- the right hemisphere works in a parallel processing mode, and is the center of holistic perception (spirituality), pattern recognition, intuition, dreams, and active imagination.

However, the right hemisphere lacks the capacity of expressing its findings. It was found that the information is transmitted by the corpus callosum to the left hemisphere where it is expressed by “internal language” and thus is brought to consciousness. Yet, the transfer is by far not perfect. It is either partially inhibited by the limited capacity of the corpus callosum or censored by the left hemisphere. The fact that the left hemisphere is the center of expression of the contents of both hemispheres, and that it exerts a censorship on the information transmitted by the right hemisphere, raises it into a dominant position. Stevens talks about left-hemispheric imperialism, which is mirrored by an imperialistic scenario not only on the individual but also on the macroscopic level of

society (Stevens, p.298).

Galin (1974) and Rossi (1977) were the first to establish a relationship between these neurophysiological findings and the Jungian model of the human psyche. Galin concluded that the inhibition of information transfer from the right to the left hemisphere could be associated with the mechanism of repression, denial and shadow projection which is part of the Jungian model. He concluded that the confinement of certain contents in the right hemisphere could indicate that it is the seat of the unconscious, while ego-consciousness could be associated with the left hemisphere. But Stevens warned that "To equate the conscious mind with the one hemisphere and the unconscious with the other is a gross over-simplification" (Stevens, p. 304) and "It would clearly be an error to confine to the left side of the brain consciousness as a whole. Consciousness is not a simple, unitary phenomenon which can be assumed to possess a discrete cerebral location, but a richly complex process dependent upon a vast network of neuronal structures which are probably hierarchically arranged. Perception depends on the integration of information coming from all sense modalities, with or without the intervention of consciousness" (p.303). Stevens cites different sources which show that the brain functions not only by lateral integration of the two hemispheres, but also by vertical integration of the older brain structures with the neocortex (p.308-309). There is some evidence that the archetypes, too, are not confined to the right hemisphere alone, but that the core of their activity resides rather in the older parts of the brain (p. 304).

Several decades before Sperry and Gazzaniga, Jung claimed that the cooperation between conscious and unconscious, ego and Self, is necessary to overcome the "imperialism" of Western rationality (Stevens, p. 300). This cooperative interaction, which he called the transcendent function, is the basic mechanism of the individuation process. Note that, seen from the perspective of complex systems theory, the balance between the ego and Self or left and right hemispheric activity of the mind, or between rationality and spirituality is equivalent to the edge-of-chaos of systems theory. Note, too, that a right-hemispheric dominance would not be desirable either, since it could lead to obscurantism, superstition, or fundamentalism.

Regarding the objectives of this paper, the exact relation between neurophysiological and psychological structure is, in principle, of secondary importance. I retain from these findings that

- The human brain works in two different modes simultaneously.
- The dominant position of the left hemisphere has led to the "imperialism" of rationality which characterizes Western civilization.
- Neurophysiology lends strong support to the Jungian model of the human psyche.
- The restoration of the dialogue between the two hemispheres should be a primary task of the new paradigm.

Framework for a new paradigm

As an attempt to move forward from diagnosis to therapy, I propose a framework consisting of the two components „Systems Theory“ and „Psychology“ as foundation for the new paradigm. The systemic component is intended to replace the deterministic perspective of the old paradigm. The rules of systemics are not limited to the physical world, but are valid universally, i.e. they apply to life processes and social processes at the human level as well. Hence they situate the human existence within the biosphere and define its role in the evolution. Systems theory is not only a scientific discipline as many others. In the form of systems thinking, it is qualified to become an essential component of the new paradigm for the general public. A tight relationship between systems theory and systems thinking should assure that the paradigm is constantly updated with the most recent findings of systems science. The rapid evolution of research, e.g. in network theory, provides a plethora of further rules applicable to fields like psychology, sociology, medicine, ecology and so forth.

In the realm of the old paradigm, the role of psychology is confined to the understanding of mental disorders of individuals. Within the new paradigm a prominent place has to be assigned to psychology in order to improve our understanding of the general mechanisms underlying mental processes at both the individual and collective level, in other words, to improve the knowledge of who we are. This is a prerequisite for changing the basis of our actions. I have chosen the Jungian model of psychology because it maps well to systemic principles as we will see below.

