

A SCIENCE OF GOAL FORMULATION

American and Soviet Discussions of Cybernetics and Systems Theory

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SPONTANEOUS SOCIAL ORDERS†

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As the results of man-engineered experiments with social design, social "revolution", socialist "perestroikas", and other feats of "social engineering", are crumbling down, they are causing large-scale human suffering through their failures. There is a renewed awareness that self-organizing and spontaneous properties of complex social systems are much too powerful (and much too vulnerable at the same time) to respond or be exposed to the endless, reductionistic "tinkering" of policy "makers", "scientists" of the artificial, and "engineers of human souls".‡ The mankind is again ready to learn how to "trigger", "catalyze", "sustain" and "lead-manage" a *spontaneous process* of social self-organization, it is becoming less inclined to design another "central super-controller", "information-processing command system", or "World Brain".

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‡Even Geoffrey Vickers, in his *Human Systems are Different*²⁶ ends up using a similar metaphor: "It [his book] does not offer a blueprint for the design of human societies. I hope it will weaken the contemporary urge to regard such activities as akin to engineering rather than (at most) to gardening." One can only change the "at most" to "at least".

The purpose of this paper is to show: (1) that theories dealing with "spontaneous social orders" have deep historical roots and (2) that systems sciences are in a good position (better than economics, engineering or sociology) to build upon these roots and expand the theories into useful, practical methodologies. For example, modern theories of *autopoiesis and order through fluctuations*, especially their rich, computer-based simulation experiments, provide a good and solid foundation.

1 INTRODUCTION

We live in the age of large-scale social and organizational *designs*, artificial intelligence, social engineering, and even "sciences of the artificial". The ordering activity of an ordering mind seems to be lurking behind it all—or so it may appear to a less inquiring mind. §

There are, of course, man-made, artificially created societal orders and arrangements. They are achieved by arranging the relations between societal parts *according to a preconceived plan*: organization charts, management hierarchies, command economies, artificial cities, military systems, political "machines", orchestrated movements, specifically designed institutions, concentration camps. The power of many men can be increased by such deliberate coordination of their efforts and many of the crowning achievements of man rest on the use of this technique. It is an order we all understand because we know how it was made, how it came into being.

"But it is not the only nor even the chief kind of order on which the working of society rests; nor can the whole of the order of society be produced in this manner.

The *discovery* that there exist in society orders of another kind, which have not been designed by men but have resulted from the action of individuals without their intending to create such an order, is the achievement of social theory."

The above observation comes from F. A. Hayek.¹⁰ Needless to say that this "discovery", dating from Adam Smith's "invisible hand", has not yet led to serious study and competent insights into the underlying self-organizing mechanisms producing spontaneous social orders. The "Invisible Hand", if anything, has remained invisible.

K. E. Boulding⁸ characterizes the invisible hand as the concept of the development of social order through the *unplanned* interactions of large numbers of individuals, each seeking their own gain through production and exchange, coordinated through the development of the system of relative prices. "This is a considerable conceptual advance beyond the rather one-dimensional mechanics of Newton," adds K. E. Boulding. The whole of modern economics and its systems of equations is based on the Newtonian mechanics.

§In a remarkable report,⁹ Albert Hajnal puts a finger on the curse of modern science: "What we have to deplore is not so much the fact that *scientists are specializing*, but rather the fact that the *specialists are generalizing*."

Social systems (of the human kind) are a mixture of deliberate arrangements of man-planner-designer, interacting with complex, spontaneously emerging orders, increasingly complex and important, made by no one, preconceived by no one, foreseen by no one. Both aspects—artificial and natural, man-made and spontaneous, designed and self-produced, simple and complex—should be studied in their interaction and mutual determination. The following analogy is useful: one can grow a big, healthy tree or one can take some wire and scissors and impose a formal structure upon it to grow a bonsai.

2 HISTORICAL SYNOPSIS OF SPONTANEOUS SOCIAL ORDERS

The exquisite observations of Adam Smith in his *Wealth of Nations* have already been mentioned. He perceived, in the seeming chaos of the marketplace, always-emerging spontaneous order, an order generated through self-correcting actions of the participants. Smith realized that seemingly inchoate flux of phenomena and events possesses self-ordering properties well beyond the wildest dreams of most assertive social engineers; he first realized that *chaos is unstable* and more; that chaos is a particular structural manifestation of an order not yet perceived or understood by human observers.

Unraveling the underlying self-organizing mechanism should be the rock upon which economics is built.

Instead, according to Kristol:¹⁶

"The economic perspective can now provide a series of static 'snapshots' of a universe-in-change, not a discursive description of a dynamic marketplace in which men learn, innovate, and generate economic growth. Economic *states* become the focus of analysis as contrasted with the economic *process* that Smith rather casually (through brilliantly) analyzed."