Summed up, systemics describes the dynamics of processes, their coming into existence, their evolution and their life cycle, including their decline whereas, at the level of both the individual and social systems, psychology describes the forces driving the actions and decisions of both the human individual and human society.

Applying the Framework

Systems science provides generic principles, concepts and rules which apply to any system (see Table 1). The notion of attractor is ubiquitous in living systems. Since they are complex adaptive systems, their attractors are further strengthened by an immune system, i.e. they defend themselves against attacks by adapting their strategy. They can only be destroyed by bifurcations which imply parameter changes and overcome the defense of the system. Usually, parameters are variables which are not part of the system. They represent either the environment or variables which have been overlooked or which reveal their relevance only later in the course of the process. Social processes are usually self-organized processes (see **Appendix**). Above a certain threshold of the number of agents and interconnections between them, spontaneous emergence of new properties occurs, a notion absent from the former paradigm. While rationalists think in linear cause-effect relationships, systemists are used to think in interactive loops and networks of variables. They are prepared to encounter a nonlinear, S-shaped response of a system (see Table 1 and Fig. 1). Kauffman's NK landscape model shows that the evolution of systems breaks down, if the rate of mutations exceeds that of selections or if the interconnectivity of the agents of the system becomes too dense ($K \rightarrow n-1$). Both Kauffmanian "catastrophes" are active in the present world. The rapidity of change does not allow to find a stable configuration by selection. In particular, the human mind has not the necessary time to adapt. The notion of edge-of-chaos can be verified ubiquitously. In Jungian psychology it is found in the notion of enantiodromia, in the bipolarity of Ego and Self and of consciousness and unconscious. Kauffman's notion of the forcing structure (see **Appendix**) can explain the Jungian participation mystique: individuals trapped in ego-consciousness exhibit the OR function in their social behavior. They join groups of individuals with the same psychic constitution. This mechanism explains the explosive percolation of mobbing, racism, ideologies or one-sided political opinions through large-scale social systems. These few examples are provided to show the huge potential of systemic notions for understanding the functioning of both the human individual and society.

Regarding the bicamerality of our mind, the two components of the framework coincide with the functions of the two hemispheres of our mind: the systemic component reflects the rational activity of the left hemisphere, the psychological component the unconscious/intuitive/spiritual activity of the right hemisphere, the inputs of which determine our thoughts and actions. In other words the present framework reflects Jung's transcendent function.

Viewed from the perspective of the proposed framework, human social systems are virtual systems. They are configured and synthesized in the mind of the individuals which compose them, and, hence, there are collective archetypes and shadows. There is a collective ego-consciousness. Therefore, existential anxiety and projection characterize the behavior of ethnic groups, nations and the human society as a whole. Participation mystique is the main mechanism by which social systems form and are held together. Stakeholders of power use participation mystique to manipulate their subjects, a mechanism called "social steering": a germ in the form of an ideology or some tailored information is injected into the social system. The ego-dependence of the individuals works as the OR-function of a forcing structure resulting in a percolation of the injected information through the social system. Consequently, in the long term, any kind of governance tends to the attractor "totalitarianism", i.e., Hardt & Negri's (2000) "One" is realized. Thus, the governance of a social system is considerably simplified. Social steering is a perverted form of self-organization. Obviously, as long as these circumstances prevail, democracy is an illusion.

We have seen that ego-driven individuals either strive for dominant positions in society in order to cover up their interior weakness, or, alternatively, drift to addiction, a hidden form of suicide. On the societal level, the present world society shows both forms of ego-driven behavior: imperialistic ambitions coexist with military provocation on the border of nuclear war.

On the background of the framework presented here, we can reply to the questions in the introduction of this paper:

- Why did humanity embark on the rationality paradigm? Rationality provides the illusion of security and domination over nature and death.
- Why does systems thinking and psychology have difficulties in being adopted by society? Systems thinking confronts it with the bipolarity of reality. Even systems scientists which are used to apply the new way of thinking in their work, continue to practice the old paradigm in their personal life.
- Why has the appeal of the Club of Rome and of U Thant not been followed so far? For the reasons just mentioned.

The current worldview presents itself as a model requiring the least effort and the highest benefit, while the right-hemispheric model requires “swimming upstream”. We must learn that the rational paradigm is a dangerous trap.