So, even today, we remain as casual as Smith was about the concept of utmost importance; we study equilibrium instead of disequilibrium, statics instead of dynamics, structural manifestations instead of self-organizing principles, perfect instead of imperfect competition, being instead of becoming, mechanism instead of organism, artificial and man-made instead of spontaneous social orders, simple instead of the complex.

We might be replacing the Newtonian clockwork model by a cybernetic model, mechanical statics by mechanical dynamics, or systems of linear equations by systems of differential equations—but the radical *conceptual* revolution which would allow us to see social systems as self-organizing and self-producing systems is still not in sight.

Adam Smith was not of course alone in his perceptions. Giambattista Vico⁴ and Bronislaw Trentowski²⁵ (in his *Cybernetyka*, 1843) have understood societies as organisms. Interested reader should also consult Refs 27 and 28 for a review. We shall start with Carl Menger.

Carl Menger¹⁹ was the first scientist to use the term "spontaneous organization" in the sense explored here. He noticed that the admirable functionality of all parts of natural organisms, with respect to the whole, is *not* the result of human calculation. The same seems to hold true for numerous social institutions: they present themselves to us as "natural", i.e. not artificial, products, and as *unintended results of historical development*. One needs only to think of such complex phenomena as money, law, language, the origin of markets, communities, states, etc.

Menger published his major statements in 1883, just naturally preceding Jan Smuts and his "holism" which expressed similar philosophy. The analogy of social phenomena and natural organisms, as drawn by Menger, refers only to those phenomena which are *unintended* product of historical development; the rest are the result of human calculation and thus are not comparable to *organisms*, but to *mechanisms*. Social institutions are therefore mixtures: neither artificial nor natural, both intentionally created and spontaneously generated.

Thus, according to Menger, social systems are best described as *social organisms*, i.e. not natural organisms and not social mechanisms. He poses the following question: "how can it be that institutions which serve the common welfare and are extremely significant for its development come into being without a common will directed toward establishing them?" He cites social prices of goods, interest rates, rents, wages, etc., as examples of such institutions. His analysis of the origin of money and of the origin of law represent excellent insights into spontaneous social orders. Similarly, development of new localities, separation of professions, division of labor and even origin of the state are analyzed in detail.

Although Menger laid direct and rich foundations to the work of F. A. Hayek, two great thinkers contributed to the concept in the meantime: Jan Smuts and Alexander Bogdanov.

A. A. Bogdanov⁶ published his Tektology in 1912. In this general science of organization he formulated basic organizational rules that govern the origin (creation), maintenance, and destruction of systems. Basic rules of conjunction (production) and disjunction (disintegration) are interconnecting components into network and, through their interaction a tektological boundary *emerges*. (Observe that boundary of the systems and its structure are not given but come into being, emerge).

Bogdanov was the first to recognize the difference between organizational rules (guiding the interaction of components) and their structural manifestation (spatio-temporal pattern, structure). This distinction later reappeared and brought its fruit in the theory of autopoiesis.²⁹ Until today, however, much more attention is being paid to pre-existing, fixed structures and too little to the underlying organizational rules which bring such structures into existence.

Jan Christiaan Smuts is known as the father of holism²¹ which he introduced in 1926. Smuts states:

"An organism is a continuous *autogenesis*. It can only be explained by reference to its past and its future as well as its present: the central *structure* is not sufficient and literally has not enough in it to go round in the way of explanation.

Whole is always transcendent of its parts and its character cannot be inferred from the character of its parts."

By introducing holism, Smuts draws attention, albeit only of a few, to the fact that in organisms (as opposed to mechanisms), both natural and social, not only the whole cannot be inferred from its parts but the parts themselves can only be known within the ever-changing whole: the whole and the parts mutually determine one another and are related in a circular dependency.

F. A. Hayek,¹¹ building upon such excellent foundations, introduced the most extensive argument for the study of spontaneous social orders. He recognizes "the rules of conduct of the individuals" as leading to "the production of the overall order" which is not "the conscious aim of individual action". In the modern vocabulary of autopoiesis, one would say: organization of components and processes of their production gives rise to their structure (their particular spatio-temporal arrangement) in a natural, self-organizing fashion.

Hayek thus is aware that the same overall order of actions may be produced by different sets of rules of individual conduct (different organizations can manifest themselves in the same structure). He also recognizes the role of environmental embedding: the same set of rules may lead to different orders of action under different external circumstances. He sees clearly the holistic closure: a certain kind of overall order may contribute to the survival of the members of the group. He also understands Bogdanov's role of evolutionary selection: the evolutionary selection of different rules of individual conduct operates through the viability of the order it will produce.

Hayek thus offers a crucial, modern insight into behavior of social systems: *the rules of conduct will always act only as a constraint on actions induced by other causes*.

Thus, he does not deny the role of human will, purpose and choice; he recognizes the needs, objectives and goals as stimuli and impulses for action—to be constrained and streamlined by the rules of conduct (in biological systems a rule of conduct itself may be a sufficient cause of action).

It is to be concluded that the most potent precursor of modern theory of autopoiesis has its roots in theories of *social systems*. It is in studying social systems where the spontaneous self-production was first observed and studied. In fact, all biological systems are—and should be studied as—spontaneous social systems.

It is interesting to note that social orders can persist in spite of the continual, even random, replacement of components: imagine a dictator who specifies all particular actions to be performed but keeps selecting the individuals to perform them by random drawings—there will exist and persist a recognizable order.

Examples of spontaneous social orders would include the arrow formation of migrating wild geese, the defensive ring of the buffaloes, or the hunting formation of a pride of lions: it can be safely presumed that there is not an awareness of the whole on part of the individual. There are rules of responding to the immediate environment which constraint and coordinate actions of independently acting individuals. More complex examples are insect societies of bees, ants, and termites, characterized by

complex structures, "sophisticated" division of labor, and appropriate evolutionary adaptations. (To study such behavior through genetic transfer of encoded informational "blueprints" is thus misplaced and will cause continuing ignorance about the innate rules of conduct of the individuals).†

Thus, human organization (rules of conduct) is evolving in response to the changes in the environment (circumstances). An environmental perturbation requires, if the whole is to persist, a change in the order of the group (structure) and, consequently, a change in the rules of conduct of the individuals (organization). The sets of rules of conduct will evolve only as wholes because the selection process of evolution can operate on a given order only as a whole, not on its parts. (We observe the same in biological systems although our theories of evolution are based on different, atomistic notions).

Hayek's theory of social systems, especially as expressed in Ref. 11, is complete and thoroughly modern. He insists that economic and linguistic theories are endeavoring to reconstruct from regularities of the individual actions the character of the resulting order. Yet, the nature of the different kinds of rules of individual conduct is frequently left obscure. Then we cannot study the question of which of these rules can be deliberately and profitably altered, and which are better left to gradual, natural evolution—we cannot evolve a meaningful *theory of action*.

Societies differ from individual (complex) systems by the fact that their components are themselves complex systems whose change to persist is enhanced by (or dependent upon) their being part of this more comprehensive system (society). *All living systems form societies*. Individuals, in their conduct, are constrained by the very environmental structure (society) they form. They accept such constraints in order to preserve or enhance their individual survival. By doing that, they further strengthen the structure (society). No "design by a maker" needs to be evoked.

Individuals of a group of hungry animals act individually and independently to satisfy their own hunger. Through doing that, because they possess common set of responses to a given environment (as a result of identical physiological structure and similar experience), they generate a precursory formation which becomes an environmental constraint to them. They adjust their actions to this emerging social order (if they do not, they not only destroy the order but perish as individuals), ultimately forming a complex order of apparent cooperation, communication and collective social action. This is Adam Smith's "invisible hand".

From the above thoughts emerges Ortega y Gasset's observation, "I am myself and my circumstance", as a clear and deep insight into the human condition.

Humans, in their history, have shown distinct preference for observing the rules of conduct whose consequences are predictable rather than those of unpredictable consequences. This, in itself, provides an engine for evolution of social orders.

†So called "biological analogy" is quite powerless if biological organism itself is viewed only as a machine (a computer). See for example discussions in Refs 14 and 23. Neither biological nor social systems are machines and should not be studied as machines (or "information"-processing computers).

Predictability of consequences is much more powerful criterion for choosing an action than their relative "utility" or "morality". A criminal who is persistently and without guilt violating man-designed and authority-imposed rules of conduct might never even consider raising his voice to his father, striking a child, or betraying his friends. The world becomes frighteningly unpredictable if one deviates from the spontaneously evolved, natural rules of conduct. To know what is taboo is as important as any positive knowledge about the environment. "Thou shalt not", by conveying the *sense of constraint*, is as important rule of conduct as any positive guide to action.

We should not "plan" a society *because* it has grown too complex; in fact, the order of such complexity can only be preserved if we aim at the formation of a spontaneous order. We cannot improve upon a spontaneous order by issuing direct and specific commands to its individuals—no central authority can ever know "*their* circumstance".