Can a turnaround be brought about?

The current paradigm is an attractor. More precisely, the collective mind is the attractor. To be changed, it requires a bifurcation. The collective mind is dominated by ego-consciousness. The parameter to be changed is the orientation of our psyche from ego-consciousness to a cooperative interaction between ego and Self, in other words between the two hemispheres of our brain and their respective modes of operation, rationality and spirituality. Spirituality is to be understood as the inner voice which represents the integration of the totality of our brain, its interaction with the whole of our organism and, in a wider sense, its embedding into the biosphere and its evolutionary history. This kind of perception produces a more holistic understanding of situations and actions to undertake.

At all times, it has been the objective of education to structure the mind of children and adolescents in this sense:

- Comenius (1657), considered by many to be the founder of modern pedagogy, advocated teaching “everything to everybody in a holistic manner” and declined any form of coercion. Learning should be driven by the libido of the person. The objective of his education was “wisdom as the way to salvation...”: Knowing is a left-hemispheric process while wisdom is a bicameral one.
- In his *Emile*, J.J. Rousseau (1762) argued that education should aim to develop first a consolidated personality, before developing intelligence. A consolidated personality means developing the capacities of the right hemisphere prior to those of the left hemisphere, in order to become immune against one’s desires and not depend on the opinions of others, that is, being immune against participation mystique. Only after having undergone this kind of education is *Emile* able to assume his role as a self-centered and altruistic citizen who can fulfill the conditions of the “*Contrat Social*”.
- W. v. Humboldt’s program for the revision of the Prussian school system and the new university founded by him specified that it should be richly filled with transdisciplinary knowledge, e.g. a combination of literature, art, music, philosophy, which offers enhanced possibilities of cross-fertilization. Humboldt drew upon Rousseau’s principles in two marvelous sentences. First, he defined the destination of the human individual (v. Humboldt, 1792 p. 13): “The true end of Man, or that which is prescribed by the eternal and immutable dictates of reason, and not suggested by vague and transient desires, is the highest and most harmonious development of his powers to a complete and consistent whole. Freedom is the first and indispensable condition which the possibility of such a development presupposes.” Second, he defines the role of the human individual as a member of society: “The final duty of our existence, to realize the notion of humanity in our person, both during our lifetime as well as beyond, by the marks of lively activity, which we leave behind us, the utmost content, this duty is accomplished only by the connection of our I with the world in order to become the most general, most active and most free interaction” (v. Humboldt, 1997, p. 25, translation by the author).

However, as we see today, all these programs fell short of their objectives. They have never been fully implemented as their inventors imagined. The Rousseau-Humboldt program was gradually perverted by the rise of industrialization. The humanistic objectives were more and more replaced by technocratic ones. Wisdom in the sense of Comenius became less and less desirable and was reduced to an alibi function which did not harm the system. New attempts to introduce a humanistic education on a large scale undertaken after the Second World War failed again (see, e.g., Löwe,

2004). Thus, the proof that a humanistic education can generate a worldview where profane and sacred are in equilibrium, has not been provided so far. Instead, today, education continues to reflect and to re-enforce the reigning paradigm.

A more profound reason of this failure perhaps lies in the fact that these programs expected to create spirituality by relying on rationality. They were intended to overcome the old paradigm with its own means, which cannot work. The old paradigm does not dispose of the instruments to overcome itself. There is no chance to expect a Münchhausen-effect. The educators mentioned disposed neither of systemics nor psychology in the modern sense, i.e. the notions of emergence and individuation. They could not see that appeals to reason have no effect against the power of the unconscious.

In recent years, several initiatives have been started in order to introduce systemic education on different levels of education (Waters Foundation, 2015), Kunz *et al.*, 2015). While these approaches have the merit of first inroads into the stronghold of the old paradigm, they unfortunately have in common with those of Comenius, Rousseau or von Humboldt that psychology is absent from their models. Therefore, it is not surprising that they encounter considerable inertia and that progress is slow. There is not yet a breakthrough.

Systems theory and psychology can be taught, but individuation, a notion of salvation of the human psyche, is a bifurcation irrupting from the unconscious in a non-transparent way. It seems that Jung did not think it was possible to provoke it by an intentional act, e.g. by education. For him, it was a “grace of god”. So far, individuation is a strictly personal experience. Though Jung already discussed the necessity of collective individuation for the survival of humanity, he could not propose a model for its realization, neither on the level of the individual nor of society. Can systemics pave the way to it?