The interpretation of law as an instrument of arrangement (konkretes Ordnungsdenken) is far and distinct from its interpretation as a constraint on the conditions of spontaneous order formation, and thus far from Hayek's interpretation of social systems. A complex society can be effectively controlled through the conditions of the formation, not through direct design and deliberate arrangements. That approach is suitable only for relatively simple orders of limited creative capabilities (although very efficient in destruction: concentration camps, military complexes and police bureaucracies).‡

The counterintuitive dilemma for some is that in an apparent striving for rationality in the sense of fuller taking into account all the foreseeable consequences, we may achieve even greater irrationality, less effective taking into account of remote effects. In the words of von Hayek:¹¹

"...the consequence of modern democratic legislation, which disdains submitting to general rules and attempts to solve each problem as it comes on its specific merits, is probably the most irrational and disorderly arrangement of affairs ever produced by the deliberate decisions of men."

Thus we "solve" the problem of hunger by shipments of food, the problem of racial integration by forced busing of children, the problem of homeless by providing

‡The "engineering" view of control, as emphasized by Ashby's "Law of Requisite Variety", does not apply to social systems. "Only variety can destroy variety" implies that the "control" must be able to respond differentially to all the states the controlled unity may display. Thus, the controller must be at least of the same complexity as the controlled. Ashby himself was quite aware of this "trite law" being a fallacy with respect to social systems: "...the law says that his [Hitler's] control over Germany amounted to just 1 man-power, and no more. (Whether this statement is true must be tested by the future...)" [W. Ross Ashby, *An Introduction to Cybernetics*, John Wiley & Sons, New York, 1966, p. 213].

The future has tested that, many times. In social systems, the extent of control has something to do with the willingness, agreement or consent of the controlled to be regulated. This is addressed by the concept of "leadership" which is missing from the cybernetic theory of control.

It is no longer possible and more, unethical, to understand society as a kind of machinery in need of regulation.

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shelters (not homes), the problem of poverty by providing handouts, the problem of "Poland" by billions of dollars, and so on. We never concern ourselves, hopefully because of ignorance and not politics, about the causes, the spontaneous, ever-renewing and self-maintaining conditions, of human misery.

Societies based on democratic (governmental) legislation, *not* democracies, have taught their citizens to shift their natural responsibilities, as members of human communities and societies, on the shoulders of central governments. The larger the shift, the higher the price (the taxation level). It is not difficult to outlaw poverty, to ban unemployment, to forbid crime—it is only costly and it effects the structure, not the underlying organization which generates the phenomenon. Thus, this approach is doomed to failure.

3 PARALLEL VIEWS ON SOCIAL AUTOPOIESIS OR SELF-PRODUCTION

The intellectual history of spontaneous social orders has, of course, been interrupted and it virtually ends with von Hayek.[†] The idea itself has sometimes been independently generated and rediscovered, in different fields and in different domains of human inquiry.

Alain Touraine²⁴ published his "The Self-Production of Society" in 1973. Although working without the benefit of Hayek's powerful insights, Touraine does understand society as a network of actions and relations and as being totally the product of *social relations*. In this sense,

"Society is not just reproduction and adaptation; it is also creation, self-production."

Self-production (or autopoiesis) implies that a society, first and foremost, is an agent (and object) of its own self-production. Touraine also employs the rules of conduct of individuals as a generative force towards unintended, spontaneous social arrangements:

"The meaning of conduct must be explained not by the consciousness of the actor or by the situation he is placed in, but by the social interactions in which he is involved."

The concept of closure and self-reference is also not foreign to him: societies act upon their own functioning, they turn back upon themselves. Touraine also goes beyond postulated invariance of the underlying rules of conduct (organization) and, as Hayek, fully understands that these also evolve, and that the system involved is not only self-producing but also self-organizing.²⁴

[†]Von Hayek was even able to formulate the fundamental problem of economics in the remarkably modern framework of *knowledge*. "How can the combination of fragments of knowledge existing in different minds bring about results, which, if they were to be brought about deliberately, would require a knowledge on the part of the directing mind which no single person can possess?" (F. A. von Hayek, "Economics and Knowledge", *Economica*, February 1937, p. 52).

"Human society cannot be reduced to an organism always reproducing itself immutably, dependent for any transformation in itself upon mutations brought about by internal or external events. Its capability is not limited to adapting itself to a changing environment and is constantly modifying the rules by which it functions."

This is another insight from social sciences which should find its manifestation in our interpretation of biological systems. The organization of a living system, far from being simply "invariant", continually evolves and adapts itself (self-organizes itself) in response to environmental perturbations and thus induced structural changes.

Alain Touraine says it simply and tersely:

"Society produces itself."

Nobody else ever put it so boldly and with such confidence.

Touraine goes, of course, further: society not only produces itself, but it also adapts itself and consumes itself. It concatenates the processes of production, persistence and disintegration (consumption) circularly upon itself. Touraine identifies the corresponding areas of inquiry as "the field of historicity", "the institutional system", and the "social organization".