We have seen that emergence is a central notion of the theory of complex systems. Emergence is the result of a self-organizing process. The existence of life, culture, technology, globalization and of the existing paradigm are results of self-organization. Based on a model similar to the one shown in the **Appendix**, Gabora & Aerts (2009) have presented a theory of the development of worldviews. They evoke the necessity of the cooperation between analytic thought and associative thought which reminds the concept of bicamerality presented in this paper.

Can the model of the **Appendix** be applied to understand how the transition from the mind determined by the left-hemisphere to the balanced mind could happen? Individuation is initiated by a bifurcation occurring in a non-transparent way in the hidden layer of the neuronal structure called the “unconscious”. The causes can be external or internal to the person. External causes can be natural or man-made catastrophes. An internal cause is a personal experience which rather isolates the person from her social environment. Sometimes it is even the source of conflicts. No conscious act can cause the transfer of individuation from one person to the other. Only the increase of identity and personality which a person gains by the individuation process can enable her to “catalyze” it in another one, though with low probability. But as the percentage of persons who have undergone this experience increases, it can be expected that the probability of transfer will increase too and hopefully will overcome the resistance of the immune system of the old paradigm. The outcome of this conflict is uncertain, but it can be expected that once the threshold of self-organization is reached, the new paradigm outlined above will percolate through the collective mind. It is uncertain whether the build-up of collective individuation will be sufficiently rapid in order to avoid the menacing collapse of civilization. Still other open questions remain: How to avoid the complexity catastrophes? Is a society devoid of conflicts realistic? Or does edge-of-chaos again intervene in another manner?

In his Divine Comedy, Dante uses the symbol of the Candida Rosa, the Celestial Rose, to describe the utopian model of a society composed of individuals each with its distinct personality, but united by an overarching principle, some kind of a guiding star (Mazzarella, chap. 26.4, p. 510). Candida Rosa represents a society which has experienced collective individuation. Therefore, all its members can cooperate with unconstrained objectivity, that is, their decisions are taken free of psychological bias. They have reached a state of increased consciousness as a collective, i.e. a state of real rationality. The Candida Rosa society differs from the participation mystique society by the fact that the overarching principle is Self-centered and not ego-centered. It is difficult to estimate whether a Candida Rosa society has ever been reached. While the fear of God, or in other words, existential anxiety, has induced individuals to combine their efforts in order to build pyramids, temples and

cathedrals, efforts which sometimes lasted for several centuries, Candida Rosa would require a state free of existential anxiety. One may object that such a model is unrealistic. However, Candida Rosa is a vision present in subliminal form in the mind of every human being. It is the New Jerusalem which appeared to St. John in the Apocalypse. Why is it there? How did it get there?

Summary

Since the second half of the 20th century, the scientific community has continuously warned that our civilization could collapse, if steps were not taken to stop the exponential growth of human activity. To a large extent, the political-economic complex has ignored these warnings, contrary to any rational assessment of the situation. I have tried to show that this blockade is due to the paradigm used by the contemporary society. This paradigm is no longer suitable to deal with the manmade complexity. I tried to identify the deficiencies of this paradigm. It relies nearly exclusively on the rational component of our mind which narrows down our perception of reality and it is based on an incomplete self-image of Man.

Two important discoveries of 20th century science offer the opportunity to increase both our horizon of perception and our capacity to handle the complexity which we have created: systems theory and psychology. The basic principle of systems theory is wholeness. It requires to confront complexity with all its aspects instead of ignoring them, i.e. to deal with complexity in a more holistic manner. In the popular form of systems thinking, general concepts and rules derived from systems theory can help everybody to understand and handle complex problems in daily life. The objective of modern psychology is to help individuals to find the way to a complete understanding of themselves. S. Freud and C. G. Jung have shown that the motives of our thoughts and actions are deeply rooted in the unconscious part of our mind, a fact ignored by most human beings, whether scientists or not. C. G. Jung has shown how the archetypal infrastructure of the unconscious censors our choices and exerts an unrecognized bias on our thinking and decision taking, thus preventing us from acting according to best knowledge.