Touraine inches toward interpretation of the exhaustion of industrial society not as being replaced by a society of equilibrium but by a society in which society's capacity for action upon itself as a whole is making a qualitative step.

Industrial society does merge into the stasis and equilibrium of "postindustrial society"—as a simple projection of existing trends—but transforms its own organization (the underlying rules of conduct) in response to limitations and constraints it itself has created. The society acquires not only new structure but, more importantly, new organization (new rules of conduct). This is evident in emerging decentralization of work, increasing work at home and self-service, breakdown of hierarchies in high-technology businesses, and the reversal of the process of division of labor. (All this is different from a "structural" argument that more people are involved in services and information industries—thus "post-industrial" society).³¹

Another independent, parallel view comes from one of the proponents of autopoiesis theory, Humberto R. Maturana.¹⁸ Although a biologist, Maturana has expressed unambiguous and competent views on social systems and human condition. He states, as confidently as Touraine:

"A social system is a biological system."

The label "biological" must be understood in Maturana's sense: autopoietic, self-producing, living. That is *not* as a genetically reproducing machines.

The only other statement of similar unambiguity comes from a management and organizational scientist, Stafford Beer.³

"Yes, human societies *are* biological systems."

It should be obvious that if any of the assertions presented so far are even partially correct, then studying social systems as machines or mechanisms (or *artificial* contrivances) is bound to be misplaced. There is bound to be natural resistance to the "biological" view of society; even from biologists themselves.

The issue is philosophically complex and we shall not attempt to resolve it here. Let us simply state that whether or not something is or is not labeled as "biological" is in itself irrelevant. It all depends how we understand "biological" at a given stage of history; as a complicated machine, chemical or electric factory, sophisticated super-computer, or self-organizing autopoietic system? Let us simply say that living systems cannot be understood and should not be studied apart from social systems they create and on which they are dependent as individuals.[†] There are no individuals apart from social systems and no social systems apart from individuals; these are two aspects of the same "living" system.

Let us return to Maturana. He expresses the same idea by observing that a social system can only be integrated by living systems, and the relations and interactions between living systems that do not involve their autopoiesis do not participate in its constitution. In other words, Maturana sees social system as a network of interactions and relations, a medium in which human beings realize their autopoiesis. He introduces the notion of a *natural* social system. This is important because humans are capable of creating *artificial* "social" systems, especially in this age of "the sciences of the artificial". Concentration camp is neither autopoietic nor spontaneous, it is not self-maintaining and does not emerge from the underlying rules of conduct. Yet, it is a "social" system. It has been created by man as a designer and planner, externally, through operating directly on the structure. Although such artificially imposed structure affects the rules of conduct of the individuals, the rules of conduct themselves do not generate the structure. Remove the pressure of the "designer" and the whole social system disintegrates: everybody goes home.[‡]

In some other statements of Maturana we hear echoes of Bogdanov and his categories of positive and negative selection:

"Social system is a medium which operates as a recursive *positive selector* of those properties of its components that confirm it (social system), and as a *negative selector* of those which negate it.

On a purely ethical basis and in response to some criticism of his views, Maturana argues that "no human being can be effectively replaced" in a given system—simply because no two human beings are identical. This is a weak argument because what is striking and important about natural social systems is their ability to maintain identity, continuity and autonomy in spite of (or because of) even a substantial turnover of human individuals. A family, village, town, market, etc., may retain their characteristics and definitional features over centuries and countless generations.

[†]Biological and social systems, for example, do not have goals or objectives, only individual humans do. Here the fallacy of "biological analogy" becomes clear; because organizational goals cannot be satisfactorily defined in principle, some writers¹⁵ conclude that "...if this is so, organizations do not look much like organisms". Observe that this assumes that organisms do have goals.

It is much more useful to understand that so called "goals" of biological organisms are anthropomorphic imputations (assignments of the human observer). As Keeley¹⁵ points out, we have to distinguish goals of an organization from goals for an organization.

[‡]People scale Berlin walls, flee in raincoat-made balloons, forge documents, and plain simply risk their lives in order to escape one or another carefully "engineered" and well designed social "paradise". This also implies that humans can compare, quite reliably, different cultures and ways of life.

The ethical issue, if any, concerns the wisdom of perpetuating the myth of man as a creator, designer and master of human society—when he is plainly not. Of course that individuals are and always have been replaceable in the great schemes of self-renewing social systems. It is precisely this knowledge which makes us effectively human and *useful* to other humans within our social system. Most miseries and disasters of human race stem from the pathological condition when certain individuals or groups viewed themselves as "irreplaceable".

Man as a planner, man as a designer has redesigned rural economies, ignored peasant needs and customs, clobbered economies with foreign aid misspent on industry and mechanization, imported Scotch whiskey and German Mercedeses instead of knowledge, fought rebels with starvation, forbade Russians to drink, designed import taxes on humanitarian aid, allocated 100 million on military parades, built convention centers and put flags all over the countryside. When millions of children started dying, the designer mobilized emergency airlifts bringing heaps of food and blamed the problems on—the weather. Man, as a planner, never reflected on the organizing principles of a society, stimulus and motivation for self-reliance, self-sufficiency, people and their relationships, thus ignoring or damaging spontaneous self-organizing forces of human societies.

Touraine and Maturana are quite solitary in their views on self-production of society. That should not be interpreted as that others do not, at least in part, find the "spontaneous" or "autopoietic" way of thinking useful. Even Hagerstrand¹² finds it useful to study streams of human beings "flowing through" a fairly rigid organizational structure. Boulding^{8a} reminds us that most efficiently man-designed structures are military systems (destruction and disintegration rather than creation and production). Man keeps fighting spontaneous orders (free markets, underground economy, money, etc.) but very little the man-designed structures and institutions.[†] Luhmann¹⁷ considers *events* to be basic units of social systems and their dissolution and disintegration as necessary for reproduction of social systems. Atlan² distinguishes between *artificial systems* (finality imposed by the planner) and *natural systems* (finality unknown, generated by the system itself). Holling¹³ recognizes fundamental continuing disequilibrium of social (ecological) systems: new substrate → production → aging → degradation → new substrate. Thus, complex social systems exhibit enormous *resilience* to perturbations and to *management*.

Allen¹ shows very convincingly, in his computer simulation studies, that each social actor, taken separately, may have very simple and different decision criteria and desires, but the dynamic "folding" of the system can give rise to unintended and complex patterns and flows.

Prigogine²⁰ refers to a widespread interest in, and recognition of, the vital importance of the creative *self-evolution* of complex socio-technical systems. The global features of such systems do not reflect the fulfillment of a "master plan", but rather an evolution of process and structure in directions not necessarily planned, intended or

[†]Recent successful dissolution of regulatory CAB (Civil Aeronautics Board) in the U.S.A. remains an exception, yet the benefits to the quality of life are immediately felt.

desired by any single actor or group of actors. He even speaks of the emergence of "eco-science" as an essential element in the new dialog of man with nature.

4 THEORY AND MODELS OF SPONTANEOUS SOCIAL SYSTEMS

Social world is in a continuous *state of becoming*, it is therefore incomplete to model it as if it were in a *state of being*. Maturana's conception of social system (human or animal) is useful because it allows us to distinguish between organization and structure of a social system:

Social organization is a network of interactions, relations and processes through which the living components maintain their autopoiesis and thus produce, maintain and renew the same network of interactions.

Minimum processes involve those of production, linkage, and disintegration. *Production* refers to the rules and relations guiding the entry (birth, membership, acceptance, etc.) of new living components; *linkage* guides the association, roles, functions and positions of individuals during their tenure within a given organization; finally, *disintegration* refers to the processes associated with termination of membership (death, separation, expulsion, etc.).

All three types of processes must be present and balanced if a given organization is to exhibit self-production, self-maintenance and self-renewal.

Social structure refers to a particular contingent of living components integrating and constituting the organization at a given time and place. Structure is a particular spatio-temporal pattern of particular individuals: a "snapshot" of a state of being of the underlying world in a state of becoming.

Social system consists of the generative social organization and its particular manifestations and embeddings: social structures.†

Example. Family and club are examples of two different social systems. Their organization is different: they differ in the rules of conduct guiding the entry, roles and positions, and termination of their members. Individuals, through their conduct and adherence to (or disobedience of) rules, realize their own autopoiesis and thus recursively produce the same organization that produced them (as members). In a family, for example, a child is born not only as a biological entity, but also as a social entity: son, heir, citizen, etc. A newborn automatically enters a number of social systems and takes part in their autopoiesis. A club functions on different rules of conduct but its structural arrangement may or may not resemble that of a family. In the minimum, it could have the same individuals in common with a given family. The roles, hierarchy of power and the form of communication could resemble those of a family.

†Hajnal⁹ for the first time makes a distinction between organization and structure as applied to the concept of culture. Instead of simply listing the attributes of culture as a static construct, he concentrates on spontaneously formed culture-generators: (1) The reproduction of society, (2) Innovation, (3) Productive work, (4) Organization of work, (5) Exchange and interest relations, (6) Organizations: communities, associations, federations. These generators are remarkably invariant (like organization in autopoiesis), they are not artificial products of man, but originate and renew themselves spontaneously. They are the fundamentals of culture.