These findings have led me to present a framework which could serve as the basis of a new paradigm. It consists of the Theory of Complex Systems and Jungian psychology. The first component describes the dynamics of complex systems of all kind. The second component describes the determining force active in human activities and social systems: the human psyche. Since the importance of these two disciplines of science is still not recognized ubiquitously, I have briefly presented the essential features of both as well as some examples of their generic concepts and rules. Some typical psychic mechanisms are described which are encountered ubiquitously in social systems, in particular the roles of the Jungian archetypes in the collective unconscious, and of participation mystique.

A section has been dedicated to the neurophysiological findings regarding the bicamerality of our brain and its respective functions. These findings suggest that the left hemisphere of the brain is the center of logic thought and analysis, while the right hemisphere is the center of holistic perception, intuition and is related to the Jungian unconscious. The neglect of the right hemisphere deprives individuals of the contributions of an essential part of their mind.

On the basis of the framework described in this article we can understand why society is unable to escape from the attractor which increasingly entraps it. The collective mind is paralyzed by the collective ego. Since society is becoming progressively globalized, there is no outside left from which a bifurcation could be initiated. Hence, humanity is drifting in an uncontrolled manner towards an uncertain future. Salvation can only come from the only "outside" still remaining: the inside of the human beings, their Self. The breakthrough to the new paradigm must be the result of a self-organized process according to the model shown in the **Appendix**. It must be initiated „bottom-up“ by individuals the individuation of which has been triggered by the confrontation with one or the other consequences of the ego-centered paradigm. Their primary task will be to restore the balanced cooperation between the two hemispheres. This transition is equivalent to the step from rationality to a higher level of consciousness, or, in other words, to a rationality which merits this designation. Consciousness is the capacity to perceive reality holistically. Once achieved, the doorwings of Parmenides will spring open again (Parmenides, Praeoeonium).

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Appendix

Kauffman's model of a self-organization process (Kauffman, 1993, p. 423-424)

Emergence is the key feature of self-organization. Agent-based models are well suited to explore its properties, rules as well as its limits. Based on the random graph theory of Erdős & Renyi (1959, 1960), S. Kauffman has presented an origin-of-life model that attempts to describe the transition from simple organic chemical compounds to self-replicating protein sets, i.e. to living matter (Kauffman, 1993, p. 235, 423).

Fig. 3 shows a set of $N = 20$ agents increasingly connected by M arrows. According to Erdős&Renyi, at $N \cong M$ the connectivity exhibits a sudden jump to a dense web. Kauffman's simulations with a set of $N = 200$ agents and randomly chosen connections have shown that

- the length of the chain of connected arrows („descendants“) grows abruptly beyond $N = M$ (Fig. 3a).
- the mean radius (mean number of steps necessary to reach all descendants) goes through a maximum, because the formation of loops sets in (Fig. 3b).
- the fraction of loops grows rapidly beyond $N = M$ (Fig. 3c).