Given the above, we can distinguish two basic kinds of *social change*: organizational and structural.

Organizational social change refers to the change (whether spontaneous or imposed) in the underlying rules of conduct. If, under such change, the individuals remain capable of maintaining their autopoiesis, they will recreate the changed organization together with its new structural manifestations—the change will be viable, long-lasting, capable of its own self-renewal. Otherwise, the change may lead to the demise of a given social system as a self-maintaining entity.

Structural social change refers to the change (whether spontaneous or imposed) in the outward structural manifestations (changes in personal contingent, reassignment of roles, restructuring of hierarchical linkages, and spatio-temporal displacement). The underlying social organization is unaffected. This type of social change, if not brought about by the underlying organizational process, is not self-maintaining, is short-term, and must be externally enforced and policed. The underlying social organization will continue producing its own structures (necessary for its own autopoiesis and the only ones it is capable of producing). Depending on the severity of structural change (e.g., physical or social destruction of most individuals) or the intensity and longevity of its enforcement (e.g., policing geographical location), the underlying social organization will either cease to exist as an autopoietic unity or will manifest its autopoiesis in a pathological (either predatory or deprived) pattern.

Structural change, if not severe, is not capable of changing social organization and thus is insufficient as a tool for social change. To be effective in a long run and in terms of social self-production, the underlying social organization must be changed first.

Examples. (1) Free price formation continues in centrally controlled economies in spite of fixed "official" prices. Real price = "official" price + correction factor (reciprocal service, bribe, additional payment, and so on). (2) Because social organization of concentration camps is not self-producing, whenever its external structural enforcement ceases it disintegrates as an entity. (3) Other, vigorously self-renewing social systems cannot be changed via structural change (short of severe physical interference): ghettos of poverty, racial distribution, free markets, or networks of criminal activity.

There are, always, social systems which have to *keep people in*, prevent them from leaving or cancelling membership, translate subtle social boundaries into their crude and visible physical embodiments. There are, always, social systems which have to *keep people out*, control and limit their entry, often resorting to similar physical embodiments of boundaries (otherwise their own self-production and existence might be endangered).

Most man-made systems are of the first kind. No spontaneous, naturally emerging system can be of the first kind—by definition. It would not, then, arise spontaneously and naturally.

J. Kenneth Benson⁵ has proposed to study complex organizations by analyzing the processes through which organizational arrangements are produced and maintained. This clear focus has been mostly missing in the organization theory and

Benson's ideas represent yet another independent and parallel notion of spontaneous social orders, this time from an organizational "micro view".

Conventional organizational theory views business and governmental organizations as static structures in the state of being: it is preoccupied with man-made structural design, re-design and spatio-temporal restructuring. In our terminology, organizational theory does not deal with organizations but only with structures of a given social system. Spontaneous processes of self-organization are often labeled as "parallel", "informal", "secondary", etc., as something to be ignored or suppressed, rather than recognized as the only viable, structure-generating, self-maintaining aspect of such "organization". The word "organization" in organizational theory corresponds to our "social system"; no distinction between organization and structure is usually even attempted.

Benson starts from the right premises:⁵

"People are continually constructing the social world. Through their interactions with each other social patterns are gradually built and eventually a set of institutional arrangements is established. Through continued interactions the arrangements previously constructed are gradually modified or replaced."

This is unmistakably an autopoietic view of the society as a process of spontaneous (not the vulgar "rational-purposeful") social construction. The product of human action then represents a constraint on human action. Yet, the social construct is *an emergent*, an outcome of mostly autonomous process. This is why attempts to regulate the process through authoritarian direction or ideological manipulation are only partly successful, whether in political empires or organizational regimes.

It is not sufficient to study social structure, "a crystallized but temporary outcome of the process of social construction".⁵ There is still a fair amount of theory which takes this narrow, structural view of organization as something which can be designed in the service of specific purposes. As one can see from the radical restructuring and reshaping of organizations in the U.S. *high technology industry* (dismantling of hierarchy, flattening of the levels, *ad hoc* task forces, and emphasis on the individual): that works the best that nobody artificially imposed on people. There is no such "thing" as "formal structure" which can somehow be abstracted from the flux of the underlying organizational life. (Even if one would call such "thing" organizational morphology).

There is always the underlying social organization: a complex network of relations linking participants to each other and to the larger social world in a multiplicity of unregulated ways. It is there where one encounters the basis of power, not in the artificial "top-of-the-pyramid" scheme of things.

It is for these reasons, that Susman and Evered²² may conclude the following about so called organizational science:

"...the findings in our scholarly management journals are only remotely related to the real world of practicing managers and to the actual issues with which members of organizations are concerned..."

The modeling and study of the spontaneous autopoietic processes is best accomplished via computer-based simulation. One of the most important efforts is being

carried out by Peter Allen and his co-workers.¹ They fully recognize that so-called "stochastic effects" are not just minor irritations and nuisance to the modeller—but the *vital force* of evolutionary change. Scenario playing and analysis are more natural and more useful to the policy maker than machine-like "predictions", "forecasts" and other extrapolation artifacts.

Another set of computer-based efforts is represented by a series of works by this author,²⁷⁻³¹ arguing for the *autopoietic view of social organization*.

It is more than appropriate to conclude this paper with the quotation from Lenin, a reminder to the hasty engineers of our times:

"Small-scale commercial production is, every moment of every day, giving birth *spontaneously* to capitalism and the bourgeoisie... Wherever there is small business and freedom of trade, capitalism appears."

The above quotation demonstrates, as French historian Fernand Braudel observed, Lenin's homage and respect to the enormous creative powers of the market, exchange, self-employment and individual resourcefulness. In order to get rid of capitalism one has to root out its generating foundations: spontaneity of organization, freedom to choose, innovation and human self-reliance.

This is why *spontaneous social orders* are so important.

Omnia sponte fluant, absit violentia rebus.†

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†Motto of J. A. Comenius, "Teacher of Nations." (Let all flow in a spontaneous fashion, by force nothing can be gained.)

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DISCUSSION OF ZELENY'S PRESENTATION

Umpleby

In your opinion does Ashby's work on self-organizing systems and intelligence amplification address the question of how knowledge is combined in economic systems? What is missing from Ashby's theory in your opinion?

Zeleny

Ashby does not make the distinction between organization (generational) and structure (manifestational) aspects of self-producing systems.

These theories are not applicable to *social* or *human* systems. He talks of "self-structuralization" rather than "self-organization" even though he calls it self-organization. Actually Ashby later moved away from that formulation.

Umpleby

Can you give a reference?

Zeleny

Compare his *Design for a Brain*, (1960) and his "Principles of the Self-Organizing System" (1962). Ashby stated that the description of living systems in terms of state-determined behavior is adequate and the term "self-organizing system" could be dropped from use.

Sadovsky

Give us please an example of a social system which has man-made and spontaneous components. Is it possible to say that spontaneous components are unpredictable results of man's activity or in other words that the elements and subsystems, of a spontaneous system are man-made, but the spontaneous system itself is not man-made?

Zeleny

Examples of spontaneous systems: markets, money, firms, families, clubs, towns, ideologies, interest rates, etc. Anything having boundaries to keep people out rather than to keep people in.

Examples of man-made systems: military formations, concentration camps, managerial hierarchies, command economies, artificial towns and social institutions, etc.

Spontaneous orders are *unintended* (unplanned for) emergents of human interactions. These spontaneous outcomes are unpredictable only to the extent of our ignorance of the *generating* mechanisms.

Von Glasersfeld

The distinction between spontaneous systems which we do *not* understand and man-made systems which we do understand is relevant to politics. Politicians (of every color) often try to make people believe that the particular man-made system they represent is *the* spontaneous system that everyone wants but has not yet realized. This, surely, is one root of demagogery. A fully "spontaneous" system could arise only through what I would call "collaborative dialectic."

Umpleby

Are the terms centralization and decentralization a suitable paraphrase for your terms man-made and spontaneous organization? Governments can be thought of as oscillating between centralized and decentralized policies. In the U.S. the Democratic Party tends to suggest centralized policies while the Republican Party prefers decentralized policies. Even in one party systems one can observe such changes. For example, in China centralized policies were pursued under Mao, but lately there have been experiments in decentralization.

Zeleny

Centralized systems are *typically* man-made by definition of the central designer. Spontaneous ones are *typically* non-centralized *but* there could be spontaneous transformation of decentralized into centralized, and vice versa.

The policy oscillations I would attribute to our poor understanding of the proper roles design and self-production play in social systems.

Mitroff

Why did early systems ideas not catch on?

Zeleny

The nature of scientific revolutions.

Lapin

You strongly stated that spontaneous systems are more viable with respect to external impacts than consciously created systems. Is this an intuitive statement, or is there some scientific proof for it?

Zeleny

I didn't mean to state that *all* spontaneous orders are more resilient to external disturbances. Some are very brittle and can be destroyed (a free democratic society). Some man-made systems can be "shielded" from external disturbances by man-made "barriers"; thus they can survive longer. *Removing the barriers*, spontaneous systems are better equipped to survive.

Look at a system's boundary and watch which way people are crossing it. People do not leave a spontaneously self-organized system.