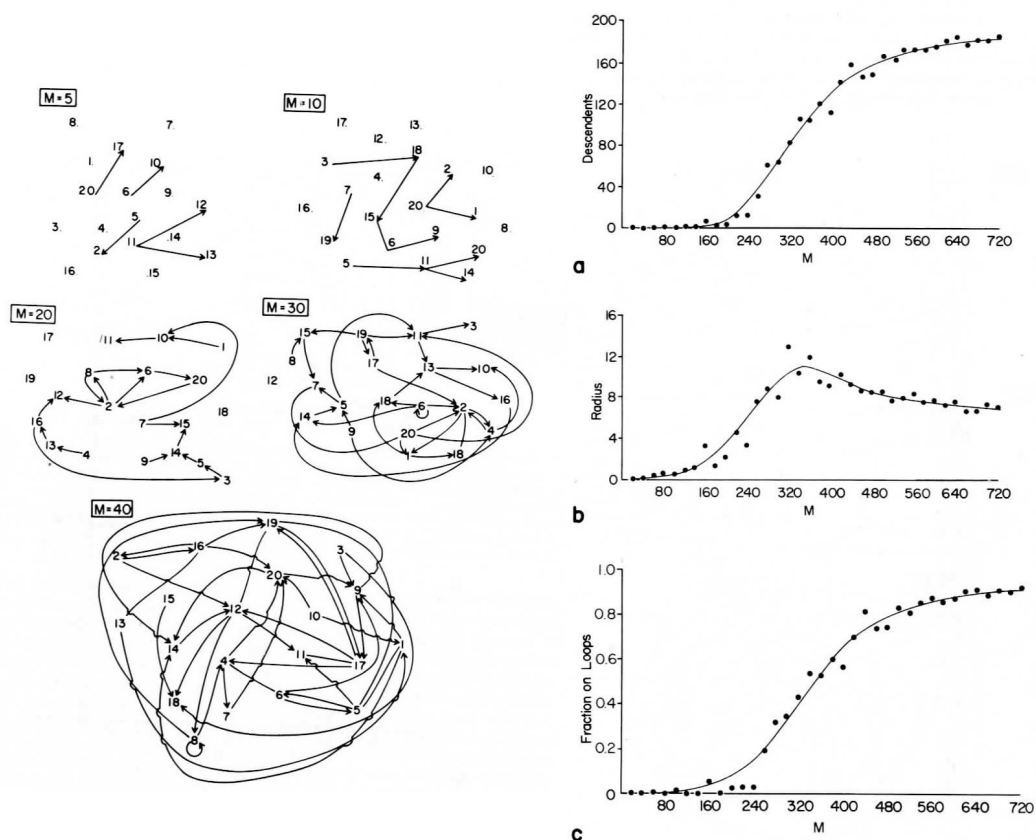


Fig. 3 Kauffman's Model of a self-organization process (Kauffman, Figs. 11.5 and 11.6, p.423)
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In other simulations, Kauffman has submitted wiring diagrams of the the type of Fig. 3 to mutations/ selections tests in order to analyze their fitness evolution. He detected two „fitness catastrophes“:

- Smooth fitness distributions characterize networks with zero or one input per agent only. The fitness distribution has a single peak. If mutations exceed selections, the fitness of these system declines instead of climbing to and remaining at the optimum (error catastrophe).
- If the connectivity and the number of agents are high, the fitness distribution is characterized by a high number of fitness peaks much lower than the optimum. The hill climbing process gets trapped at these suboptimal peaks and evolution is stalled (complexity catastrophe).

A special type of network is the forcing structure (Kauffman, p. 203-206, p.495-500). It is composed of a chain of agents with two inputs which are governed by the Boolean „OR“ function (Fig. 4). As shows the truth table of this function, the agents output „1“, if one of their inputs is in the „1“ state, independently of the input to the other state. The structure propagates the value „1“downstream. The result is a highly stable odered structure, in other words, an attractor.

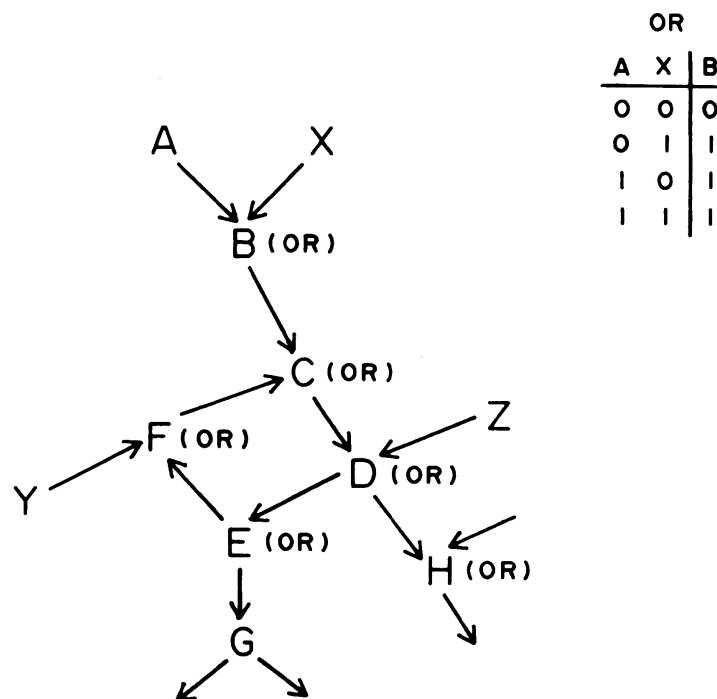


Fig. 4 Forcing structure (Kauffman, Fig. 5.9, p.204)

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